Competence coverage matrix

GHENT UNIVERSITY

Master of Science in Electromechanical Engineering

Electrical Power Engineering

Academic year 2021-2022

Legend:
 T=teaching methods
 E=evaluation methods

Course columns (left→right):

#	Group	Course
1	General Courses	E036130 Controlled Electrical Drives
2	General Courses	E037321 Turbomachines
3	General Courses	E037121 Displacement Pumps, Compressors and IC Engine Fundamentals
4	General Courses	E019331 ICT and Mechatronics
5	General Courses	E040670 Mechanical Vibrations
6	General Courses	E076221 Manufacturing Planning and Control
7	Courses Related to the Main Subject	E035010 Electrical Power System Analysis
8	Courses Related to the Main Subject	E033222 Sensor Based Measurement Systems
9	Courses Related to the Main Subject	E038020 Nuclear Reactor Theory: part 1
10	Courses Related to the Main Subject	E030520 Power Electronics
11	Courses Related to the Main Subject	E037820 Technology of Electrical Installations
12	Courses Related to the Main Subject	E036900 Dynamics of Electrical Machines and Drives
13	Courses Related to the Main Subject	E035421 Sustainable Energy
14	Courses Related to the Main Subject	E035050 Operational Aspects of Electrical Power Systems
15	Courses Related to the Main Subject	E036611 Electrical Machine Design
16	Master's Dissertation	E091103 Master's Dissertation

Competences in one/more scientific discipline(s)

Competence	T/E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Master and apply advanced knowledge in the own engineering discipline in solving complex problems.	T 12			T	T	T	T	T		T	T	T	T		T	T	T
	E 12			E	E		E	E		E	E	E	E		E	E	E
Apply Computer Aided Engineering (CAE) tools and advanced communication instruments in a creative and purposeful way.	T 3							T					T			T	
	E 4				E			E					E			E	
Have a thorough insight in the interactions between different electromechanical parts and energy conversions of complex systems.	T 10	T		T	T			T			T	T	T		T	T	T
	E 10	E		E	E			E			E	E	E		E	E	E
Have a thorough knowledge of measurement techniques, sensors, actuators and ICT and the ability to apply the knowledge.	T 7			T	T	T			T			T					T
	E 5			E	E				E			E					E
Be familiar with the management of companies and operations.	T 2						T					T					
	E 1						E										
Specifically for main subject 'Mechanical Energy Engineering': Have a thorough insight in mechanical and thermodynamical energy conversions, fluid dynamics, heat transfer and combustion and apply the knowledge to complex problems.	T 3		T	T													T
	E 3		E	E													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 6	T						T					T		T	T	T
	E 6	E						E					E		E	E	E
Specifically for main subject 'Mechanical Construction': Have a thorough insight in the design, behaviour and manufacturing of constructions and machines and apply the knowledge to complex problems.	T 1																T
	E 1																E
Specifically for main subject 'Control Engineering and Automation': Have a thorough insight in the design and behaviour of control loops and of system dynamics and apply the knowledge to complex problems.	T 5	T			T						T		T				T
	E 4	E			E								E				E
Specifically for main subject 'Maritime Engineering': Have a thorough insight in the design, construction, functioning and exploitation of maritime systems.	T 1																T
	E 1																E

Scientific competences

Competence	T/E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Analyse complex problems and translate them into concrete research questions.	T 5				T	T				T	T						T
	E 5				E	E				E	E						E
Consult the scientific literature as part of the own research.	T 3				T										T		T
	E 4				E										E		E
Select and apply the appropriate models, methods and techniques.	T 13	T			T	T	T	T	T	T	T	T	T		T		T
	E 11	E			E	E	E	E	E		E	E	E		E		E
Develop and validate mathematical models and methods.	T 5				T	T	T			T	T						
	E 5				E	E	E			E	E						
Interpret research findings in an objective and critical manner.	T 3				T						T					T	T
	E 4				E						E					E	E

Intellectual competences

Competence	T/E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Independently form an opinion on complex situations and problems, and defend this point of view.	T 6	T					T				T		T		T		T
	E 4	E									E		E				E
Apply knowledge in a creative, purposeful and innovative way to research, conceptual design and production.	T 5					T					T		T			T	T
	E 5				E	E					E		E				E
Critically reflect on one's own way of thinking and acting, and understand the limits of one's competences.	T 3				T						T						T
	E 2				E												E
Stay update with the evolutions in the discipline to elevate the own competences to expert level.	T 5	T			T								T		T		T
	E 3	E											E				E
Readily adapt to changing professional circumstances.	T 4				T				T		T						T
	E 3								E		E						E

Competences in cooperation and communication

Competence	T/E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Have the ability to communicate in English about the own field of specialisation.	T 13	T		T	T	T		T	T	T	T	T	T		T	T	T
	E 13	E		E	E	E		E	E	E	E	E	E		E	E	E
Project management: have the ability to formulate objectives, report efficiently, keep track of targets, follow the progress of the project,...	T 8			T	T			T	T		T		T		T	T	T
	E 8			E	E			E	E		E		E		E	E	E
Have the ability to work as a member of a team in a multidisciplinary workingenvironment, as well as being capable of taking on supervisory responsibilities.	T 3				T				T		T						
	E 3				E				E		E						
Report on technical or scientific subjects verbally, in writing and using graphics.	T 11	T		T	T	T		T	T	T	T		T		T	T	T
	E 12	E		E	E	E		E	E	E	E		E		E	E	E

Societal competences

Competence	T/E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Act in an ethical, professional and social way.	T 3	T		T													T
	E 2	E															E
Recognize the most important business and legal aspects of the own engineering discipline.	T 2						T								T		
	E 1														E		
Understand the historical evolution of the own engineering discipline and its social relevance.	T 3				T					T							T
	E 2									E							E

Profession-specific competence

Competence	T/E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Master the complexity of technical systems by using system and process models.	T 11	T		T	T	T	T	T		T	T	T	T				T
	E 11	E		E	E	E	E	E		E	E	E	E				E
Reconcile conflicting specifications and prior conditions in a high quality and innovative concept or process.	T 6				T				T		T		T			T	T
	E 5				E				E		E		E				E
Synthesize incomplete, contradictory or redundant data into useful information.	T 3				T						T						T
	E 3				E						E						E
Possess sufficient ready knowledge and understanding to evaluate the results of complex calculations, or make approximate estimates.	T 12	T	T		T	T		T			T	T	T		T	T	T
	E 10	E	E		E			E			E	E	E			E	E
Pay attention to entire life cycles of systems, machines, and processes.	T 4	T			T						T			T			T
	E 2										E			E			E

Competence coverage matrix

GHENT UNIVERSITY

Master of Science in Electromechanical Engineering

Electrical Power Engineering

Academic year 2021-2022

Legend:
 T=teaching methods
 E=evaluation methods

Profession-specific competence			E036130 Controlled Electrical Drives	E037321 Turbomachines	E037121 Displacement Pumps, Compressors and IC Engine Fundamentals	E019331 ICT and Mechatronics	E040670 Mechanical Vibrations	E076221 Manufacturing Planning and Control	E035010 Electrical Power System Analysis	E032322 Sensor Based Measurement Systems	E038020 Nuclear Reactor Theory: part 1	E030520 Power Electronics	E037820 Technology of Electrical Installations	E036900 Dynamics of Electrical Machines and Drives	E035421 Sustainable Energy	E035050 Operational Aspects of Electrical Power Systems	E036611 Electrical Machine Design	E091103 Master's Dissertation
Pay attention to sustainability, energyefficiency, environmental cost, use of raw materials and labour costs.	T 6	T		T							T	T	T			T	
	E 3										E	E	E				
Pay attention to all aspects of reliability, safety, and ergonomics.	T 5	T			T						T	T	T				
	E 3				E						E	E	E				
Have insight into and understanding of the importance of entrepreneurship.	T 2										T	T					
	E 1										E						
Show perseverance, innovativeness, and an aptitude for creating added value.	T 3				T						T						T
	E 3				E						E						E
Integrate the advanced knowledge of mechanical and electrical systems and ICT in order to design, implement and exploit technological innovations.	T 5				T						T		T			T	T
	E 4				E						E		E				E
Be familiar with the energy efficiency of (electrical, mechanical and thermal) energy conversion systems and distribution systems.	T 10	T	T	T				T			T	T	T		T	T	T
	E 9	E	E					E			E	E	E		E	E	E
		W 15	W 3	W 11	W 22	W 10	W 7	W 11	W 8	W 12	W 25	W 12	W 20		W 13	W 14	W 29
		E 12	E 3	E 8	E 23	E 8	E 5	E 11	E 8	E 10	E 23	E 9	E 20		E 9	E 10	E 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 teruggevonden 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.
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
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.
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
E035010 Electrical Power System Analysis	guided self-study online seminar: coached exercises online project online lecture lecture: plenary exercises project practicum lecture	written examination report participation oral examination	Decompose three-phase quantities by means of symmetrical components and the Clarke and Park transform. Analyse transmission lines under transient and sinusoidal conditions. Analyse transient stability. Understand the function and principle of regulating transformers. Determine line parameters of transmission lines. Compute short circuit currents.

Code	Course	Teaching methods	Examination methods	Learning outcomes
E038020	Nuclear Reactor Theory: part 1	excursion seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	The student should fully understand and be capable of defining the following TERMINOLOGY: PWR, enrichment grade, fission neutrons, energy production, burnup, fission products, Bethe-Weiszaecker formula. compound nucleus, neutron cross section, multiplication factor, Doppler effect, production factor, fast fission factor, resonance escape probability, thermal utilisation factor, neutron leakage, thermal neutrons, thermal/ epithermal/ fast energy region, homogeneous/ heterogenous core, self shielding (energetic and spatial), reactor period, average generation time, Inhour equation, antireactivity, Xe, Sm poisoning. The student should be capable of solving exercises, of which examples are given during the course, such as e.g. calculating the necessary anti-reactivity (e.g. boron concentration) when making a reactor critical (e.g. compensation of the invested reactivity for the core life time at start-up). The student should have achieved the knowledge to differentiate the most important (6) nuclear reactor types and to address/comment in a balanced way the safe operation of a reactor. The student is expected to explain the physics (with mathematical formulae) of the fission phenomenon, the different types of neutron interactions, the neutron flux distribution, the operation of a reactor core with evolution of its fuel composition and being capable to reproduce all theoretical derivations (as shown on the blackboard). The student should fully understand the operation of the core of a pressurised water reactor from neutron kinetic point of view. The student should have obtained full understanding of the coupled neutron- and thermo-dynamic response during its operation under a neutron flux.
E030520	Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS: electronic and thermal aspects
E037820	Technology of Electrical Installations	lecture seminar: coached exercises	written examination	To select appropriate battery technology for a given application. To dimension a simple industrial electrical installation in a correct way, according to the AREI.
E036900	Dynamics of Electrical Machines and Drives	lecture seminar: practical PC room classes seminar: coached exercises project	written examination report open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E035050	Operational Aspects of Electrical Power Systems	guided self-study online project online lecture project lecture demonstration	oral examination report skills test participation	Analyse optimal power flow. Understand the control of frequency, power and voltage. Understand electric power markets. Understand the function and principles of FACTS devices. Know the origin and solutions of power quality issues.
E036611	Electrical Machine Design	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises self-reliant study activities project	written examination report oral examination	Understand skin and proximity effects. Analyse parasitic effects (vibrations, noise, torques). Know the design and materials of the most common electrical machines. Use numerical methods for magnetic field computations in electrical machines. Analyse the windings of AC machines.
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden 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
E035010 Electrical Power System Analysis	guided self-study online seminar: coached exercises online project online lecture lecture: plenary exercises project practicum lecture	written examination report participation oral examination	Decompose three-phase quantities by means of symmetrical components and the Clarke and Park transform. Analyse transmission lines under transient and sinusoidal conditions. Analyse transient stability. Understand the function and principle of regulating transformers. Determine line parameters of transmission lines. Compute short circuit currents.
E036900 Dynamics of Electrical Machines and Drives	lecture seminar: practical PC room classes seminar: coached exercises project	written examination report open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E036611 Electrical Machine Design	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises self-reliant study activities project	written examination report oral examination	Understand skin and proximity effects. Analyse parasitic effects (vibrations, noise, torques). Know the design and materials of the most common electrical machines. Use numerical methods for magnetic field computations in electrical machines. Analyse the windings of AC machines.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
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, 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	report	Analyse and interpret measurements on positive displacement machinery.
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
E035010 Electrical Power System Analysis	guided self-study online seminar: coached exercises online project online lecture lecture: plenary exercises project practicum lecture	written examination report participation oral examination	Decompose three-phase quantities by means of symmetrical components and the Clarke and Park transform. Analyse transmission lines under transient and sinusoidal conditions. Analyse transient stability. Understand the function and principle of regulating transformers. Determine line parameters of transmission lines. Compute short circuit currents.
E030520 Power Electronics	lecture seminar practicum	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E037820 Technology of Electrical Installations	lecture seminar: coached exercises	written examination	To select appropriate battery technology for a given application. To dimension a simple industrial electrical installation in a correct way, according to the AREI.
E036900 Dynamics of Electrical Machines and Drives	lecture seminar: practical PC room classes seminar: coached exercises project	written examination report open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E035050 Operational Aspects of Electrical Power Systems	guided self-study online project online lecture project lecture demonstration	oral examination report skills test participation	Analyse optimal power flow. Understand the control of frequency, power and voltage. Understand electric power markets. Understand the function and principles of FACTS devices. Know the origin and solutions of power quality issues.
E036611 Electrical Machine Design	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises self-reliant study activities project	written examination report oral examination	Understand skin and proximity effects. Analyse parasitic effects (vibrations, noise, torques). Know the design and materials of the most common electrical machines. Use numerical methods for magnetic field computations in electrical machines. Analyse the windings of AC machines.
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden 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 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
E040670 Mechanical Vibrations	seminar: coached exercises		Identify modal parameters from an experiment
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.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E037820 Technology of Electrical Installations	lecture seminar: coached exercises		To select appropriate battery technology for a given application. To dimension a simple industrial electrical installation in a correct way, according to the AREI.
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.

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 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
E030520 Power Electronics	guided self-study seminar practicum lecture		INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
E037321 Turbomachines	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
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.
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden 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
E035010 Electrical Power System Analysis	guided self-study online seminar: coached exercises online project online lecture lecture: plenary exercises project practicum lecture	written examination report participation oral examination	Decompose three-phase quantities by means of symmetrical components and the Clarke and Park transform. Analyse transmission lines under transient and sinusoidal conditions. Analyse transient stability. Understand the function and principle of regulating transformers. Determine line parameters of transmission lines. Compute short circuit currents.
E036900 Dynamics of Electrical Machines and Drives	lecture seminar: practical PC room classes seminar: coached exercises project	written examination report open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E035050 Operational Aspects of Electrical Power Systems	guided self-study online project online lecture project lecture demonstration	oral examination report skills test participation	Analyse optimal power flow. Understand the control of frequency, power and voltage. Understand electric power markets. Understand the function and principles of FACTS devices. Know the origin and solutions of power quality issues.
E036611 Electrical Machine Design	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises self-reliant study activities project	written examination report oral examination	Understand skin and proximity effects. Analyse parasitic effects (vibrations, noise, torques). Know the design and materials of the most common electrical machines. Use numerical methods for magnetic field computations in electrical machines. Analyse the windings of AC machines.
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden 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, 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	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
E030520 Power Electronics	guided self-study seminar practicum lecture		INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E036900 Dynamics of Electrical Machines and Drives	lecture seminar: practical PC room classes seminar: coached exercises project	written examination report open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
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.

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
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.
E038020 Nuclear Reactor Theory: part 1	excursion seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	The student should fully understand and be capable of defining the following TERMINOLOGY: PWR, enrichment grade, fission neutrons, energy production, burnup, fission products, Bethe-Weiszaecker formula. compound nucleus, neutron cross section, multiplication factor, Doppler effect, production factor, fast fission factor, resonance escape probability, thermal utilisation factor, neutron leakage, thermal neutrons, thermal/ epithermal/ fast energy region, homogeneous/ heterogenous core, self shielding (energetic and spatial), reactor period, average generation time, Inhour equation, antireactivity, Xe, Sm poisoning. The student should be capable of solving exercises, of which examples are given during the course, such as e.g. calculating the necessary anti-reactivity (e.g. boron concentration) when making a reactor critical (e.g. compensation of the invested reactivity for the core life time at start-up). The student should have achieved the knowledge to differentiate the most important (6) nuclear reactor types and to address/comment in a balanced way the safe operation of a reactor. The student is expected to explain the physics (with mathematical formulae) of the fission phenomenon, the different types of neutron interactions, the neutron flux distribution, the operation of a reactor core with evolution of its fuel composition and being capable to reproduce all theoretical derivations (as shown on the blackboard). The student should fully understand the operation of the core of a pressurised water reactor from neutron kinetic point of view. The student should have obtained full understanding of the coupled neutron- and thermo-dynamic response during its operation under a neutron flux.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden 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
E036900 Dynamics of Electrical Machines and Drives	lecture	open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E035050 Operational Aspects of Electrical Power Systems	guided self-study online project online lecture project lecture demonstration	oral examination report skills test participation	Analyse optimal power flow. Understand the control of frequency, power and voltage. Understand electric power markets. Understand the function and principles of FACTS devices. Know the origin and solutions of power quality issues.
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden 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
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
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.
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
E035010 Electrical Power System Analysis	guided self-study online seminar: coached exercises online project online lecture lecture: plenary exercises project practicum lecture	written examination report participation oral examination	Decompose three-phase quantities by means of symmetrical components and the Clarke and Park transform. Analyse transmission lines under transient and sinusoidal conditions. Analyse transient stability. Understand the function and principle of regulating transformers. Determine line parameters of transmission lines. Compute short circuit currents.
E032322 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.
E038020 Nuclear Reactor Theory: part 1	excursion seminar: coached exercises lecture: plenary exercises lecture		The student should fully understand and be capable of defining the following TERMINOLOGY: PWR, enrichment grade, fission neutrons, energy production, burnup, fission products, Bethe-Weizsaecker formula. compound nucleus, neutron cross section, multiplication factor, Doppler effect, production factor, fast fission factor, resonance escape probability, thermal utilisation factor, neutron leakage, thermal neutrons, thermal/ epithermal/ fast energy region, homogeneous/ heterogenous core, self shielding (energetic and spatial), reactor period, average generation time, Inhour equation, antireactivity, Xe, Sm poisoning. The student should be capable of solving exercises, of which examples are given during the course, such as e.g. calculating the necessary anti-reactivity (e.g. boron concentration) when making a reactor critical (e.g. compensation of the invested reactivity for the core life time at start-up). The student should have achieved the knowledge to differentiate the most important (6) nuclear reactor types and to address/comment in a balanced way the safe operation of a reactor. The student is expected to explain the physics (with mathematical formulae) of the fission phenomenon, the different types of neutron interactions, the neutron flux distribution, the operation of a reactor core with evolution of its fuel composition and being capable to reproduce all theoretical derivations (as shown on the blackboard). The student should fully understand the operation of the core of a pressurised water reactor from neutron kinetic point of view. The student should have obtained full understanding of the coupled neutron- and thermo-dynamic response during its operation under a neutron flux.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E037820 Technology of Electrical Installations	lecture seminar: coached exercises	written examination	To select appropriate battery technology for a given application. To dimension a simple industrial electrical installation in a correct way, according to the AREI.
E036900 Dynamics of Electrical Machines and Drives	lecture seminar: practical PC room classes seminar: coached exercises project	written examination report open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E035050 Operational Aspects of Electrical Power Systems	guided self-study online project online lecture project lecture demonstration		Analyse optimal power flow. Understand the control of frequency, power and voltage. Understand electric power markets. Understand the function and principles of FACTS devices. Know the origin and solutions of power quality issues.

E036611 Electrical Machine Design	lecture	written examination	Understand skin and proximity effects.
	online seminar	report	Analyse parasitic effects (vibrations, noise, torques).
	online lecture	oral examination	Know the design and materials of the most common electrical machines.
	seminar: coached exercises		Use numerical methods for magnetic field computations in electrical machines.
	lecture: plenary exercises		Analyse the windings of AC machines.
	self-reliant study activities		
	project		
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.

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
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.
E076221 Manufacturing Planning and Control	lecture seminar: coached exercises	written examination	analyse and control complex production systems by using mathematical models quantify the impact of variability on the performance of a production system
E038020 Nuclear Reactor Theory: part 1	excursion seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	The student should fully understand and be capable of defining the following TERMINOLOGY: PWR, enrichment grade, fission neutrons, energy production, burnup, fission products, Bethe-Weiszaecker formula. compound nucleus, neutron cross section, multiplication factor, Doppler effect, production factor, fast fission factor, resonance escape probability, thermal utilisation factor, neutron leakage, thermal neutrons, thermal/ epithermal/ fast energy region, homogeneous/ heterogenous core, self shielding (energetic and spatial), reactor period, average generation time, Inhour equation, antireactivity, Xe, Sm poisoning. The student should be capable of solving exercises, of which examples are given during the course, such as e.g. calculating the necessary anti-reactivity (e.g. boron concentration) when making a reactor critical (e.g. compensation of the invested reactivity for the core life time at start-up). The student should have achieved the knowledge to differentiate the most important (6) nuclear reactor types and to address/comment in a balanced way the safe operation of a reactor. The student is expected to explain the physics (with mathematical formulae) of the fission phenomenon, the different types of neutron interactions, the neutron flux distribution, the operation of a reactor core with evolution of its fuel composition and being capable to reproduce all theoretical derivations (as shown on the blackboard). The student should fully understand the operation of the core of a pressurised water reactor from neutron kinetic point of view. The student should have obtained full understanding of the coupled neutron- and thermo-dynamic response during its operation under a neutron flux.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden 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
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E035050 Operational Aspects of Electrical Power Systems	guided self-study online project online lecture project lecture demonstration	oral examination report skills test participation	Analyse optimal power flow. Understand the control of frequency, power and voltage. Understand electric power markets. Understand the function and principles of FACTS devices. Know the origin and solutions of power quality issues.
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden 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, 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
E038020 Nuclear Reactor Theory: part 1	excursion seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	The student should fully understand and be capable of defining the following TERMINOLOGY: PWR, enrichment grade, fission neutrons, energy production, burnup, fission products, Bethe-Weiszaecker formula. compound nucleus, neutron cross section, multiplication factor, Doppler effect, production factor, fast fission factor, resonance escape probability, thermal utilisation factor, neutron leakage, thermal neutrons, thermal/ epithermal/ fast energy region, homogeneous/ heterogenous core, self shielding (energetic and spatial), reactor period, average generation time, Inhour equation, antireactivity, Xe, Sm poisoning. The student should be capable of solving exercises, of which examples are given during the course, such as e.g. calculating the necessary anti-reactivity (e.g. boron concentration) when making a reactor critical (e.g. compensation of the invested reactivity for the core life time at start-up). The student should have achieved the knowledge to differentiate the most important (6) nuclear reactor types and to address/comment in a balanced way the safe operation of a reactor. The student is expected to explain the physics (with mathematical formulae) of the fission phenomenon, the different types of neutron interactions, the neutron flux distribution, the operation of a reactor core with evolution of its fuel composition and being capable to reproduce all theoretical derivations (as shown on the blackboard). The student should fully understand the operation of the core of a pressurised water reactor from neutron kinetic point of view. The student should have obtained full understanding of the coupled neutron- and thermo-dynamic response during its operation under a neutron flux.
E036900 Dynamics of Electrical Machines and Drives	project	report	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E035050 Operational Aspects of Electrical Power Systems	guided self-study online project online lecture project lecture demonstration		Analyse optimal power flow. Understand the control of frequency, power and voltage. Understand electric power markets. Understand the function and principles of FACTS devices. Know the origin and solutions of power quality issues.
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden 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
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.
E038020 Nuclear Reactor Theory: part 1	excursion seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	The student should fully understand and be capable of defining the following TERMINOLOGY: PWR, enrichment grade, fission neutrons, energy production, burnup, fission products, Bethe-Weiszaecker formula. compound nucleus, neutron cross section, multiplication factor, Doppler effect, production factor, fast fission factor, resonance escape probability, thermal utilisation factor, neutron leakage, thermal neutrons, thermal/ epithermal/ fast energy region, homogeneous/ heterogenous core, self shielding (energetic and spatial), reactor period, average generation time, Inhour equation, antireactivity, Xe, Sm poisoning. The student should be capable of solving exercises, of which examples are given during the course, such as e.g. calculating the necessary anti-reactivity (e.g. boron concentration) when making a reactor critical (e.g. compensation of the invested reactivity for the core life time at start-up). The student should have achieved the knowledge to differentiate the most important (6) nuclear reactor types and to address/comment in a balanced way the safe operation of a reactor. The student is expected to explain the physics (with mathematical formulae) of the fission phenomenon, the different types of neutron interactions, the neutron flux distribution, the operation of a reactor core with evolution of its fuel composition and being capable to reproduce all theoretical derivations (as shown on the blackboard). The student should fully understand the operation of the core of a pressurised water reactor from neutron kinetic point of view. The student should have obtained full understanding of the coupled neutron- and thermo-dynamic response during its operation under a neutron flux.
E036900 Dynamics of Electrical Machines and Drives	lecture seminar: practical PC room classes seminar: coached exercises project	written examination report open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E036611 Electrical Machine Design	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises self-reliant study activities project		Understand skin and proximity effects. Analyse parasitic effects (vibrations, noise, torques). Know the design and materials of the most common electrical machines. Use numerical methods for magnetic field computations in electrical machines. Analyse the windings of AC machines.
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.

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
E038020 Nuclear Reactor Theory: part 1	excursion seminar: coached exercises lecture: plenary exercises lecture		The student should fully understand and be capable of defining the following TERMINOLOGY: PWR, enrichment grade, fission neutrons, energy production, burnup, fission products, Bethe-Weiszaecker formula. compound nucleus, neutron cross section, multiplication factor, Doppler effect, production factor, fast fission factor, resonance escape probability, thermal utilisation factor, neutron leakage, thermal neutrons, thermal/ epithermal/ fast energy region, homogeneous/ heterogenous core, self shielding (energetic and spatial), reactor period, average generation time, Inhour equation, antireactivity, Xe, Sm poisoning. The student should be capable of solving exercises, of which examples are given during the course, such as e.g. calculating the necessary anti-reactivity (e.g. boron concentration) when making a reactor critical (e.g. compensation of the invested reactivity for the core life time at start-up). The student should have achieved the knowledge to differentiate the most important (6) nuclear reactor types and to address/comment in a balanced way the safe operation of a reactor. The student is expected to explain the physics (with mathematical formulae) of the fission phenomenon, the different types of neutron interactions, the neutron flux distribution, the operation of a reactor core with evolution of its fuel composition and being capable to reproduce all theoretical derivations (as shown on the blackboard). The student should fully understand the operation of the core of a pressurised water reactor from neutron kinetic point of view. The student should have obtained full understanding of the coupled neutron- and thermo-dynamic response during its operation under a neutron flux.
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden 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, 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
E036900 Dynamics of Electrical Machines and Drives	lecture seminar: practical PC room classes seminar: coached exercises project	written examination report open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E035050 Operational Aspects of Electrical Power Systems	guided self-study online project online lecture project lecture demonstration		Analyse optimal power flow. Understand the control of frequency, power and voltage. Understand electric power markets. Understand the function and principles of FACTS devices. Know the origin and solutions of power quality issues.
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.

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		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.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden 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
E037121 Displacement Pumps, Compressors and IC Engine Fundamentals	lecture seminar practicum	report	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.
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
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.
E035010 Electrical Power System Analysis	guided self-study online seminar: coached exercises online project online lecture lecture: plenary exercises project practicum lecture	written examination report participation oral examination	Decompose three-phase quantities by means of symmetrical components and the Clarke and Park transform. Analyse transmission lines under transient and sinusoidal conditions. Analyse transient stability. Understand the function and principle of regulating transformers. Determine line parameters of transmission lines. Compute short circuit currents.
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
E038020 Nuclear Reactor Theory: part 1	excursion seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	The student should fully understand and be capable of defining the following TERMINOLOGY: PWR, enrichment grade, fission neutrons, energy production, burnup, fission products, Bethe-Weiszaecker formula. compound nucleus, neutron cross section, multiplication factor, Doppler effect, production factor, fast fission factor, resonance escape probability, thermal utilisation factor, neutron leakage, thermal neutrons, thermal/ epithermal/ fast energy region, homogenous/ heterogenous core, self shielding (energetic and spatial), reactor period, average generation time, Inhour equation, antireactivity, Xe, Sm poisoning. The student should be capable of solving exercises, of which examples are given during the course, such as e.g. calculating the necessary anti-reactivity (e.g. boron concentration) when making a reactor critical (e.g. compensation of the invested reactivity for the core life time at start-up). The student should have achieved the knowledge to differentiate the most important (6) nuclear reactor types and to address/comment in a balanced way the safe operation of a reactor. The student is expected to explain the physics (with mathematical formulae) of the fission phenomenon, the different types of neutron interactions, the neutron flux distribution, the operation of a reactor core with evolution of its fuel composition and being capable to reproduce all theoretical derivations (as shown on the blackboard). The student should fully understand the operation of the core of a pressurised water reactor from neutron kinetic point of view. The student should have obtained full understanding of the coupled neutron- and thermo-dynamic response during its operation under a neutron flux.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E037820 Technology of Electrical Installations	lecture seminar: coached exercises	written examination	To select appropriate battery technology for a given application. To dimension a simple industrial electrical installation in a correct way, according to the AREI.
E036900 Dynamics of Electrical Machines and Drives	lecture seminar: practical PC room classes seminar: coached exercises project	written examination report open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E035050 Operational Aspects of Electrical Power Systems	guided self-study online project online lecture project lecture demonstration	oral examination report skills test participation	Analyse optimal power flow. Understand the control of frequency, power and voltage. Understand electric power markets. Understand the function and principles of FACTS devices. Know the origin and solutions of power quality issues.

E036611	Electrical Machine Design	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises self-reliant study activities project	written examination report oral examination	Understand skin and proximity effects. Analyse parasitic effects (vibrations, noise, torques). Know the design and materials of the most common electrical machines. Use numerical methods for magnetic field computations in electrical machines. Analyse the windings of AC machines.
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden 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 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
E035010 Electrical Power System Analysis	guided self-study online seminar: coached exercises online project online lecture lecture: plenary exercises project practicum lecture	written examination report participation oral examination	Decompose three-phase quantities by means of symmetrical components and the Clarke and Park transform. Analyse transmission lines under transient and sinusoidal conditions. Analyse transient stability. Understand the function and principle of regulating transformers. Determine line parameters of transmission lines. Compute short circuit currents.
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.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E036900 Dynamics of Electrical Machines and Drives	project seminar: practical PC room classes seminar: coached exercises	written examination report	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E036611 Electrical Machine Design	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises self-reliant study activities project	written examination report oral examination	Understand skin and proximity effects. Analyse parasitic effects (vibrations, noise, torques). Know the design and materials of the most common electrical machines. Use numerical methods for magnetic field computations in electrical machines. Analyse the windings of AC machines.
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.

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
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.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden 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 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	report	Analyse and interpret measurements on positive displacement machinery.
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
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.
E035010 Electrical Power System Analysis	guided self-study online seminar: coached exercises online project online lecture lecture: plenary exercises project practicum lecture	written examination report participation oral examination	Decompose three-phase quantities by means of symmetrical components and the Clarke and Park transform. Analyse transmission lines under transient and sinusoidal conditions. Analyse transient stability. Understand the function and principle of regulating transformers. Determine line parameters of transmission lines. Compute short circuit currents.
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.
E038020 Nuclear Reactor Theory: part 1	excursion seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	The student should fully understand and be capable of defining the following TERMINOLOGY: PWR, enrichment grade, fission neutrons, energy production, burnup, fission products, Bethe-Weiszaecker formula. compound nucleus, neutron cross section, multiplication factor, Doppler effect, production factor, fast fission factor, resonance escape probability, thermal utilisation factor, neutron leakage, thermal neutrons, thermal/ epithermal/ fast energy region, homogeneous/ heterogenous core, self shielding (energetic and spatial), reactor period, average generation time, Inhour equation, antireactivity, Xe, Sm poisoning. The student should be capable of solving exercises, of which examples are given during the course, such as e.g. calculating the necessary anti-reactivity (e.g. boron concentration) when making a reactor critical (e.g. compensation of the invested reactivity for the core life time at start-up). The student should have achieved the knowledge to differentiate the most important (6) nuclear reactor types and to address/comment in a balanced way the safe operation of a reactor. The student is expected to explain the physics (with mathematical formulae) of the fission phenomenon, the different types of neutron interactions, the neutron flux distribution, the operation of a reactor core with evolution of its fuel composition and being capable to reproduce all theoretical derivations (as shown on the blackboard). The student should fully understand the operation of the core of a pressurised water reactor from neutron kinetic point of view. The student should have obtained full understanding of the coupled neutron- and thermo-dynamic response during its operation under a neutron flux.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E036900 Dynamics of Electrical Machines and Drives	project	report	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E035050 Operational Aspects of Electrical Power Systems	guided self-study online project online lecture project lecture demonstration	oral examination report skills test participation	Analyse optimal power flow. Understand the control of frequency, power and voltage. Understand electric power markets. Understand the function and principles of FACTS devices. Know the origin and solutions of power quality issues.
E036611 Electrical Machine Design	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises self-reliant study activities project	written examination report oral examination	Understand skin and proximity effects. Analyse parasitic effects (vibrations, noise, torques). Know the design and materials of the most common electrical machines. Use numerical methods for magnetic field computations in electrical machines. Analyse the windings of AC machines.

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.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden 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, 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.
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.

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
E035050 Operational Aspects of Electrical Power Systems	guided self-study online project online lecture project lecture demonstration	oral examination report skills test participation	Analyse optimal power flow. Understand the control of frequency, power and voltage. Understand electric power markets. Understand the function and principles of FACTS devices. Know the origin and solutions of power quality issues.

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		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
E038020 Nuclear Reactor Theory: part 1	excursion seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	The student should fully understand and be capable of defining the following TERMINOLOGY: PWR, enrichment grade, fission neutrons, energy production, burnup, fission products, Bethe-Weiszaecker formula. compound nucleus, neutron cross section, multiplication factor, Doppler effect, production factor, fast fission factor, resonance escape probability, thermal utilisation factor, neutron leakage, thermal neutrons, thermal/ epithermal/ fast energy region, homogeneous/ heterogenous core, self shielding (energetic and spatial), reactor period, average generation time, Inhour equation, antireactivity, Xe, Sm poisoning. The student should be capable of solving exercises, of which examples are given during the course, such as e.g. calculating the necessary anti-reactivity (e.g. boron concentration) when making a reactor critical (e.g. compensation of the invested reactivity for the core life time at start-up). The student should have achieved the knowledge to differentiate the most important (6) nuclear reactor types and to address/comment in a balanced way the safe operation of a reactor. The student is expected to explain the physics (with mathematical formulae) of the fission phenomenon, the different types of neutron interactions, the neutron flux distribution, the operation of a reactor core with evolution of its fuel composition and being capable to reproduce all theoretical derivations (as shown on the blackboard). The student should fully understand the operation of the core of a pressurised water reactor from neutron kinetic point of view. The student should have obtained full understanding of the coupled neutron- and thermo-dynamic response during its operation under a neutron flux.
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden 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, 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.
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
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.
E076221 Manufacturing Planning and Control	lecture seminar: coached exercises	written examination	analyse and control complex production systems by using mathematical models quantify the impact of variability on the performance of a production system
E035010 Electrical Power System Analysis	guided self-study online seminar: coached exercises online project online lecture lecture: plenary exercises project practicum lecture	written examination report participation oral examination	Decompose three-phase quantities by means of symmetrical components and the Clarke and Park transform. Analyse transmission lines under transient and sinusoidal conditions. Analyse transient stability. Understand the function and principle of regulating transformers. Determine line parameters of transmission lines. Compute short circuit currents.
E038020 Nuclear Reactor Theory: part 1	excursion seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	The student should fully understand and be capable of defining the following TERMINOLOGY: PWR, enrichment grade, fission neutrons, energy production, burnup, fission products, Bethe-Weiszaecker formula. compound nucleus, neutron cross section, multiplication factor, Doppler effect, production factor, fast fission factor, resonance escape probability, thermal utilisation factor, neutron leakage, thermal neutrons, thermal/ epithermal/ fast energy region, homogeneous/ heterogenous core, self shielding (energetic and spatial), reactor period, average generation time, Inhour equation, antireactivity, Xe, Sm poisoning. The student should be capable of solving exercises, of which examples are given during the course, such as e.g. calculating the necessary anti-reactivity (e.g. boron concentration) when making a reactor critical (e.g. compensation of the invested reactivity for the core life time at start-up). The student should have achieved the knowledge to differentiate the most important (6) nuclear reactor types and to address/comment in a balanced way the safe operation of a reactor. The student is expected to explain the physics (with mathematical formulae) of the fission phenomenon, the different types of neutron interactions, the neutron flux distribution, the operation of a reactor core with evolution of its fuel composition and being capable to reproduce all theoretical derivations (as shown on the blackboard). The student should fully understand the operation of the core of a pressurised water reactor from neutron kinetic point of view. The student should have obtained full understanding of the coupled neutron- and thermo-dynamic response during its operation under a neutron flux.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E037820 Technology of Electrical Installations	lecture seminar: coached exercises	written examination	To select appropriate battery technology for a given application. To dimension a simple industrial electrical installation in a correct way, according to the AREI.
E036900 Dynamics of Electrical Machines and Drives	lecture seminar: practical PC room classes seminar: coached exercises project	written examination report open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.

| 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. |

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
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.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E036900 Dynamics of Electrical Machines and Drives	project	report	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E036611 Electrical Machine Design	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises self-reliant study activities project		Understand skin and proximity effects. Analyse parasitic effects (vibrations, noise, torques). Know the design and materials of the most common electrical machines. Use numerical methods for magnetic field computations in electrical machines. Analyse the windings of AC machines.
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.

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
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden 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 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
E037321 Turbomachines	practicum seminar: coached exercises	written examination	Calculate the flow in a turbomachine using one-dimensional analysis
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
E040670 Mechanical Vibrations	seminar: coached exercises		Perform a modal analysis and formulate structural modifications for continuous and discrete systems. Apply model structure preserving reduction techniques. Identify modal parameters from an experiment Design of vibration isolation and vibration absorption devices.
E035010 Electrical Power System Analysis	guided self-study online seminar: coached exercises online project online lecture lecture: plenary exercises project practicum lecture	written examination report participation oral examination	Decompose three-phase quantities by means of symmetrical components and the Clarke and Park transform. Analyse transmission lines under transient and sinusoidal conditions. Analyse transient stability. Understand the function and principle of regulating transformers. Determine line parameters of transmission lines. Compute short circuit currents.
E038020 Nuclear Reactor Theory: part 1	excursion seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	The student should fully understand and be capable of defining the following TERMINOLOGY: PWR, enrichment grade, fission neutrons, energy production, burnup, fission products, Bethe-Weizsaecker formula. compound nucleus, neutron cross section, multiplication factor, Doppler effect, production factor, fast fission factor, resonance escape probability, thermal utilisation factor, neutron leakage, thermal neutrons, thermal/ epithermal/ fast energy region, homogeneous/ heterogenous core, self shielding (energetic and spatial), reactor period, average generation time, Inhour equation, antireactivity, Xe, Sm poisoning. The student should be capable of solving exercises, of which examples are given during the course, such as e.g. calculating the necessary anti-reactivity (e.g. boron concentration) when making a reactor critical (e.g. compensation of the invested reactivity for the core life time at start-up). The student should have achieved the knowledge to differentiate the most important (6) nuclear reactor types and to address/comment in a balanced way the safe operation of a reactor. The student is expected to explain the physics (with mathematical formulae) of the fission phenomenon, the different types of neutron interactions, the neutron flux distribution, the operation of a reactor core with evolution of its fuel composition and being capable to reproduce all theoretical derivations (as shown on the blackboard). The student should fully understand the operation of the core of a pressurised water reactor from neutron kinetic point of view. The student should have obtained full understanding of the coupled neutron- and thermo-dynamic response during its operation under a neutron flux.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E037820 Technology of Electrical Installations	lecture seminar: coached exercises	written examination	To select appropriate battery technology for a given application. To dimension a simple industrial electrical installation in a correct way, according to the AREI.
E036900 Dynamics of Electrical Machines and Drives	project seminar: practical PC room classes seminar: coached exercises	written examination report	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E035050 Operational Aspects of Electrical Power Systems	guided self-study online project online lecture project lecture demonstration		Analyse optimal power flow. Understand the control of frequency, power and voltage. Understand electric power markets. Understand the function and principles of FACTS devices. Know the origin and solutions of power quality issues.
E036611 Electrical Machine Design	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises self-reliant study activities project	written examination report oral examination	Understand skin and proximity effects. Analyse parasitic effects (vibrations, noise, torques). Know the design and materials of the most common electrical machines. Use numerical methods for magnetic field computations in electrical machines. Analyse the windings of AC machines.

| 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.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden 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 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
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E037820 Technology of Electrical Installations	lecture seminar: coached exercises	written examination	To select appropriate battery technology for a given application. To dimension a simple industrial electrical installation in a correct way, according to the AREI.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden 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.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E037820 Technology of Electrical Installations	lecture seminar: coached exercises	written examination	To select appropriate battery technology for a given application. To dimension a simple industrial electrical installation in a correct way, according to the AREI.
E036900 Dynamics of Electrical Machines and Drives	lecture seminar: practical PC room classes seminar: coached exercises project	written examination report open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E036611 Electrical Machine Design	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises self-reliant study activities project		Understand skin and proximity effects. Analyse parasitic effects (vibrations, noise, torques). Know the design and materials of the most common electrical machines. Use numerical methods for magnetic field computations in electrical machines. Analyse the windings of AC machines.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden 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 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
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E037820 Technology of Electrical Installations	lecture seminar: coached exercises		To select appropriate battery technology for a given application. To dimension a simple industrial electrical installation in a correct way, according to the AREI.
E036900 Dynamics of Electrical Machines and Drives	lecture seminar: practical PC room classes seminar: coached exercises project	written examination report open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche			
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E037820 Technology of Electrical Installations	lecture seminar: coached exercises		To select appropriate battery technology for a given application. To dimension a simple industrial electrical installation in a correct way, according to the AREI.

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
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
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.

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
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E036900 Dynamics of Electrical Machines and Drives	project seminar: practical PC room classes seminar: coached exercises	report	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E036611 Electrical Machine Design	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises self-reliant study activities project		Understand skin and proximity effects. Analyse parasitic effects (vibrations, noise, torques). Know the design and materials of the most common electrical machines. Use numerical methods for magnetic field computations in electrical machines. Analyse the windings of AC machines.
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.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden 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, 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
E037321 Turbomachines	guided self-study lecture	oral examination	Derive parameter choice and layout of fans, steam turbines, pumps, hydraulic turbines and wind turbines
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.
E035010 Electrical Power System Analysis	guided self-study online seminar: coached exercises online project online lecture lecture: plenary exercises project practicum lecture	written examination report participation oral examination	Decompose three-phase quantities by means of symmetrical components and the Clarke and Park transform. Analyse transmission lines under transient and sinusoidal conditions. Analyse transient stability. Understand the function and principle of regulating transformers. Determine line parameters of transmission lines. Compute short circuit currents.
E030520 Power Electronics	guided self-study seminar practicum lecture	written examination with open questions report simulation	INSIGHTS: Understanding voltage and current waveforms CONCEPTS: simple designs of converters and passive components inductors and transformers with ferrite SKILLS:electronic and thermal aspects
E037820 Technology of Electrical Installations	lecture seminar: coached exercises	written examination	To select appropriate battery technology for a given application. To dimension a simple industrial electrical installation in a correct way, according to the AREI.
E036900 Dynamics of Electrical Machines and Drives	lecture seminar: practical PC room classes seminar: coached exercises project	written examination report open book examination	Calculation of transient phenomena in electrical circuits; calculation of transients via modelling of of DC machines; modelling of induction machines; modelling of synchronous machines. Understanding the dynamic behaviour of DC machines, induction and synchronous machines. Understanding the concepts of local stability, static and dynamic stability, input-output stability, field orientation and vector control, transient and subtransient dynamics of machines; pulsating loading of machines; voltage surges in machines.
E035050 Operational Aspects of Electrical Power Systems	guided self-study online project online lecture project lecture demonstration	oral examination report skills test participation	Analyse optimal power flow. Understand the control of frequency, power and voltage. Understand electric power markets. Understand the function and principles of FACTS devices. Know the origin and solutions of power quality issues.
E036611 Electrical Machine Design	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises self-reliant study activities project	written examination report oral examination	Understand skin and proximity effects. Analyse parasitic effects (vibrations, noise, torques). Know the design and materials of the most common electrical machines. Use numerical methods for magnetic field computations in electrical machines. Analyse the windings of AC machines.
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.