Competence coverage matrix				G	eneral	Cours	es			С	ourses	Relate	ed to th	ne Main	Subje	ct		Maste r's Disser tation
																tation		
<u></u> GHENT			Compressors and IC						esign	SI	research	and						
GHENT UNIVERSITY								Control	ģ		nical De	System	and	Air-conditioning and				
Master of Science in El	rives					g and (ynamic		Mechai	rement	design	vir-cond						
Mechanical Energy Eng	gineering		E036130 Controlled Electrical Drives	S	Displacement Pumps, undamentals	E040670 Mechanical Vibrations	E019331 ICT and Mechatronics	E076221 Manufacturing Planning and Control	E045240 Computational Fluid Dynamics	llations	E043070 Materials Selection in Mechanical Design	E032322 Sensor Based Measurement Systems	advanced			nergy	ics	ertation
Academic year 2021-20	olled Ele	Turbomachines	acement nentals	anical V	nd Mech	facturing	utationa	E028700 Thermal Installations	ials Sele	or Basec	gines: a	E039211 Heating, Ventilation, Refrigeration	E037621 Gas Turbines	Sustainable Energy	E040560 Fluid Mechanics	E091103 Master's Dissertation		
) Contro		E037121 Displacemer Engine Fundamentals) Mech	ICT ar	Manul	Сотр) Therm) Mater	Senso	E037221 IC Engines:	Heatir ation	GasT	Susta	Fluid	3 Maste
Legend: T=teaching methods			036130	E037321	037121 ngine F	040670	019331	076221	045240	028700	043070	032322	037221	039211 efrigera	037621	E035421	040560	091103
E=evaluation methods Competences in		T 10	ш	Ш	Т	Т	Т	Т	Ш	Т	Т	ш	Т	Т	Т	ш	Ш	Т
one/more scientific discipline(s)	Apply Computer Aided Engineering (CAE) tools and advanced	E 10			Е	Е	E	E	Т	Е	Е		E	E T	Е			E
	Have a thorough insight in the interactions between different	E 3	T		T		E T		Е	T			T	Е				T
	systems.	E 6	E		E	-	E			Е		-	E					E
	Have a thorough knowledge of measurement techniques, sensors, actuators and ICT and the ability to apply the knowledge.	E 4			T E	Т	T E	-				T E						E
		T 1 E 1 T 8		Т	Т			T E		Т			Т	т	Т		т	Т
	Have a thorough insight in mechanical and thermodynamical energy conversions, fluid dynamics, heat transfer and combustion and apply the knowledge to complex problems.	E 8		Ė	Ē					Ė			Ė	Ė	Ė		Ė	E
	Specifically for main subject 'Electrical Power Engineering': Have a thorough insight in the production, distribution, conversion and use of electrical power and apply the knowledge to complex problems.	T 2 E 2	E															E
	Specifically for main subject 'Mechanical Construction': Have a	T 2 E 2									T E							T E
	Specifically for main subject 'Control Engineering and Automation':	T 3 E 3	T E				T E											T E
	Specifically for main subject 'Maritime Engineering': Have a	T 1 E 1																T E
Scientific competences		T 5 E 5				T E	T E				T E		T E					T E
		T 2 E 2					E				Т							T E
		T 10 E 10	T E			T E	T E	T E	T E	T E	T E	T E		T E				T E
	·	T 3 E 3				T E	T E	T E										
		T 3 E 3					E				Т		T E					T E
Intellectual competences	problems, and defend this point of view.	T 7 E 6	E					Т			E		T E	E	T E			T E
		T 3 E 4				T E	E			E								T E
		T 2 E 2					T E											T E
	· ·	T 6 E 3	T E				T			Т	Т		T E					T E
	, , , , , ,	T 3 E 2					Т					T E						T E
Competences in cooperation and	specialisation.	T 8 E 7	T E		T E	T E	T E			Т		T E	T E					T E
communication	report efficiently, keep track of targets, follow the progress of the project,	T 4 E 4			T E		T E					T E						T E
	Have the ability to work as a member of a team in a multi disciplinary workingenvironment, as well as being capable of taking on supervisory responsibilities.	T 2 E 2					E					E						
	Report on technical or scientific subjects verbally, in writing and using graphics.	T 8 E 8	T E		T E	T E	E				Т	T E	T E		T E			T E
Societal competences	Act in an ethical, professional and social way.	T 4 E 2	T		T	_	_			Т		_	_		_			T
	Recognize the most important business and legal aspects of the	T 2 E 1	Ė					Т			T E							_
	Understand the historical evolution of the own engineering	T 3 E 2					Т				T E							T E
Profession-specific competence	Master the complexity of technical systems by using system and	T 8 E 8	T E		T E	T E	T E	T E		T E				T E				T E
competence		T 4 E 4	Ė		_	_	T	_		_	T E	T E		_				T E
	Synthesize incomplete, contradictory or redundant data into useful	Т 3					Т				T							Т
	Possess sufficient ready knowledge and understanding to evaluate	E 2 T 6 E 5	T E	T E		Т	T E				T E							T E
		T 3 E 1	т				Т				T E							
								1										

GHENT UNIVERSITY Master of Science in E Mechanical Energy En Academic year 2021-20 Legend: T=teaching methods E=evaluation methods			E036130 Controlled Electrical Drives	E037321 Turbomachines	E037121 Displacement Pumps, Compressors and IC Engine Fundamentals	E040670 Mechanical Vibrations	E019331 ICT and Mechatronics	E076221 Manufacturing Planning and Control	E045240 Computational Fluid Dynamics	E028700 Thermal Installations	E043070 Materials Selection in Mechanical Design	E032322 Sensor Based Measurement Systems	E037221 IC Engines: advanced design and research	E039211 Heating, Ventilation, Air-conditioning and Refrigeration	E037621 Gas Turbines	E035421 Sustainable Energy	E040560 Fluid Mechanics	E091103 Master's Dissertation
Profession-specific competence	Pay attention to sustainability, energyefficiency, environmental cost, use of raw materials and labour costs.	T 5 E 2	T		Т					Т	T E		T E					
·	Pay attention to all aspects of reliability, safety, and ergonomics.	T 3 E 2	Т				T E				T E							
	Have insight into and understanding of the importance of entrepreneurship.																	
	Show perseverance, innovativeness, and an aptitude for creating added value.	T 2 E 2					T E											T E
	Integrate the advanced knowledge of mechanical and electrical systems and ICT in order to design, implement and exploit technological innovations.	T 2 E 2					T E											T E
	Be familiar with the energy efficiency of (electrical, mechanical and thermal) energy conversion systems and distribution systems.	T 7 E 6	T E	T E	Т					T E			T E		T E			T E
			W 15	W 3	W 11	M 40	W 22	M/Z	W 2	W 11	W 17	M/ Q	W 11	W 6	W 5		W 1	W 29

EMingwALG1.1 Master and apply advanced knowledge in the own engineering discipline in solving complex problems.

Competences in one/more scientific discipline(s)

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	gevonden in de studiefiche		
E037121 Displacement Pumps, Compressors and IC Engine Fundamentals	lecture seminar practicum	report	Execute thermodynamic analyses of displacement machines and calculate performance parameters. Choose a suitable pump, compressor or internal combustion engine type depending on the application and determine its basic dimensions. Analyse and interpret measurements on positive displacement machinery. Explain trends in engine design, fuel choice and emission legislation and explain why a specific engine design would be chosen according to the needs of the application. Calculate the margin to cavitation for a pump installation and if necessary propose the required adaptations.
E040670 Mechanical Vibrations	guided self-study seminar: coached exercises lecture	oral examination	Modelling of rotating and non-rotating mechanical systems based on Langrange's technique. Apply model structure preserving reduction techniques. Identify modal parameters from an experiment Design of vibration isolation and vibration absorption devices. Perform a modal analysis and formulate structural modifications for continuous and discrete systems. Calculate vibration levels of mechanical structures subjected to dynamic loads.
E019331 ICT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E076221 Manufacturing Planning and Control	lecture seminar: coached exercises practicum	written examination	distinguish and correctly apply methods and tools for planning production and inventory at strategic, tactical and operational level assess the usefulness of the different methods and tools for shop floor control in varying situations
E028700 Thermal Installations	lecture seminar: practical PC room classes seminar: coached exercises self-reliant study activities	open book examination	Designing heat exchangers Understanding the physics of two phase gas liquid flow Pointing out heat exchanger types and their properties
E043070 Materials Selection in Mechanical Design	lecture self-reliant study activities	written examination with open questions open book examination	Obtain understanding into the complex interactions between design, materials selection and related economical aspects. Independently defend an opinion regarding the failure behaviour of a construction / machine part ("engineering failure analysis"). Know the principal properties of common construction materials. Formulate suggestions to improve material behaviour. Compare different materials in a multidisciplinary framework, often having conflicting boundary conditions.
E037221 IC Engines: advanced design and research	group work practicum lecture	oral examination report skills test	Explain trends in internal combustion engine technologies and fuels Process and interpret advanced engine measurements Synthesize, present and explain scientific literature on internal combustion engines
E039211 Heating, Ventilation, Air-conditioning and Refrigeration	lecture project	report	Design of HVAC&R systems
E037621 Gas Turbines	lecture seminar: coached exercises self-reliant study activities	oral examination report	Layout and performance characteristics of axial and radial turbines for gases. Components of power gas turbines; thermodynamic modelling of gas turbines; performance of different cycles for power generation. Layout and performance characteristics of axial and radial compressors. Generation and energetic optimisation of thrust; technology of an aero-engine.

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

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

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

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

Render and synthesise the results concisely.

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

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

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet te	ruggevonden in de studiefiche		
E019331 ICT and Mechatronics	Only evaluation	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E045240 Computational Fluid Dynamics	lecture seminar: practical PC room cl project	written examination with open lasses questions report	Describe selected techniques in computational fluid dynamics (applicable for the course of 6 ECTS)
E039211 Heating, Ventilation, Air-conditioning and Refrigeration	project	report	Design of HVAC&R systems

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EMingwELME1.1 Have a thorough insight in the interactions between different electromechanical parts and energy conversions of complex Competences in one/more scientific disciplin	EMingwELME1.1 Have a thorough insight in the interactions between different electromechanic	cal parts and energy conversions of complex	Competences in one/more scientific discipline(s)
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systems. Course	Teaching methods	Evaluation methods	Course learning outcome
		Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studietiche		
E036130 Controlled Electrical Drives	lecture	open book examination	Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal supply Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and
			load commutation in VSI
			and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines
			versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of power electronic supply on
			the machine and vice-versa, stepping motors versus classical motors
			Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivalen circuits for inverters, V/F
			supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation, hystereis motor, stepping motors and their characteristics
E037121 Displacement Pumps, Compressors and IC	practicum	report	Analyse and interpret measurements on positive displacement machinery.
Engine Fundamentals	•	report	
E019331 ICT and Mechatronics	guided self-study	written examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and
	seminar	report	machine learning
	project	skills test	Represent simple motion systems with matrix groups and realize their limitations
	lecture	oral examination	Discriminate between different task organizations: layers, parallel threads, object oriented
			Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies
			Name relevant techniques and recognize the dangers for multiple-task management
			Understand how basic components of complex mechatronic systems work, especially on the ICT side
			Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered
			mechatronic system
028700 Thermal Installations	excursion	report	Analysing complex thermal processes and cycles
	lecture	. op o. t	Approaching energy use in an industrial context in a critical way both in a company and in society
037221 IC Engines: advanced design and research	group work	oral examination	Explain trends in internal combustion engine technologies and fuels
3	practicum	report	Process and interpret advanced engine measurements
	lecture	skills test	Synthesize, present and explain scientific literature on internal combustion engines
091103 Master's Dissertation	master's dissertation	oral examination	Define, study and analyse the research problem in a specific domain.
		assignment	Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance.
			Self-assessment with adequate and critical self-correction and objectivity.
			Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople.
			Render and synthesise the results concisely.
			Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search,
			topical study, research and the
			reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwELME1.2 Have a thorough	h knowledge of measureme	nt techniques, sensors, ac	ctuators and ICT and the ability to apply the knowledge. Competences in one/more scientific discipline(s)
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet ter	uggevonden in de studiefiche		
E037121 Displacement Pumps, Compressors and IC Engine Fundamentals	practicum	report	Analyse and interpret measurements on positive displacement machinery.
E040670 Mechanical Vibrations	seminar: coached exercises		Identify modal parameters from an experiment
E019331 ICT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E032322 Sensor Based Measurement Systems	lecture project	oral examination report assignment	Programming of microcontrollers for data acquisition and programming in Python to process measurement data. Understand and describe the operation of sensors and signal conditioners Dealing with inaccurate measurement data in a judicious way; eliminate or take into account interferences and digitizing artifacts.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwELME1.3 Be familiar with the management of companies and operations.

Competences in one/more scientific discipline(s)

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet t	teruggevonden in de studiefiche		
E076221 Manufacturing Planning and Control	lecture seminar: coached exercises practicum	written examination	indicate the strategic importance of production planning and control for a company assess the usefulness of the different methods and tools for shop floor control in varying situations distinguish and correctly apply methods and tools for planning production and inventory at strategic, tactical and operational level quantify the impact of variability on the performance of a production system analyse and control complex production systems by using mathematical models

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EMingwELME1.4 Specifically for main subject 'Mechanical Energy Engineering': Have a thorough insight in mechanical and thermodynamical

<<	EMingwELME1.4 Specifically for renergy conversions, fluid dynami			thorough insight in mechanical and thermodynamical Competences in one/more scientific discipline(s) ledge to complex problems.
Course		Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en	evaluatievormen voorafgegaan door ** werden niet terug	gevonden in de studiefiche		
E037321 T	urbomachines	guided self-study lecture	oral examination	Derive parameter choice and layout of fans, steam turbines, pumps, hydraulic turbines and wind turbines Derive basic functioning of turbomachines and the flow in their components
	Displacement Pumps, Compressors and IC Engine Fundamentals	lecture seminar practicum	report	Execute thermodynamic analyses of displacement machines and calculate performance parameters. Choose a suitable pump, compressor or internal combustion engine type depending on the application and determine its basic dimensions. Analyse and interpret measurements on positive displacement machinery. Explain trends in engine design, fuel choice and emission legislation and explain why a specific engine design would be chosen according to the needs of the application. Calculate the margin to cavitation for a pump installation and if necessary propose the required adaptations.
E028700 T	Thermal Installations	guided self-study seminar: practical PC room classes seminar: coached exercises self-reliant study activities lecture excursion	open book examination report skills test assignment	Analysing complex thermal processes and cycles Using software for energy calculations Understanding the physics of two phase gas liquid flow Approaching energy use in an industrial context in a critical way both in a company and in society Pointing out heat exchanger types and their properties Designing heat exchangers
E037221 I	C Engines: advanced design and research	group work practicum lecture	oral examination report skills test	Explain trends in internal combustion engine technologies and fuels Process and interpret advanced engine measurements Synthesize, present and explain scientific literature on internal combustion engines
	Heating, Ventilation, Air-conditioning and Refrigeration	lecture project	report	Understanding and describing components of HVAC&R systems Reporting on design and energy performance Doing Dynamic simulation and energy performance calculations Understanding Energy performance of building, building systems and components Design of HVAC&R systems Describing part load behaviour of HVAC&R systems
E037621 0	Gas Turbines	lecture seminar: coached exercises self-reliant study activities	oral examination report	Layout and performance characteristics of axial and radial turbines for gases. Components of power gas turbines; thermodynamic modelling of gas turbines; performance of different cycles for power generation. Layout and performance characteristics of axial and radial compressors. Generation and energetic optimisation of thrust; technology of an aero-engine.
E040560 F	Fluid Mechanics	excursion seminar: practical PC room classes seminar: coached exercises practicum lecture	written examination oral examination	Compute one-dimensional and two-dimensional flow with a compressible fluid Explain the influence of compressibility of the fluid on a flow Explain running waves in unsteady flows
E091103 N	Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwELME1.5 Specifically for main subject 'Electrical Power Engineering': Have a thorough insight in the production, distribution, conversion and use of electrical power and apply the knowledge to complex problems.

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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 ** werde	n niet teruggevonden in de studiefiche		
E036130 Controlled Electrical Drives	lecture seminar: coached exercises practicum	open book examination	Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal supply Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and load commutation in VSI and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of power electronic supply on the machine and vice-versa, stepping motors versus classical motors Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivalent circuits for inverters, V/F supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation, hystereis motor, stepping motors and their characteristics
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwELME1.6 Specifically for of constructions and machines	-		h insight in the design, behaviour and manufacturing Competences in one/more scientific discipline(s)
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet ter	ruggevonden in de studiefiche		
E043070 Materials Selection in Mechanical Design	lecture self-reliant study activities	written examination with open questions open book examination	Formulate suggestions to improve the lifetime of a construction / machine part. Understand the importance of standardization in materials selection (juridical aspect). Independently defend an opinion regarding the failure behaviour of a construction / machine part ("engineering failure analysis"). Know the principal properties of common construction materials. Systematically identify suitable candidate materials. Formulate suggestions to improve material behaviour. Compare different materials in a multidisciplinary framework, often having conflicting boundary conditions. Show attention to ecological aspects of design. Obtain understanding into the complex interactions between design, materials selection and related economical aspects. Find and critically analyze scientific literature. Understand the importance of reliability and robustness in mechanical design.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwELME1.7 Specifically for main subject 'Control Engineering and Automation': Have a thorough insight in the design and behaviour of	Competences in one/more scientific discipline(s)

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werdel	n niet teruggevonden in de studiefiche		
E036130 Controlled Electrical Drives	lecture seminar: coached exercises	open book examination	Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal supply Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and load commutation in VSI and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of power electronic supply on the machine and vice-versa, stepping motors versus classical motors Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivalen circuits for inverters, V/F supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation, hystereis motor, stepping motors and their characteristics
E019331 ICT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwELME1.8 Specifically for main subject 'Maritime Engineering': Have a thorough insight in the design, construction, functioning and Competences in one/more scientific discipline(s) << exploitation of maritime systems. Course learning outcome Course Teaching methods **Evaluation methods** Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche E091103 Master's Dissertation master's dissertation oral examination Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. assignment Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,...). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
E040670 Mechanical Vibrations	guided self-study seminar: coached exercises lecture	oral examination	Modelling of rotating and non-rotating mechanical systems based on Langrange's technique. Apply model structure preserving reduction techniques. Identify modal parameters from an experiment Design of vibration isolation and vibration absorption devices. Perform a modal analysis and formulate structural modifications for continuous and discrete systems. Calculate vibration levels of mechanical structures subjected to dynamic loads.
E019331 ICT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E043070 Materials Selection in Mechanical Design	lecture self-reliant study activities	open book examination	Formulate suggestions to improve the lifetime of a construction / machine part. Independently defend an opinion regarding the failure behaviour of a construction / machine part ("engineering failure analysis' Formulate suggestions to improve material behaviour. Compare different materials in a multidisciplinary framework, often having conflicting boundary conditions. Obtain understanding into the complex interactions between design, materials selection and related economical aspects. Find and critically analyze scientific literature.
E037221 IC Engines: advanced design and research	group work practicum lecture	oral examination report skills test	Explain trends in internal combustion engine technologies and fuels Process and interpret advanced engine measurements Synthesize, present and explain scientific literature on internal combustion engines
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet ter	ruggevonden in de studiefiche		
E019331 ICT and Mechatronics	Only evaluation	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E043070 Materials Selection in Mechanical Design	self-reliant study activities		Find and critically analyze scientific literature.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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<<	EMingwALG2.3 Select and apply the appropriate models, methods and techniques.
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Scientific compe	uences
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EMingwALG2.3 Select and apply the appropriate models, methods and techniques. Scientific compete				
Course		Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en	evaluatievormen voorafgegaan door ** werden niet teru	nggevonden in de studiefiche		
E036130 (Controlled Electrical Drives	lecture seminar: coached exercises practicum	open book examination	Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal supply Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and load commutation in VSI and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of power electronic supply on the machine and vice-versa, stepping motors versus classical motors Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivalent circuits for inverters, V/F supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation, hystereis motor, stepping motors and their characteristics
E040670 N	Mechanical Vibrations	guided self-study seminar: coached exercises lecture	oral examination	Modelling of rotating and non-rotating mechanical systems based on Langrange's technique. Apply model structure preserving reduction techniques. Identify modal parameters from an experiment Design of vibration isolation and vibration absorption devices. Perform a modal analysis and formulate structural modifications for continuous and discrete systems. Calculate vibration levels of mechanical structures subjected to dynamic loads.
E019331 I	CT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E076221 N	Manufacturing Planning and Control	lecture seminar: coached exercises practicum	written examination	distinguish and correctly apply methods and tools for planning production and inventory at strategic, tactical and operational level assess the usefulness of the different methods and tools for shop floor control in varying situations
E045240 (Computational Fluid Dynamics	lecture seminar: practical PC room classes project	written examination with open questions report	Select appropriate numerical techniques and settings for a flow problem (applicable for the full version of 6 ECTS and the partim version of 4 ECTS)
E028700 T	hermal Installations	self-reliant study activities seminar: practical PC room classes	report	Using software for energy calculations
E043070 N	Materials Selection in Mechanical Design	lecture	open book examination	Compare different materials in a multidisciplinary framework, often having conflicting boundary conditions. Systematically identify suitable candidate materials.
E032322 S	Sensor Based Measurement Systems	project	assignment report	Dealing with inaccurate measurement data in a judicious way; eliminate or take into account interferences and digitizing artifacts.
	leating, Ventilation, Air-conditioning and Refrigeration	lecture project	report	Understanding and describing components of HVAC&R systems Reporting on design and energy performance Doing Dynamic simulation and energy performance calculations Understanding Energy performance of building, building systems and components Design of HVAC&R systems Describing part load behaviour of HVAC&R systems
E091103 N	Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwALG2.4 Develop and validate mathematical models and methods. <<

written examination

lecture

seminar: coached exercises

E076221 Manufacturing Planning and Control

Scientific competences Course Teaching methods **Evaluation methods** Course learning outcome Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche E040670 Mechanical Vibrations Modelling of rotating and non-rotating mechanical systems based on Langrange's technique. guided self-study oral examination Apply model structure preserving reduction techniques. seminar: coached exercises lecture Identify modal parameters from an experiment Design of vibration isolation and vibration absorption devices. Perform a modal analysis and formulate structural modifications for continuous and discrete systems. Calculate vibration levels of mechanical structures subjected to dynamic loads. E019331 ICT and Mechatronics Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and guided self-study written examination machine learning seminar report skills test Represent simple motion systems with matrix groups and realize their limitations project lecture Discriminate between different task organizations: layers, parallel threads, object oriented oral examination Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered

analyse and control complex production systems by using mathematical models

quantify the impact of variability on the performance of a production system

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EMingwALG2.5 Interpret research findings in an objective and critical manner.	
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Scienti	ific co	mpe	tence

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche		
E019331 ICT and Mechatronics	Only evaluation	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E043070 Materials Selection in Mechanical Design	self-reliant study activities		Find and critically analyze scientific literature.
E037221 IC Engines: advanced design and research	group work practicum lecture	oral examination report skills test	Explain trends in internal combustion engine technologies and fuels Process and interpret advanced engine measurements Synthesize, present and explain scientific literature on internal combustion engines
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
E036130 Controlled Electrical Drives	lecture seminar: coached exercises	open book examination	Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal supply Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with
			classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and load commutation in VSI
			and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines
			versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of power electronic supply on
			the machine and vice-versa, stepping motors versus classical motors
			Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivalent circuits for inverters, V/F
			supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation, hystereis motor, stepping motors
			and their characteristics
E076221 Manufacturing Planning and Control	lecture		assess the usefulness of the different methods and tools for shop floor control in varying situations
E043070 Materials Selection in Mechanical Design	lecture	open book examination	Formulate suggestions to improve the lifetime of a construction / machine part.
	self-reliant study activities		Independently defend an opinion regarding the failure behaviour of a construction / machine part ("engineering failure analysis").
			Formulate suggestions to improve material behaviour.
			Find and critically analyze scientific literature.
E037221 IC Engines: advanced design and research	group work	oral examination	Explain trends in internal combustion engine technologies and fuels
	practicum	report	Process and interpret advanced engine measurements
	lecture	skills test	Synthesize, present and explain scientific literature on internal combustion engines
E039211 Heating, Ventilation, Air-conditioning and	lecture	oral examination	Understanding and describing components of HVAC&R systems
Refrigeration	project	report	Reporting on design and energy performance
			Doing Dynamic simulation and energy performance calculations
			Understanding Energy performance of building, building systems and components
			Design of HVAC&R systems
			Describing part load behaviour of HVAC&R systems
E037621 Gas Turbines	self-reliant study activities	report	Layout and performance characteristics of axial and radial turbines for gases.
			Components of power gas turbines; thermodynamic modelling of gas turbines; performance of different cycles for power generation.
			Layout and performance characteristics of axial and radial compressors.
			Generation and energetic optimisation of thrust; technology of an aero-engine.
E091103 Master's Dissertation	master's dissertation	oral examination	Define, study and analyse the research problem in a specific domain.
LOST TOS Master's Dissertation	master's dissertation	assignment	Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance.
		assignment	Self-assessment with adequate and critical self-correction and objectivity.
			Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to
			laypeople.
			Render and synthesise the results concisely.
			Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search,
			topical study, research and the
			reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,).
			Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwALG3.2 Apply knowledge in a creative, purposeful and innovative way to research, conceptual design and production.

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tellectua	competences
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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** wer	den niet teruggevonden in de studiefiche		
E040670 Mechanical Vibrations	seminar: coached exercises	oral examination	Perform a modal analysis and formulate structural modifications for continuous and discrete systems. Apply model structure preserving reduction techniques. Design of vibration isolation and vibration absorption devices.
E019331 ICT and Mechatronics	Only evaluation	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E028700 Thermal Installations	seminar: coached exercises seminar: practical PC room classe	open book examination s report	Analysing complex thermal processes and cycles Designing heat exchangers
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwALG3.3 Critically reflect on one's own way of thinking and acting, and understand the limits of one's competences.

Intellectual competences

Course	Teaching methods	Evaluation methods	Course learning outcome			
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche						
E019331 ICT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system			
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.			

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
E036130 Controlled Electrical Drives	lecture seminar: coached exercises	open book examination	Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal supply Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and load commutation in VSI and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of power electronic supply on the machine and vice-versa, stepping motors versus classical motors Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivalent circuits for inverters, V/F supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation, hystereis motor, stepping motors and their characteristics
E019331 ICT and Mechatronics	guided self-study seminar project lecture		Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E028700 Thermal Installations	excursion self-reliant study activities lecture		Pointing out heat exchanger types and their properties Approaching energy use in an industrial context in a critical way both in a company and in society
E043070 Materials Selection in Mechanical Design	self-reliant study activities		Find and critically analyze scientific literature.
E037221 IC Engines: advanced design and research	group work practicum lecture	oral examination report skills test	Explain trends in internal combustion engine technologies and fuels Process and interpret advanced engine measurements Synthesize, present and explain scientific literature on internal combustion engines
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwALG3.5 Readily adapt to changing professional circumstances.

Intellectual competend	ces
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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet t	eruggevonden in de studiefiche		
E019331 ICT and Mechatronics	guided self-study seminar project lecture		Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E032322 Sensor Based Measurement Systems	project	assignment report	Collaborate in a small group on a project to design and realize a practical sensor based measurement system.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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<<	EMingwALG4.1 Have the ability to		•	ialisation. Competences in cooperation and communication
Course		Teaching methods	Evaluation methods	Course learning outcome
Noot: leer-	en evaluatievormen voorafgegaan door ** werden niet terug	gevonden in de studiefiche		
E036130	Controlled Electrical Drives	lecture seminar: coached exercises practicum	open book examination	Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal supply Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and load commutation in VSI and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of power electronic supply on the machine and vice-versa, stepping motors versus classical motors Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivaler circuits for inverters, V/F supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation, hystereis motor, stepping motors
E037121	Displacement Pumps, Compressors and IC Engine Fundamentals	lecture seminar practicum	report	and their characteristics Calculate the margin to cavitation for a pump installation and if necessary propose the required adaptations. Choose a suitable pump, compressor or internal combustion engine type depending on the application and determine its basic dimensions. Analyse and interpret measurements on positive displacement machinery. Explain trends in engine design, fuel choice and emission legislation and explain why a specific engine design would be chosen according to the needs of the application.
E040670	Mechanical Vibrations	lecture	oral examination	Modelling of rotating and non-rotating mechanical systems based on Langrange's technique. Apply model structure preserving reduction techniques. Identify modal parameters from an experiment Design of vibration isolation and vibration absorption devices. Perform a modal analysis and formulate structural modifications for continuous and discrete systems. Calculate vibration levels of mechanical structures subjected to dynamic loads.
E019331	ICT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E028700	Thermal Installations	lecture		Pointing out heat exchanger types and their properties
E032322	Sensor Based Measurement Systems	project	oral examination report	Collaborate in a small group on a project to design and realize a practical sensor based measurement system. Understand and describe the operation of sensors and signal conditioners
E037221	IC Engines: advanced design and research	group work practicum lecture	oral examination report skills test	Explain trends in internal combustion engine technologies and fuels Process and interpret advanced engine measurements Synthesize, present and explain scientific literature on internal combustion engines
E091103	Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwALG4.2 Project management: have the ability to formulate objectives, report efficiently, keep track of targets, follow the progress of the Competences in cooperation and communication project....

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project, Course	Teaching methods	Evaluation methods	Course learning outcome
		Lvaluation metrious	
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
E037121 Displacement Pumps, Compressors and IC Engine Fundamentals	practicum	report	Analyse and interpret measurements on positive displacement machinery.
E019331 ICT and Mechatronics	guided self-study seminar	written examination report	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning
	project	skills test	Represent simple motion systems with matrix groups and realize their limitations
	lecture	oral examination	Discriminate between different task organizations: layers, parallel threads, object oriented
			Understand basic communication techniques: setting up communication, choosing information channel and information content
			Design and implement computer-based motion control strategies
			Name relevant techniques and recognize the dangers for multiple-task management
			Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered
			mechatronic system
E032322 Sensor Based Measurement Systems	project	assignment	Programming of microcontrollers for data acquisition and programming in Python to process measurement data.
•	. ,	report	Collaborate in a small group on a project to design and realize a practical sensor based measurement system.
E091103 Master's Dissertation	master's dissertation	oral examination	Define, study and analyse the research problem in a specific domain.
		assignment	Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance.
			Self-assessment with adequate and critical self-correction and objectivity.
			Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to
			laypeople.
			Render and synthesise the results concisely.
			Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search,
			topical study, research and the
			reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.
			i ind an appropriate methodology, in accordance with the applicable scientific floring of the specific field of study.

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

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supervisory responsibilities.			• • •
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet te	eruggevonden in de studiefiche		
E019331 ICT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E032322 Sensor Based Measurement Systems	project	assignment	Collaborate in a small group on a project to design and realize a practical sensor based measurement system.

report

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EMingwALG4.4 Report on technical or scientific subjects verbally, in writing and using graphics.				
Course	Teaching methods	Evaluation methods	Course learning outcome	
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terd	uggevonden in de studiefiche			
E036130 Controlled Electrical Drives	practicum	skills test	Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal suppl Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and load commutation in VSI and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of	
			power electronic supply on the machine and vice-versa, stepping motors versus classical motors Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivalencircuits for inverters, V/F	
			supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation, hystereis motor, stepping motors and their characteristics	
E037121 Displacement Pumps, Compressors and IC Engine Fundamentals	practicum	report	Analyse and interpret measurements on positive displacement machinery.	
E040670 Mechanical Vibrations	lecture seminar: coached exercises	report	Modelling of rotating and non-rotating mechanical systems based on Langrange's technique. Perform a modal analysis and formulate structural modifications for continuous and discrete systems.	
E019331 ICT and Mechatronics	Only evaluation	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system	
E043070 Materials Selection in Mechanical Design	self-reliant study activities		Find and critically analyze scientific literature.	
E032322 Sensor Based Measurement Systems	project	oral examination report	Collaborate in a small group on a project to design and realize a practical sensor based measurement system.	
E037221 IC Engines: advanced design and research	group work practicum lecture	oral examination report skills test	Explain trends in internal combustion engine technologies and fuels Process and interpret advanced engine measurements Synthesize, present and explain scientific literature on internal combustion engines	
E037621 Gas Turbines	self-reliant study activities	report	Layout and performance characteristics of axial and radial turbines for gases. Components of power gas turbines; thermodynamic modelling of gas turbines; performance of different cycles for power generation. Layout and performance characteristics of axial and radial compressors. Generation and energetic optimisation of thrust; technology of an aero-engine.	
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.	

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

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
E036130 Controlled Electrical Drives	lecture seminar: coached exercises	open book examination	Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal supply Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and load commutation in VSI and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of power electronic supply on the machine and vice-versa, stepping motors versus classical motors Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivalent circuits for inverters, V/F supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation, hystereis motor, stepping motors and their characteristics
E037121 Displacement Pumps, Compressors and IC Engine Fundamentals	lecture		Explain trends in engine design, fuel choice and emission legislation and explain why a specific engine design would be chosen according to the needs of the application.
E028700 Thermal Installations	excursion lecture		Approaching energy use in an industrial context in a critical way both in a company and in society
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

Societal competences

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EMingwALG5.2 Recognize the most important business and legal aspects of the own engineering discipline.

Societal competences

Course	Teaching methods	Evaluation methods	Course learning outcome		
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche					
E076221 Manufacturing Planning and Control	lecture		indicate the strategic importance of production planning and control for a company		
E043070 Materials Selection in Mechanical Design	lecture	written examination with open questions	Understand the importance of standardization in materials selection (juridical aspect).		

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

Societal competences

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet ter	uggevonden in de studiefiche		
E019331 ICT and Mechatronics	guided self-study seminar project lecture		Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered
E043070 Materials Selection in Mechanical Design	lecture	written examination with open questions	mechatronic system Show attention to ecological aspects of design. Understand the importance of standardization in materials selection (juridical aspect). Know the principal properties of common construction materials.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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<<	EMingwALG6.1 Master the compl	exity of technical systems by u	ising system and proce	Profession-specific competence
Course		Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- e	en evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche		
E036130	Controlled Electrical Drives	lecture seminar: coached exercises	open book examination	Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal supply Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and load commutation in VSI and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of power electronic supply on the machine and vice-versa, stepping motors versus classical motors
				Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivalent circuits for inverters, V/F supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation,
				hystereis motor, stepping motors and their characteristics
E037121	Displacement Pumps, Compressors and IC Engine Fundamentals	practicum seminar	report	Execute thermodynamic analyses of displacement machines and calculate performance parameters. Choose a suitable pump, compressor or internal combustion engine type depending on the application and determine its basic dimensions. Analyse and interpret measurements on positive displacement machinery. Calculate the margin to cavitation for a pump installation and if necessary propose the required adaptations.
E040670	Mechanical Vibrations	guided self-study seminar: coached exercises lecture	oral examination	Modelling of rotating and non-rotating mechanical systems based on Langrange's technique. Apply model structure preserving reduction techniques. Identify modal parameters from an experiment Design of vibration isolation and vibration absorption devices. Perform a modal analysis and formulate structural modifications for continuous and discrete systems. Calculate vibration levels of mechanical structures subjected to dynamic loads.
E019331	ICT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E076221	Manufacturing Planning and Control	lecture	written examination	analyse and control complex production systems by using mathematical models
E028700	Thermal Installations	seminar: coached exercises seminar: coached exercises seminar: practical PC room classes	report	quantify the impact of variability on the performance of a production system Designing heat exchangers Using software for energy calculations
E039211	Heating, Ventilation, Air-conditioning and Refrigeration	lecture project	report	Understanding and describing components of HVAC&R systems Reporting on design and energy performance Doing Dynamic simulation and energy performance calculations Understanding Energy performance of building, building systems and components Design of HVAC&R systems Describing part load behaviour of HVAC&R systems
E091103	Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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

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Profession-s	pecific	competence
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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet ter	uggevonden in de studiefiche		
E019331 ICT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E043070 Materials Selection in Mechanical Design	lecture self-reliant study activities	written examination with open questions open book examination	Obtain understanding into the complex interactions between design, materials selection and related economical aspects. Understand the importance of standardization in materials selection (juridical aspect). Compare different materials in a multidisciplinary framework, often having conflicting boundary conditions.
E032322 Sensor Based Measurement Systems	project	assignment report	Programming of microcontrollers for data acquisition and programming in Python to process measurement data. Collaborate in a small group on a project to design and realize a practical sensor based measurement system.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwALG6.3 Synthesize incomplete, contradictory or redundant data into useful information.

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Profession-specific competence

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet ter	uggevonden in de studiefiche		
E019331 ICT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E043070 Materials Selection in Mechanical Design	self-reliant study activities		Find and critically analyze scientific literature.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwALG6.4 Possess sufficient ready knowledge and understanding to evaluate the results of complex calculations, or make approximate estimates.			Profession-specific competence		
Course		Teaching methods	Evaluation methods	Course learning outcome	
Noot: leer- en	n evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche			
E036130 (Controlled Electrical Drives	lecture seminar: coached exercises practicum	open book examination skills test	Understanding the differences and similarities between space vectors and time phas Gaining insight into the differences and similarities between space vectors and (time starting, restraints with classical starting methods, power electronic starting methods, voltage and speed cor load commutation in VSI and CSI, differences and similarities between controlled drives and servo drives, small commutator machines versus DC commutator machines, small versus large induction machines, small versus power electronic supply on the machine and vice-versa, stepping motors versus classical motors. Understanding the principle of current supply versus voltage supply, schemes and no circuits for inverters, V/F) phasors, voltage and temperature limits for introl, current and torque control, forced and all versus large commutator machines, AC sus large synchronous machines, effects of modulation principles for inverters, equivalen
				supply, vector control and field orientation, DTC (direct torque control), servo drives, hystereis motor, stepping motors and their characteristics	snaded pole motor, p.m. excitation,
E037321 7	Turbomachines	practicum seminar: coached exercises	written examination	Calculate the flow in a turbomachine using one-dimensional analysis	
E040670 N	Mechanical Vibrations	seminar: coached exercises		Perform a modal analysis and formulate structural modifications for continuous and Apply model structure preserving reduction techniques. Identify modal parameters from an experiment Design of vibration isolation and vibration absorption devices.	discrete systems.
E019331 I	CT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and intermachine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object orie Understand basic communication techniques: setting up communication, choosing in Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especiall Propose, analyze, select and implement hard- and software solutions for sensing and mechatronic system	ented Information channel and information content y on the ICT side
E043070 N	Materials Selection in Mechanical Design	lecture	written examination with open questions	Obtain understanding into the complex interactions between design, materials select Know the principal properties of common construction materials.	tion and related economical aspects.
E091103 M	Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and for laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the etopical study, research and the reflection on the research, experiments, experimentations, designs, simulations, resulting an appropriate methodology, in accordance with the applicable scientific norms	execution of research (literature search,

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terd	uggevonden in de studiefiche		
E036130 Controlled Electrical Drives	lecture		Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal supply Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with
			classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and load commutation in VSI
			and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines
			versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of power electronic supply on
			the machine and vice-versa, stepping motors versus classical motors
			Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivalent circuits for inverters, V/F
			supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation, hystereis motor, stepping motors
			and their characteristics
E019331 ICT and Mechatronics	guided self-study seminar		Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning
	project		Represent simple motion systems with matrix groups and realize their limitations
	lecture		Discriminate between different task organizations: layers, parallel threads, object oriented
			Understand basic communication techniques: setting up communication, choosing information channel and information content
			Design and implement computer-based motion control strategies
			Name relevant techniques and recognize the dangers for multiple-task management
			Understand how basic components of complex mechatronic systems work, especially on the ICT side
			Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system
E043070 Materials Selection in Mechanical Design	lecture	written examination with open questions	Show attention to ecological aspects of design.

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

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Profession-s	pecific	comi	netence
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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		
E036130 Controlled Electrical Drives	lecture seminar: coached exercises		Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal supply Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with
			classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and load commutation in VSI
			and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines
			versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of power electronic supply on
			the machine and vice-versa, stepping motors versus classical motors
			Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivalent circuits for inverters, V/F
			supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation, hystereis motor, stepping motors
			and their characteristics
E037121 Displacement Pumps, Compressors and IC Engine Fundamentals	lecture		Explain trends in engine design, fuel choice and emission legislation and explain why a specific engine design would be chosen according to the needs of
· ·			the application.
			Choose a suitable pump, compressor or internal combustion engine type depending on the application and determine its basic
			dimensions.
E028700 Thermal Installations	excursion		Approaching energy use in an industrial context in a critical way both in a company and in society
	lecture		
E043070 Materials Selection in Mechanical Design	lecture	written examination with open questions	Show attention to ecological aspects of design.
E037221 IC Engines: advanced design and research	group work	oral examination	Explain trends in internal combustion engine technologies and fuels
9	practicum	report	Process and interpret advanced engine measurements
	lecture	skills test	Synthesize, present and explain scientific literature on internal combustion engines

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<<	EMingwALG6.7 Pay attention to all aspects of reliability, safe	ety, and ergonomics.
Course	Teaching methods	Evaluation methods

Profession-specific competence

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	iggevonden in de studiefiche		
E036130 Controlled Electrical Drives	lecture		Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal supply Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with
			classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and load commutation in VSI
			and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines
			versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of power electronic supply on
			the machine and vice-versa, stepping motors versus classical motors
			Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivalent circuits for inverters, V/F
			supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation, hystereis motor, stepping motors
			and their characteristics
E019331 ICT and Mechatronics	guided self-study seminar	written examination report	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning
	project	skills test	Represent simple motion systems with matrix groups and realize their limitations
	lecture	oral examination	Discriminate between different task organizations: layers, parallel threads, object oriented
			Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies
			Name relevant techniques and recognize the dangers for multiple-task management
			Understand how basic components of complex mechatronic systems work, especially on the ICT side
			Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered
			mechatronic system
E043070 Materials Selection in Mechanical Design	lecture	written examination with open	Formulate suggestions to improve the lifetime of a construction / machine part.
-	self-reliant study activities	questions open book examination	Independently defend an opinion regarding the failure behaviour of a construction / machine part ("engineering failure analysis"). Formulate suggestions to improve material behaviour.
		opon book oxamination	Understand the importance of reliability and robustness in mechanical design.

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

Profession-specific competence

Course Teaching methods Evaluation methods Course learning outcome

Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche

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Course	Teaching methods	Evaluation methods	Course learning outcome			
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche						
E019331 ICT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system			
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.			

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EMingwELME6.1 Integrate the advanced knowledge of mechanical and electrical systems and ICT in order to design, implement and exploit

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Profession-specific competence

technological innovation	Teaching methods	Evaluation methods	Course learning outcome			
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche						
E019331 ICT and Mechatronics	guided self-study seminar project lecture	written examination report skills test oral examination	Understanding the reasoning and assumptions behind correct data handling and interpretation, information extraction and machine learning Represent simple motion systems with matrix groups and realize their limitations Discriminate between different task organizations: layers, parallel threads, object oriented Understand basic communication techniques: setting up communication, choosing information channel and information content Design and implement computer-based motion control strategies Name relevant techniques and recognize the dangers for multiple-task management Understand how basic components of complex mechatronic systems work, especially on the ICT side Propose, analyze, select and implement hard- and software solutions for sensing and actuation in a newly encountered mechatronic system			
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.			

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Course	systems.	Teaching methods	Evaluation methods	Course learning outcome
	valuatievormen voorafgegaan door ** werden niet terug	-	Lvaidation methods	Course learning database
		-		
E036130 Co	entrolled Electrical Drives	lecture seminar: coached exercises	open book examination	Understanding the differences and similarities between space vectors and time phasors for sinusoidal and non-sinusoidal supply Gaining insight into the differences and similarities between space vectors and (time) phasors, voltage and temperature limits for starting, restraints with classical starting methods, power electronic starting methods, voltage and speed control, current and torque control, forced and load commutation in VSI and CSI, differences and similarities between controlled drives and servo drives, small versus large commutator machines, AC commutator machines versus DC commutator machines, small versus large induction machines, small versus large synchronous machines, effects of power electronic supply on the machine and vice-versa, stepping motors versus classical motors Understanding the principle of current supply versus voltage supply, schemes and modulation principles for inverters, equivaler circuits for inverters, V/F supply, vector control and field orientation, DTC (direct torque control), servo drives, shaded pole motor, p.m. excitation, hystereis motor, stepping motors
E037321 Turbomachines	rhomachines	guided self-study	oral examination	Derive parameter choice and layout of fans, steam turbines, pumps, hydraulic turbines and wind turbines
	iboniacinnes	lecture	oral examination	betwe parameter choice and layout or lans, steam turbines, pumps, mydraulic turbines and wind turbines
	splacement Pumps, Compressors and IC agine Fundamentals	lecture		Explain trends in engine design, fuel choice and emission legislation and explain why a specific engine design would be chosen according to the needs of the application. Choose a suitable pump, compressor or internal combustion engine type depending on the application and determine its basic dimensions.
E028700 Th	ermal Installations	excursion self-reliant study activities lecture	report	Analysing complex thermal processes and cycles Approaching energy use in an industrial context in a critical way both in a company and in society
E037221 IC	Engines: advanced design and research	group work practicum lecture	oral examination report skills test	Explain trends in internal combustion engine technologies and fuels Process and interpret advanced engine measurements Synthesize, present and explain scientific literature on internal combustion engines
E037621 Ga	as Turbines	lecture	oral examination	Generation and energetic optimisation of thrust; technology of an aero-engine. Components of power gas turbines; thermodynamic modelling of gas turbines; performance of different cycles for power generation.
E091103 Ma	aster's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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