Competence coverage matrix

GHENT UNIVERSITY
Bachelor of Science in Engineering

Electromechanical Engineering

Academic year 2021-2022

Legend:
 T=teaching methods
 E=evaluation methods

General Courses / **Courses Related to the Main Subject**

Course columns (left to right):

- E001142 Basic Mathematics
- E070080 Chemical Thermodynamics
- E003043 Probability and Statistics
- E066012 Materials Technology
- E098512 Sustainability, Entrepreneurship and Ethics
- E020061 Physics I
- E001132 Mathematical Analysis I
- E001460 Discrete Mathematics I
- E070070 Chemistry, the Structure of Matter
- E098513 Modelling, Making and Measuring
- E015041 Informatics
- E001222 Mathematical Analysis II
- E000662 Geometry and Linear Algebra
- E090320 Electrical Circuits and Networks
- E040420 Mechanics of Materials
- E020220 Physics II
- E045120 Transport Phenomena
- E001321 Mathematical Analysis III
- E005020 Analysis of Systems and Signals
- E076040 Sustainable Business Operations
- E007120 Modelling and Control of Dynamic Systems
- E032010 Electronic Systems and Instrumentation
- E044011 Mechanics of Structures
- E039110 Technical Thermodynamics
- E036111 Electrical Drives
- E063130 Mechanical Production Technology
- E003320 Statistical Data Processing
- E099050 Cross-Course Project
- E040030 Dynamics of Rigid Bodies
- E062220 Machine Elements
- E002910 Introduction to Numerical Mathematics
- E099151 Engineering Project
- E036210 Electromagnetic Energy Conversion
- E041011 Kinematics and Dynamics of Mechanisms
- E008310 Electrical Power Systems
- E037010 Heat and Combustion Engineering

Competences

Competences in one/more scientific discipline(s)

Competence	T	E
Have a clear understanding of the basic sciences and basic engineering sciences, and have the ability to apply them in a creative and purposeful way in the chosen specific engineering discipline.	32	30
Employ the basic sciences and techniques (statistics, ICT, CAD) in a creative and purposeful way.	11	11
Be familiar with fluid dynamics, heat transfer, thermodynamics and combustion and apply this knowledge creatively.	3	3
Be familiar with system dynamics and control engineering and apply this knowledge creatively in the design of feedback loops.	3	3
Be familiar with the conversion and application of electrical power and apply this knowledge creatively.	4	4
Be familiar with the mechanics of structures and materials and the dimensioning of components of machines and mechanical constructions and apply this knowledge creatively.	4	4
Identify and apply the relations and analogies between the different disciplines of electromechanical engineering.	4	3
Apply mathematical models and computational techniques to mechanical and electrotechnical applications.	11	10

Scientific competences

Competence	T	E
Research and process technical and scientific information in a purposeful way.	10	7
Employ standard models, methods and techniques in assignments.	25	24
Schematize and model phenomena, processes, and systems.	18	17
Justify decision-making processes on rational grounds.	13	12
Apply the acquired knowledge and essential concepts of electromechanical engineering to (multidisciplinary) projects, case studies and experiments.	3	3
Design in a targeted way by using the acquired knowledge and bearing in mind the technological limitations.	2	1

Intellectual competences

Competence	T	E
Understand and structure learning experiences.	13	12
Think in a conceptual, analytical, system-oriented, problem-solving and synthesizing way at different levels of abstraction.	30	27
Show precision, perseverance and critical reflection.	22	21
Show scientific curiosity.	11	8
Justify further studies or professional opportunities on rational grounds.	3	1
Analyse problems in the field of electromechanical engineering.	9	8
Critically evaluate own solutions to problems in the field of electromechanical engineering.	4	4

Competences in cooperation and communication

Competence	T	E
Master scientific and discipline-specific technical terminology (also in English).	24	20
Carry out concrete assignments systematically.	5	5
Work as part of a team.	8	8
Report results verbally, in writing, and graphically.	9	8

Societal competences

Competence	T	E
Act in an ethical and social way.	4	4
Be aware of the business aspects of the engineering discipline.	3	2
Be aware of aspects of security and ecology and energy-efficiency in industrial environments.	3	2
Be aware of the social and economic importance of the mechanical and electrotechnical industry.	6	3

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

Course	Teaching methods	Evaluation methods	Course learning outcome
E001142 Basic Mathematics	lecture seminar: coached exercises lecture: plenary exercises	written examination	Being able to perform basic calculations quickly and efficiently by hand. Being able to formulate correctly and with mathematical precision. Being able to make a correct reasoning and to write it down in a structured way. To have a thorough knowledge of the topics matrices, complex numbers, elementary functions and vectors.
E070080 Chemical Thermodynamics	guided self-study seminar: coached exercises lecture	written examination open book examination	Application of the laws of thermodynamics on chemical systems. Calculation of the solubility of ionic compounds in aqueous solutions. Calculation of the pH of aqueous solutions. Understand and apply chemical equilibrium.
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties. To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations.
E098512 Sustainability, Entrepreneurship and Ethics	lecture project	participation assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E020061 Physics I	demonstration lecture	written examination	To understand the physical laws and concepts of the covered chapters. To be able to solve problems by applying these laws and concepts.
E001132 Mathematical Analysis I	guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	Being able to assess the convergence of numerical series and series of functions. To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral, improper integral and integrability. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for solving initial value problems. Being able to construct and manipulate power series and Fourier series. Being able to use power series for solving ordinary differential equations.
E001460 Discrete Mathematics I	guided self-study seminar: coached exercises practicum lecture	written examination open book examination	Distinguishing and applying fundamental algebraic and discrete structures. Being fluent in graph algorithms and applying them to real problem situations. Deploying deductively correct reasonings in an independent way. Evaluating logical reasonings with respect to correctness / identifying errors. Deploying mathematical reasoning and proof argumentation. Using basic concepts from set theory, group theory, combinatorics and graph theory.
E070070 Chemistry: the Structure of Matter	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform stoichiometric calculations. Identify and describe the different types of intermolecular interactions. Being able to determine the molecular geometry of covalent compounds. Identify and describe the different types of chemical bonding. Being able to order atoms and ions based on their periodic properties Being able to write the electron configuration of atoms and ions.
E098513 Modelling, Making and Measuring	project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language.
E015041 Informatics	lecture seminar: practical PC room classes	written examination open book examination	To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm . To design an algorithm solving a given problem, and to assess the complexity of this solution. To master the basic concepts of objectorientation and to realize an objectoriented program in Python.
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	guided self-study lecture: plenary exercises seminar lecture	open book examination	Having acquired insight in the notions rank, image, kernel, invertability, and determinant of a linear transform. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them. Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto a subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear transform between abstract vector spaces. Having acquired insight in the notions vector space, linear dependence and independence, basis and dimension. Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired insight in the mathematical, physical and geometric meaning of eigenvalues and eigenvectors.
E090320 Electrical Circuits and Networks	lecture seminar: coached exercises	written examination	Draw amplitude and phase Bode diagrams for transfer functions and determine the poles and zeros. Analyze basic electrical circuits containing diodes, bipolar transistors and MOSFETs. Determine the balance of active and reactive electrical power in a three-phase electrical network. Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients.
E040420 Mechanics of Materials	seminar: coached exercises	written examination open book examination	To be familiar with the applications of linear elasticity theory. To identify mechanical test methods. Applications of the problem solving methods in elasticity theory. To identify linear and non-linear behaviour. Knowledge of the main techniques for damage control and diagnostics. To be familiar with the basic notions of linear elasticity theory.
E020220 Physics II	demonstration lecture	written examination participation	To be able to solve physics problems by applying these laws and concepts. To understand the physical laws and concepts of the covered chapters.

Code	Course	Teaching methods	Examination	Objectives
E045120	Transport Phenomena	lecture seminar: practical PC room classes seminar	open book examination	To understand the properties of fluids. To understand the similarities between transport of impulse, heat and mass. To solve problems of stationary heat transport. To know the basic laws of stationary heat transport and to be able to apply them. To understand the law of energy in open and closed systems and to be able to apply it. To master the laws of statics and dynamics and to be able to apply them.
E001321	Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations. To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.
E005020	Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response , the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E007120	Modelling and Control of Dynamic Systems	lecture seminar: coached exercises	written examination	Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems. To implement modeling and control on small scale setups by using personal laptop To design of controllers based on the application of root-locus techniques and frequency-response techniques such as Bode, Nyquist. Being able to analyse feedback control systems using several stability criteria. To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback control systems. To have insight regarding the static and dynamic behaviour of systems and to apply this insight when designing feedback loops. To derive transfer-function models and state-space models of physical systems and comprehend linear and nonlinear behavior.
E032010	Electronic Systems and Instrumentation	lecture practicum	written examination skills test	Being able to build and experimentally evaluate analog and digital electronic circuits at breadboard level with sufficient accuracy, perseverance and critical reflection. Have the skill to communicate about own design of electronic systems in writing and in graphics. Have the skills to perform numerical simulations of electronic circuits by means of standard models and methods, in particular PSpice. Analyse basic analog and digital electronic circuits and think in a conceptual, analytical, system-oriented way about them. Understand the operation of the basic electronic components
E044011	Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E039110	Technical Thermodynamics	lecture seminar: coached exercises	open book examination oral examination	Understanding and application of the first and second law of thermodynamics.
E036111	Electrical Drives	lecture seminar: coached exercises practicum	written examination open book examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
E063130	Mechanical Production Technology	lecture seminar: coached exercises		Describe the working principles and applications of manufacturing processes Discuss on critical parameters that determine choice of manufacturing processes Calculate needed forces and power consumption for classical manufacturing processes Recognize manufacturing machines and tools and explain their operation Explain the fundamental principles of plastic forming, machining and advanced manufacturing Critically compare and evaluate manufacturing processes
E099050	Cross-Course Project	project		
E040030	Dynamics of Rigid Bodies	lecture seminar: coached exercises	written examination open book examination	To calculate engineering problems of kinematics and kinetics of a rigid body in a plane motion To calculate simple engineering problems of kinematics and kinteics of a rigid body in a 3D motion
E062220	Machine Elements	lecture seminar: coached exercises	oral examination	Understanding the operation of important machine elements Interpreting of and applying catalogue information Dimensioning of machine elements Being able to select machine elements based on functionality
E099151	Engineering Project	seminar: coached exercises seminar: practical PC room classes	oral examination report participation	Being able to analyse a design question and translate it into sketch design Being able to calculate machine parts and defining main dimensions
E036210	Electromagnetic Energy Conversion	lecture seminar practicum	written examination skills test	Insights into the operation of electrical equipment, especially transformers and DC machines. Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines. Analyze and solve problems related to electromagnetism Computation of magnetic fluxes and derived variables in magnetic networks.
E041011	Kinematics and Dynamics of Mechanisms	lecture lecture: plenary exercises	written examination report	Understanding and interpreting correctly the calculated quantities and their units. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms. To be able to apply kinematics and dynamics techniques to mechanisms. To be familiar with the basic notions of analyzing the motion of mechanisms.
E008310	Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises	written examination	Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).

E037010 Heat and Combustion Engineering | lecture | written examination | To be able to characterize and calculate the thermodynamic aspects of combustion and different flame types.

lecture: plenary exercises

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

Calculate exhaust gas composition and enthalpy of a furnace.

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

Know the most important technical properties of fuels.

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

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

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
E001132 Mathematical Analysis I	lecture lecture: plenary exercises seminar	written examination	Being able to assess the convergence of numerical series and series of functions. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for solving initial value problems. Being able to construct and manipulate power series and Fourier series. Being able to use power series for solving ordinary differential equations.
E001460 Discrete Mathematics I	practicum	written examination	Distinguishing and applying fundamental algebraic and discrete structures. Being fluent in graph algorithms and applying them to real problem situations. Deploying deductively correct reasonings in an independent way. Evaluating logical reasonings with respect to correctness / identifying errors. Deploying mathematical reasoning and proof argumentation. Using basic concepts from set theory, group theory, combinatorics and graph theory.
E098513 Modelling, Making and Measuring	project	participation report	Use of software tools to make simulations and diagrams
E015041 Informatics	lecture seminar: practical PC room classes	written examination open book examination	To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm . To master the basic concepts of objectorientation and to realize an objectoriented program in Python.
E000662 Geometry and Linear Algebra	guided self-study lecture: plenary exercises seminar lecture	written examination	Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them. Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto a subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear transform between abstract vector spaces.
E045120 Transport Phenomena	seminar: practical PC room classes	open book examination	To solve problems of stationary heat transport.
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises	written examination	To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback control systems.
E032010 Electronic Systems and Instrumentation	practicum	skills test	Being able to build and experimentally evaluate analog and digital electronic circuits at breadboard level with sufficient accuracy, perseverance and critical reflection. Have the skills to perform numerical simulations of electronic circuits by means of standard models and methods, in particular PSpice.
E003230 Statistical Data Processing	lecture seminar: practical PC room classes seminar: coached exercises	written examination report	Design an experiment Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Analyse the outcome of the experiment using frequency tables and graphical representation Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis
E099151 Engineering Project	seminar: practical PC room classes	assignment	Being able to perform a detailed 3D machine design with SolidWorks Being able to extract 2D working drawings out of a 3D component, including dimensions and tolerances, surface finish, ... Being able to extract 2D drawings out of a 3D machine model by means of judiciously selected sections
E041011 Kinematics and Dynamics of Mechanisms	lecture	report	To be familiar with the basic notions of analyzing the motion of mechanisms. To be familiar with several well known mechanisms.

Course	Teaching methods	Evaluation methods	Course learning outcome
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E045120 Transport Phenomena	lecture seminar: practical PC room classes seminar	open book examination	To understand the properties of fluids. To understand the similarities between transport of impulse, heat and mass. To solve problems of stationary heat transport. To know the basic laws of stationary heat transport and to be able to apply them. To understand the law of energy in open and closed systems and to be able to apply it. To master the laws of statics and dynamics and to be able to apply them.
E039110 Technical Thermodynamics	lecture seminar: coached exercises	open book examination oral examination	Understanding the importance and application of exergy and anergy for processes. Calculation of properties for pure substances and mixtures. Understanding and application of the first and second law of thermodynamics. Calculate thermodynamic processes and cycles and using polytropic processes
E037010 Heat and Combustion Engineering	lecture lecture: plenary exercises	written examination	To be able to characterize and calculate the thermodynamic aspects of combustion and different flame types. To be able to identify types of heat transfer and combustion in practical applications Calculate exhaust gas composition and enthalpy of a furnace. Being able to identify, describe and calculate heat transfer with phase change (evaporation / condensation) Know the most important technical properties of fuels. Know the formation mechanisms, consequences and basic countermeasures for harmful emissions, as well as principles related to emissions legislation Understand and calculate different types of heat transfer (such as conduction, convection, radiation)

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

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

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
E044011 Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E063130 Mechanical Production Technology	lecture seminar: coached exercises	open book examination oral examination	Describe the working principles and applications of manufacturing processes Discuss on critical parameters that determine choice of manufacturing processes Calculate needed forces and power consumption for classical manufacturing processes Recognize manufacturing machines and tools and explain their operation Explain the fundamental principles of plastic forming, machining and advanced manufacturing Critically compare and evaluate manufacturing processes
E062220 Machine Elements	lecture seminar: coached exercises	oral examination	Dimensioning of machine elements Interpreting of and applying catalogue information
E099151 Engineering Project	lecture seminar: practical PC room classes seminar: coached exercises	oral examination report	Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost Being able to calculate machine parts and defining main dimensions

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
E045120 Transport Phenomena	lecture seminar	open book examination	To understand the similarities between transport of impulse, heat and mass.
E099151 Engineering Project	seminar: coached exercises seminar: practical PC room classes	oral examination report assignment participation	Being able to analyse a design question and translate it into sketch design Being able to design a machine with attention for mechanical safety Being able to apply principles of Life Cycle Analysis on a machine design Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost
E008310 Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises		Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).
E037010 Heat and Combustion Engineering	lecture lecture: plenary exercises	written examination	Understand and calculate different types of heat transfer (such as conduction, convection, radiation) To be able to identify types of heat transfer and combustion in practical applications

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

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties. To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations.
E098512 Sustainability, Entrepreneurship and Ethics	project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E098513 Modelling, Making and Measuring	project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language.
E015041 Informatics	seminar: practical PC room classes	written examination open book examination	To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm . To master the basic concepts of objectorientation and to realize an objectoriented program in Python.
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises		Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems. To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback control systems.
E036111 Electrical Drives	practicum	open book examination skills test	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
E099050 Cross-Course Project	project		
E062220 Machine Elements	seminar: coached exercises		Being able to select machine elements based on functionality Interpreting of and applying catalogue information
E099151 Engineering Project	seminar: practical PC room classes	oral examination assignment	Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost
E036210 Electromagnetic Energy Conversion	practicum	written examination skills test	Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
E001142 Basic Mathematics	lecture: plenary exercises seminar: coached exercises	written examination	Being able to perform basic calculations quickly and efficiently by hand. To have a thorough knowledge of the topics matrices, complex numbers, elementary functions and vectors.
E003043 Probability and Statistics	guided self-study seminar: coached exercises lecture	written examination with multiple choice questions open book examination	To reason and to work with multi-dimensional random variables To identify an appropriate probabilistic model for the analysis of an event or experiment
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties. To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations.
E001132 Mathematical Analysis I	seminar	written examination open book examination	Being able to assess the convergence of numerical series and series of functions. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for solving initial value problems. Being able to construct and manipulate power series and Fourier series. Being able to use power series for solving ordinary differential equations.
E098513 Modelling, Making and Measuring	project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language. Use of software tools to make simulations and diagrams
E015041 Informatics	lecture seminar: practical PC room classes	written examination open book examination	To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm . To design an algorithm solving a given problem, and to assess the complexity of this solution. To master the basic concepts of objectorientation and to realize an objectoriented program in Python.
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	seminar	written examination open book examination	Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them. Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto a subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear transform between abstract vector spaces.
E090320 Electrical Circuits and Networks	seminar: coached exercises	written examination	Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients.
E040420 Mechanics of Materials	seminar: coached exercises	open book examination	To be familiar with the applications of linear elasticity theory. Applications of the problem solving methods in elasticity theory.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations. To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.
E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response , the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises practicum	report	Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems. To implement modeling and control on small scale setups by using personal laptop
E032010 Electronic Systems and Instrumentation	lecture practicum	written examination skills test	Being able to build and experimentally evaluate analog and digital electronic circuits at breadboard level with sufficient accuracy, perseverance and critical reflection. Have the skills to perform numerical simulations of electronic circuits by means of standard models and methods, in particular PSpice. Analyse basic analog and digital electronic circuits and think in a conceptual, analytical, system-oriented way about them.

Code	Course	Teaching methods	Assessment	Learning outcomes
E044011	Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E039110	Technical Thermodynamics	seminar: coached exercises seminar: practical PC room classes	open book examination	Calculate thermodynamic processes and cycles and using polytropic processes Understanding and application of the first and second law of thermodynamics.
E036111	Electrical Drives	lecture seminar: coached exercises practicum	written examination open book examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
E063130	Mechanical Production Technology	lecture seminar: coached exercises	open book examination oral examination	Describe the working principles and applications of manufacturing processes Discuss on critical parameters that determine choice of manufacturing processes Calculate needed forces and power consumption for classical manufacturing processes Recognize manufacturing machines and tools and explain their operation Explain the fundamental principles of plastic forming, machining and advanced manufacturing Critically compare and evaluate manufacturing processes
E003230	Statistical Data Processing	seminar: coached exercises seminar: practical PC room classes	written examination report	Design an experiment Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Analyse the outcome of the experiment using frequency tables and graphical representation Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis
E040030	Dynamics of Rigid Bodies	seminar: coached exercises	open book examination	To calculate engineering problems of kinematics and kinetics of a rigid body in a plane motion To calculate simple engineering problems of kinematics and kinteics of a rigid body in a 3D motion
E062220	Machine Elements	seminar: coached exercises		Dimensioning of machine elements
E036210	Electromagnetic Energy Conversion	lecture seminar practicum	written examination skills test	Insights into the operation of electrical equipment, especially transformers and DC machines. Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines. Analyze and solve problems related to electromagnetism Computation of magnetic fluxes and derived variables in magnetic networks.
E041011	Kinematics and Dynamics of Mechanisms	lecture: plenary exercises	report	Understanding and interpreting correctly the calculated quantities and their units. To be familiar with several well known mechanisms. To be familiar with velocities, accelerations, forces and energies in mechanisms. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms. To be able to apply kinematics and dynamics techniques to mechanisms.
E008310	Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises	written examination	Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).
E037010	Heat and Combustion Engineering	lecture lecture: plenary exercises	written examination	Understand and calculate different types of heat transfer (such as conduction, convection, radiation) To be able to identify types of heat transfer and combustion in practical applications Calculate exhaust gas composition and enthalpy of a furnace.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche			
E003043 Probability and Statistics	guided self-study seminar: coached exercises lecture	written examination with multiple choice questions open book examination	To reason and to work with multi-dimensional random variables To identify an appropriate probabilistic model for the analysis of an event or experiment
E020061 Physics I	demonstration lecture	written examination	To understand the physical laws and concepts of the covered chapters. To be able to solve problems by applying these laws and concepts.
E001132 Mathematical Analysis I	lecture lecture: plenary exercises seminar	written examination	To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems.
E001460 Discrete Mathematics I	guided self-study seminar: coached exercises practicum lecture	written examination open book examination	Distinguishing and applying fundamental algebraic and discrete structures. Being fluent in graph algorithms and applying them to real problem situations. Deploying deductively correct reasonings in an independent way. Evaluating logical reasonings with respect to correctness / identifying errors. Deploying mathematical reasoning and proof argumentation. Using basic concepts from set theory, group theory, combinatorics and graph theory.
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	lecture lecture: plenary exercises seminar	written examination open book examination	Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear transform between abstract vector spaces. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them.
E090320 Electrical Circuits and Networks	lecture seminar: coached exercises	written examination	Draw amplitude and phase Bode diagrams for transfer functions and determine the poles and zeros. Analyze basic electrical circuits containing diodes, bipolar transistors and MOSFETs. Determine the balance of active and reactive electrical power in a three-phase electrical network. Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients.
E020220 Physics II	demonstration lecture	written examination participation	To be able to solve physics problems by applying these laws and concepts. To understand the physical laws and concepts of the covered chapters.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations. To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.
E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response , the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E076040 Sustainable Business Operations	lecture	written examination with open questions written examination with multiple choice questions	Understand the technique of financial balance sheet reading and be able to apply it practically in simple accounting exercises
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises		Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems. To derive transfer-function models and state-space models of physical systems and comprehend linear and nonlinear behavior.
E039110 Technical Thermodynamics	lecture seminar: coached exercises	open book examination oral examination	Calculate thermodynamic processes and cycles and using polytropic processes Explaining the important thermodynamic cycles.
E063130 Mechanical Production Technology	lecture seminar: coached exercises	open book examination oral examination	Describe the working principles and applications of manufacturing processes Discuss on critical parameters that determine choice of manufacturing processes Calculate needed forces and power consumption for classical manufacturing processes Recognize manufacturing machines and tools and explain their operation Explain the fundamental principles of plastic forming, machining and advanced manufacturing Critically compare and evaluate manufacturing processes
E062220 Machine Elements	lecture seminar: coached exercises	oral examination	Understanding the operation of important machine elements Dimensioning of machine elements
E099151 Engineering Project	seminar: practical PC room classes	participation	Being able to analyse a design question and translate it into sketch design
E008310 Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises	written examination	Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).
E037010 Heat and Combustion Engineering	lecture lecture: plenary exercises	written examination	To be able to identify types of heat transfer and combustion in practical applications

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
E070080 Chemical Thermodynamics	guided self-study seminar: coached exercises lecture	written examination open book examination	Application of the laws of thermodynamics on chemical systems. Calculation of the solubility of ionic compounds in aqueous solutions. Calculation of the pH of aqueous solutions. Understand and apply chemical equilibrium.
E003043 Probability and Statistics	lecture		To calculate probabilities of events and expectations of random variables
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties. To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations.
E098512 Sustainability, Entrepreneurship and Ethics	project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E070070 Chemistry: the Structure of Matter	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform stoichiometric calculations. Identify and describe the different types of intermolecular interactions. Being able to determine the molecular geometry of covalent compounds. Identify and describe the different types of chemical bonding. Being able to order atoms and ions based on their periodic properties Being able to write the electron configuration of atoms and ions.
E098513 Modelling, Making and Measuring	project	report	Writing reports Oral presentation
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations. To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises practicum	written examination report	To have insight regarding the static and dynamic behaviour of systems and to apply this insight when designing feedback loops. To implement modeling and control on small scale setups by using personal laptop To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback control systems.
E044011 Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E003230 Statistical Data Processing	seminar: practical PC room classes	written examination report	Describe trends in data and find correlations using regression analysis Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Decide based on a limited sample, using appropriate hypothesis tests
E062220 Machine Elements	lecture seminar: coached exercises	oral examination	Being able to select machine elements based on functionality Interpreting of and applying catalogue information Dimensioning of machine elements
E099151 Engineering Project	lecture seminar: coached exercises	oral examination report	Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost Being able to apply principles of Life Cycle Analysis on a machine design Being able to calculate machine parts and defining main dimensions

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

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

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
E001142 Basic Mathematics	seminar: coached exercises	written examination	To have a thorough knowledge of the topics matrices, complex numbers, elementary functions and vectors. Being able to formulate correctly and with mathematical precision. Being able to make a correct reasoning and to write it down in a structured way.
E003043 Probability and Statistics	guided self-study seminar: coached exercises lecture	written examination with multiple choice questions open book examination	To reason and to work with multi-dimensional random variables To perform a linear regression and to interpret its results To understand and to apply methods for hypothesis testing To understand and to apply methods for (parameter) estimation To interpret and to judge the results of statistical sampling, and to represent them in an appropriate form To identify an appropriate probabilistic model for the analysis of an event or experiment To calculate probabilities of events and expectations of random variables
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties. To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations.
E001132 Mathematical Analysis I	guided self-study	written examination open book examination	Being able to assess the convergence of numerical series and series of functions. To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral, improper integral and integrability. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for solving initial value problems. Being able to construct and manipulate power series and Fourier series. Being able to use power series for solving ordinary differential equations.
E015041 Informatics	guided self-study seminar: practical PC room classes lecture	written examination open book examination	To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm . To design an algorithm solving a given problem, and to assess the complexity of this solution. To master the basic concepts of objectorientation and to realize an objectoriented program in Python.
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	guided self-study	written examination open book examination	Having acquired skills in the manipulation of vectors.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations. To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.
E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response , the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E076040 Sustainable Business Operations	lecture	written examination with open questions written examination with multiple choice questions	Critical, creative thinking and scientific reasoning Be able to think carefully about social, scientific and ethical problems and possible solutions to these problems
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises		Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems.
E062220 Machine Elements	lecture seminar: coached exercises	oral examination	Understanding the operation of important machine elements
E041011 Kinematics and Dynamics of Mechanisms	lecture: plenary exercises	report	To be familiar with the basic notions of analyzing the motion of mechanisms. To be familiar with several well known mechanisms.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche			
E001142 Basic Mathematics	lecture seminar: coached exercises lecture: plenary exercises	written examination	Being able to make a correct reasoning and to write it down in a structured way.
E003043 Probability and Statistics	guided self-study seminar: coached exercises lecture	written examination with multiple choice questions open book examination	To reason and to work with multi-dimensional random variables To identify an appropriate probabilistic model for the analysis of an event or experiment To calculate probabilities of events and expectations of random variables
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties. To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations.
E098512 Sustainability, Entrepreneurship and Ethics	project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E020061 Physics I	demonstration lecture		To understand the physical laws and concepts of the covered chapters. To be able to solve problems by applying these laws and concepts.
E001132 Mathematical Analysis I	guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	Being able to assess the convergence of numerical series and series of functions. To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral, improper integral and integrability. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for solving initial value problems. Being able to construct and manipulate power series and Fourier series. Being able to use power series for solving ordinary differential equations.
E001460 Discrete Mathematics I	guided self-study seminar: coached exercises practicum lecture	written examination open book examination	Distinguishing and applying fundamental algebraic and discrete structures. Being fluent in graph algorithms and applying them to real problem situations. Deploying deductively correct reasonings in an independent way. Evaluating logical reasonings with respect to correctness / identifying errors. Deploying mathematical reasoning and proof argumentation. Using basic concepts from set theory, group theory, combinatorics and graph theory.
E098513 Modelling, Making and Measuring	project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language. Use of software tools to make simulations and diagrams
E015041 Informatics	lecture seminar: practical PC room classes	written examination open book examination	To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm . To master the basic concepts of objectorientation and to realize an objectoriented program in Python.
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	Having acquired insight in the notions rank, image, kernel, invertability, and determinant of a linear transform. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them. Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto a subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear transform between abstract vector spaces. Having acquired insight in the notions vector space, linear dependence and independence, basis and dimension. Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired insight in the mathematical, physical and geometric meaning of eigenvalues and eigenvectors.
E090320 Electrical Circuits and Networks	seminar: coached exercises	written examination	Draw amplitude and phase Bode diagrams for transfer functions and determine the poles and zeros. Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients.
E040420 Mechanics of Materials	seminar: coached exercises	open book examination	To be familiar with the applications of linear elasticity theory. Applications of the problem solving methods in elasticity theory.
E020220 Physics II	demonstration lecture	written examination participation	To be able to solve physics problems by applying these laws and concepts. To understand the physical laws and concepts of the covered chapters.
E045120 Transport Phenomena	lecture seminar: practical PC room classes seminar	open book examination	To master the laws of statics and dynamics and to be able to apply them. To solve problems of stationary heat transport. To know the basic laws of stationary heat transport and to be able to apply them. To understand the law of energy in open and closed systems and to be able to apply it.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations. To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.

Code	Name	Teaching methods	Evaluation	Learning outcomes
E005020	Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response , the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E007120	Modelling and Control of Dynamic Systems	lecture seminar: coached exercises		Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems.
E032010	Electronic Systems and Instrumentation	lecture practicum	written examination skills test	Being able to build and experimentally evaluate analog and digital electronic circuits at breadboard level with sufficient accuracy, perseverance and critical reflection. Have the skill to communicate about own design of electronic systems in writing and in graphics. Have the skills to perform numerical simulations of electronic circuits by means of standard models and methods, in particular PSpice. Analyse basic analog and digital electronic circuits and think in a conceptual, analytical, system-oriented way about them. Understand the operation of the basic electronic components
E044011	Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E039110	Technical Thermodynamics	lecture seminar: practical PC room classes seminar: coached exercises practicum	open book examination skills test assignment oral examination	Understanding the importance and application of exergy and anergy for processes. Explaining the important thermodynamic cycles. Understanding and application of the first and second law of thermodynamics. Calculate thermodynamic processes and cycles and using polytropic processes
E036111	Electrical Drives	lecture seminar: coached exercises practicum	written examination open book examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
E003230	Statistical Data Processing	seminar: coached exercises seminar: practical PC room classes	written examination report	Design an experiment Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Analyse the outcome of the experiment using frequency tables and graphical representation Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis
E062220	Machine Elements	lecture seminar: coached exercises		Understanding the operation of important machine elements Being able to select machine elements based on functionality
E002910	Introduction to Numerical Mathematics	lecture seminar: practical PC room classes	written examination	A critical usage of algorithms in practical applications using software.
E099151	Engineering Project	lecture seminar: practical PC room classes seminar: coached exercises	assignment report	Being able to analyse a design question and translate it into sketch design Being able to extract 2D working drawings out of a 3D component, including dimensions and tolerances, surface finish, ... Being able to extract 2D drawings out of a 3D machine model by means of judiciously selected sections Being able to perform a detailed 3D machine design with SolidWorks Being able to calculate machine parts and defining main dimensions Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost
E036210	Electromagnetic Energy Conversion	lecture seminar practicum	written examination	Insights into the operation of electrical equipment, especially transformers and DC machines. Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines. Analyze and solve problems related to electromagnetism Computation of magnetic fluxes and derived variables in magnetic networks.
E041011	Kinematics and Dynamics of Mechanisms	lecture: plenary exercises	report	Understanding and interpreting correctly the calculated quantities and their units. To be familiar with several well known mechanisms. To be familiar with velocities, accelerations, forces and energies in mechanisms. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms. To be able to apply kinematics and dynamics techniques to mechanisms. To be familiar with the basic notions of analyzing the motion of mechanisms.
E008310	Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises	written examination	Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).
E037010	Heat and Combustion Engineering	lecture lecture: plenary exercises	written examination	Understand and calculate different types of heat transfer (such as conduction, convection, radiation) To be able to identify types of heat transfer and combustion in practical applications Being able to identify, describe and calculate heat transfer with phase change (evaporation / condensation)

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
E001142 Basic Mathematics	lecture seminar: coached exercises lecture: plenary exercises	written examination	Being able to formulate correctly and with mathematical precision.
E003043 Probability and Statistics	guided self-study seminar: coached exercises lecture	written examination with multiple choice questions open book examination	To reason and to work with multi-dimensional random variables To perform a linear regression and to interpret its results To understand and to apply methods for hypothesis testing To understand and to apply methods for (parameter) estimation To interpret and to judge the results of statistical sampling, and to represent them in an appropriate form To identify an appropriate probabilistic model for the analysis of an event or experiment To calculate probabilities of events and expectations of random variables
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties. To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations.
E098512 Sustainability, Entrepreneurship and Ethics	project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E001132 Mathematical Analysis I	guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	Being able to assess the convergence of numerical series and series of functions. To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral, improper integral and integrability. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for solving initial value problems. Being able to construct and manipulate power series and Fourier series. Being able to use power series for solving ordinary differential equations.
E001460 Discrete Mathematics I	guided self-study seminar: coached exercises practicum lecture	written examination open book examination	Distinguishing and applying fundamental algebraic and discrete structures. Being fluent in graph algorithms and applying them to real problem situations. Deploying deductively correct reasonings in an independent way. Evaluating logical reasonings with respect to correctness / identifying errors. Deploying mathematical reasoning and proof argumentation. Using basic concepts from set theory, group theory, combinatorics and graph theory.
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	Having acquired insight in the notions rank, image, kernel, invertability, and determinant of a linear transform. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them. Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto a subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear transform between abstract vector spaces. Having acquired insight in the notions vector space, linear dependence and independence, basis and dimension. Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired insight in the mathematical, physical and geometric meaning of eigenvalues and eigenvectors.
E090320 Electrical Circuits and Networks	seminar: coached exercises	written examination	Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients.
E045120 Transport Phenomena	lecture seminar: practical PC room classes seminar	open book examination	To understand the properties of fluids. To solve problems of stationary heat transport. To know the basic laws of stationary heat transport and to be able to apply them. To understand the law of energy in open and closed systems and to be able to apply it. To master the laws of statics and dynamics and to be able to apply them.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations. To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.

Code	Name	Teaching	Examination	Learning outcomes
E005020	Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response , the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E007120	Modelling and Control of Dynamic Systems	lecture seminar: coached exercises		To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback control systems.
E032010	Electronic Systems and Instrumentation	practicum	skills test	Being able to build and experimentally evaluate analog and digital electronic circuits at breadboard level with sufficient accuracy, perseverance and critical reflection. Have the skill to communicate about own design of electronic systems in writing and in graphics. Have the skills to perform numerical simulations of electronic circuits by means of standard models and methods, in particular PSpice.
E044011	Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E036111	Electrical Drives	lecture seminar: coached exercises practicum	written examination open book examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
E003230	Statistical Data Processing	seminar: practical PC room classes	report	Design an experiment Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Analyse the outcome of the experiment using frequency tables and graphical representation Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis
E040030	Dynamics of Rigid Bodies	lecture seminar: coached exercises	written examination open book examination	To calculate engineering problems of kinematics and kinetics of a rigid body in a plane motion To calculate simple engineering problems of kinematics and kinteics of a rigid body in a 3D motion
E062220	Machine Elements	seminar: coached exercises	oral examination	Dimensioning of machine elements Interpreting of and applying catalogue information
E099151	Engineering Project	seminar: practical PC room classes	oral examination assignment	Being able to analyse a design question and translate it into sketch design Being able to extract 2D working drawings out of a 3D component, including dimensions and tolerances, surface finish, ... Being able to extract 2D drawings out of a 3D machine model by means of judiciously selected sections Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost
E036210	Electromagnetic Energy Conversion	lecture seminar	written examination	Insights into the operation of electrical equipment, especially transformers and DC machines. Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines. Analyze and solve problems related to electromagnetism Computation of magnetic fluxes and derived variables in magnetic networks.
E041011	Kinematics and Dynamics of Mechanisms	lecture: plenary exercises	report	To be familiar with the basic notions of analyzing the motion of mechanisms. To be familiar with velocities, accelerations, forces and energies in mechanisms. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms. To be able to apply kinematics and dynamics techniques to mechanisms.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
E070080 Chemical Thermodynamics	guided self-study seminar: coached exercises lecture	written examination open book examination	Application of the laws of thermodynamics on chemical systems. Calculation of the solubility of ionic compounds in aqueous solutions. Calculation of the pH of aqueous solutions. Understand and apply chemical equilibrium.
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture		To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties. To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations.
E098512 Sustainability, Entrepreneurship and Ethics	project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E020061 Physics I	demonstration lecture		To understand the physical laws and concepts of the covered chapters. To be able to solve problems by applying these laws and concepts.
E070070 Chemistry: the Structure of Matter	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform stoichiometric calculations. Identify and describe the different types of intermolecular interactions. Being able to determine the molecular geometry of covalent compounds. Identify and describe the different types of chemical bonding. Being able to order atoms and ions based on their periodic properties Being able to write the electron configuration of atoms and ions.
E098513 Modelling, Making and Measuring	project	participation report	Concepts: working collaboration in a group, scientific techniques, use of scientific language. Use of software tools to make simulations and diagrams
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E020220 Physics II	demonstration lecture	written examination participation	To be able to solve physics problems by applying these laws and concepts. To understand the physical laws and concepts of the covered chapters.
E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response , the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E076040 Sustainable Business Operations	lecture	written examination with open questions written examination with multiple choice questions	Understanding sustainability aspects in an economic context
E062220 Machine Elements	lecture seminar: coached exercises		Understanding the operation of important machine elements Dimensioning of machine elements

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche			
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture		To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties. To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations.
E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response , the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E008310 Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises		Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).

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

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

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

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

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche			
E098512 Sustainability, Entrepreneurship and Ethics	project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E098513 Modelling, Making and Measuring	project	participation report	Concepts: working collaboration in a group, scientific techniques, use of scientific language.
E003230 Statistical Data Processing	seminar: practical PC room classes	report	Design an experiment Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Analyse the outcome of the experiment using frequency tables and graphical representation Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis
E099151 Engineering Project	seminar: coached exercises seminar: practical PC room classes	assignment report	Being able to analyse a design question and translate it into sketch design Being able to extract 2D working drawings out of a 3D component, including dimensions and tolerances, surface finish, ... Being able to extract 2D drawings out of a 3D machine model by means of judiciously selected sections Being able to perform a detailed 3D machine design with SolidWorks Being able to calculate machine parts and defining main dimensions Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost
E041011 Kinematics and Dynamics of Mechanisms	lecture: plenary exercises	report	To be able to apply kinematics and dynamics techniques to mechanisms. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche			
E098512 Sustainability, Entrepreneurship and Ethics	project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E098513 Modelling, Making and Measuring	project	participation report	Concepts: working collaboration in a group, scientific techniques, use of scientific language.
E032010 Electronic Systems and Instrumentation	practicum	skills test	Have the skill to communicate about own design of electronic systems in writing and in graphics.
E036111 Electrical Drives	practicum	open book examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
E003230 Statistical Data Processing	seminar: practical PC room classes	report	Design an experiment Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Analyse the outcome of the experiment using frequency tables and graphical representation Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis
E099050 Cross-Course Project	project	oral examination report	
E036210 Electromagnetic Energy Conversion	practicum	skills test	Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines.
E041011 Kinematics and Dynamics of Mechanisms	lecture: plenary exercises	report	Understanding and interpreting correctly the calculated quantities and their units. To be familiar with several well known mechanisms. To be familiar with velocities, accelerations, forces and energies in mechanisms. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche			
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties. To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations.
E098512 Sustainability, Entrepreneurship and Ethics	lecture project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E098513 Modelling, Making and Measuring	lecture project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language. Oral presentation Writing reports
E007120 Modelling and Control of Dynamic Systems	practicum	report	To implement modeling and control on small scale setups by using personal laptop
E032010 Electronic Systems and Instrumentation	practicum	skills test	Have the skill to communicate about own design of electronic systems in writing and in graphics.
E003230 Statistical Data Processing	seminar: practical PC room classes	report	Design an experiment Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Analyse the outcome of the experiment using frequency tables and graphical representation Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis
E099050 Cross-Course Project	project		
E099151 Engineering Project	seminar: practical PC room classes	oral examination report assignment	Being able to calculate machine parts and defining main dimensions Being able to extract 2D working drawings out of a 3D component, including dimensions and tolerances, surface finish, ... Being able to extract 2D drawings out of a 3D machine model by means of judiciously selected sections
E041011 Kinematics and Dynamics of Mechanisms	lecture	written examination report	Understanding and interpreting correctly the calculated quantities and their units. To be familiar with several well known mechanisms. To be familiar with velocities, accelerations, forces and energies in mechanisms. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms. To be able to apply kinematics and dynamics techniques to mechanisms. To be familiar with the basic notions of analyzing the motion of mechanisms.

Course	Teaching methods	Evaluation methods	Course learning outcome
*Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche*			
E066012 Materials Technology	seminar: practical PC room classes	written examination	To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties
E098512 Sustainability, Entrepreneurship and Ethics	lecture project	participation assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E076040 Sustainable Business Operations	lecture	written examination with open questions written examination with multiple choice questions	Critical, creative thinking and scientific reasoning Be able to think carefully about social, scientific and ethical problems and possible solutions to these problems
E039110 Technical Thermodynamics	excursion lecture	oral examination	Explaining the important thermodynamic cycles. Basic understanding of working principles and technology of piston machinery and turbomachinery.

Course	Teaching methods	Evaluation methods	Course learning outcome

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

Course	Teaching methods	Evaluation methods	Course learning outcome
E098512 Sustainability, Entrepreneurship and Ethics	lecture project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E076040 Sustainable Business Operations	lecture	written examination with open questions assignment written examination with multiple choice questions	Understand the technique of financial balance sheet reading and be able to apply it practically in simple accounting exercises Mastering the basic concepts of macroeconomics and microeconomy: law of supply and demand, markets (perfect competition, monopoly, oligopoly, game theory) Understanding the coherence between the different stakeholders of the company Being able to make a simple investment analysis and apply the concept of time value of money in all aspects of investment analysis Being able to make a complete costing for a product or a service Being able to distinguish between fixed, variable, direct and indirect costs Be able to analyze and assess the data of a company's balance sheet Understanding sustainability aspects in an economic context
E008310 Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises		Understand the function and principles of electric power systems. Analyse static optimisation of power division. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).

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

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche			
E076040 Sustainable Business Operations	lecture	written examination with open questions assignment written examination with multiple choice questions	Understand the technique of financial balance sheet reading and be able to apply it practically in simple accounting exercises Mastering the basic concepts of macroeconomics and microeconomy: law of supply and demand, markets (perfect competition, monopoly, oligopoly, game theory) Understanding the coherence between the different stakeholders of the company Being able to make a simple investment analysis and apply the concept of time value of money in all aspects of investment analysis Being able to make a complete costing for a product or a service Being able to distinguish between fixed, variable, direct and indirect costs Be able to analyze and assess the data of a company's balance sheet Understanding sustainability aspects in an economic context
E039110 Technical Thermodynamics	excursion lecture	oral examination	Understanding the importance and application of exergy and anergy for processes. Understanding and application of the first and second law of thermodynamics.
E063130 Mechanical Production Technology	lecture seminar: coached exercises		Describe the working principles and applications of manufacturing processes Discuss on critical parameters that determine choice of manufacturing processes Calculate needed forces and power consumption for classical manufacturing processes Recognize manufacturing machines and tools and explain their operation Explain the fundamental principles of plastic forming, machining and advanced manufacturing Critically compare and evaluate manufacturing processes
E099050 Cross-Course Project	project	report	
E008310 Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises		Understand the function and principles of electric power systems. Analyse static optimisation of power division. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).
E037010 Heat and Combustion Engineering	lecture		Know the most important technical properties of fuels.