Competence coverage	matrix										Gene	eral Cou	urses														Course	s Relat	ed to t	he Mair	Subje	ct				
GHENT UNIVERSITY Bachelor of Science in	Engineering		mics	85		neurship and Ethics				e of Matter	Measuring		_	Algebra	Networks			=	Operations		id Signals	of Dynamic Systems	nism	Instrumentation for	nd Processing		sing and Statistics		Molecular Structure	cal Systems		al Mathematics		sing		issue Analysis
Biomedical Engineerin	g	:	matics nermodynai	and Statistic	chnology	y, Entrepre		al Analysis	thematics	the Structur	laking and		al Analysis	nd Linear A	rcuits and N		henomena	al Analysis	Business (of Materials	Systems an	d Control o	ne to Orgai	ystems and	Polymers a	Sics	nal Process	se Project	hysics and	Physiologi	Project	to Numerio	emistry	ata Process	netism I	Cell and T
Academic year 2021-20	022	:	asic Matne hemical Th	obability a	aterials Te	ustainabilit	lysics I	athematica	iscrete Math	hemistry: t	odelling, M	formatics	Mathematica	eometry aı	ectrical Ci	nysics II	ansport Pl	athematica	ustainable	echanics c	nalysis of §	odelling ar	om Genor	lectronic Sy	Engineers omedical F	edical Phy	edical Sigr	ross-Cours	atistical Pł	odelling of	ngineering	troduction	rganic Che	atistical Da	ectromagr	uantitative
Legend: T=teaching methods E=evaluation methods		i C	E001142 B3	E003043 Pi	E066012 M	E098512 Si	E020061 PI	E001132 M	E001460 D	E070070 C	E098513 M	E015041 In	E001222 M	E000662 G	E090320 EI	E020220 PI	E045120 Ti	E001321 M	E076040 Si	E040420 M	E005020 A	E007120 M	E092662 FI) Ш	- − − −	E092735 M	E010390 M	E099070 CI	E021520 St	E092621 M	E099171 E	E002910 In	E070310 O	E003230 Si	E022110 Ele	E074011 Q
Competences in one/more scientific discipline(s)	Have a clear understanding of the basic sciences and basic engineering sciences, and have the ability to apply them in a creative and purposeful way in the chosen specific engineering discipline.	28 27	T T		E	E	E	T E	T E	T E	T E	T E	T E	E	E	T E	E	E		E	E	E		E	T E		E	E	E	Т			E		E	T E
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	(electromagnetism, ionizing and non-ionizing radiation) that form the basis of medical imaging and therapy.	3														T E										T E									T E	
	quantitative measuring structure and function of biological systems at molecular, organ and system level.																													E						E
	physicochemical properties of materials, in particular polymers for biomedical applications.	2																		T E					E											
	mechanics and transport physics and apply this to biomechanical and physiological processes and problems.	3															E			E			1 E													
	and develop simple electrical circuits for measuring physiological signals.	2													E									E												
Scientific compotonces		8 8 10			т	т					Т	Т										т	E	E		E		Т	E T	E	т	E			E	т
ocientino competences	purposeful way. Employ standard models, methods and techniques in	23	Т	Т	E	Ė		Т			E	E T	Т	Т	Т			Т		T	Т	T	1	. т	T		Т	E	E	Т	E		Т	Т	Т	E
	Schematize and model phenomena, processes, and systems.	18	E	E T	Е		T	E T	T		Е	E	E T	E T	E T	T		E T	T	E	E T	E T	7	E	•	T		E T	E T	E T	E		Е	Е	E T	
	Justify decision-making processes on rational grounds.	17 13 12	T	T	T	T E	Е	Е	E	T E	T E		E T E	E	Е	Е		T E	E		E	T E				E		T E	Е	E	T E			T E	E	T E
Intellectual competences	Understand and structure learning experiences.	14	T E	T E	T E			T E				T E	T E	T E				T E	T E		T E	Т							T E		T E		T E			
	Think in a conceptual, analytical, system-oriented, problem-solving T and synthesizing way at different levels of abstraction.		T E	T E	T E	T E	Т	T E	T E		T E	T E	T E	T E	T E	T E	T E	T E		T E	T E	Т	1 E	T			T E	T E	T E	T E	T E	T E	T E	T E	T E	
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	Show scientific curiosity.	15 11	T		Т	T E	Т			T E	T E		T			T E			T E		T E				T			Т	T E	Т	T					
	Justify further studies or professional opportunities on rational	2			Т																T E															
Competences in cooperation and	Master scientific and discipline-specific technical terminology (also T in English).		T T	T E	T E	T E	Т	T E		T	T E		T E	T E		T E	T E	T E				-	T E	T				T E		T E	T E		T E			T E
communication		11				T E					T E													T			T	T E	T E		T E		T E	T E	T E	T E
	Work as part of a team.	8				T					T E													T			<u> </u>	T			T		_	T E	T E	T E
	Report results verbally, in writing, and graphically.	14			T E	T					T E											T E	1	T		T	T E	T			T		T E	T E	T E	T E
Societal competences	Act in an ethical and social way.	5			T	T E					_								T E			-	<u> </u>	<u> </u>		<u>-</u>	† <u>-</u>	T			T		-	-		_
	Be aware of the business aspects of the engineering discipline.	2			_	T													T E																	
	Be aware of aspects of security and ecology and energy-efficiency																							T												
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		E-6	C 4	E 0	E 10	L 12	-2	- 0 - 1	- 3	- 3	11	-0	-9	- 0	_ 0	_ 0		- E	3 E	- J - E	о Г	у Е		E 18	5 E 3	_ E 3	F 0	L 12	E 10	-7	- 13	- Z E	F	о Е	3- E	-112

EBingwALG1.1 Have a clear understanding of the basic sciences and basic engineering sciences, and have the ability to apply them in a

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Course Next-lear, an evaluationarmen voorafraggan door ** worden niet terrum	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche		
E001142 Basic Mathematics	lecture seminar: coached exercises lecture: plenary exercises	written examination	Being able to 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.
E070080 Chemical Thermodynamics	guided self-study seminar: coached exercises lecture	written examination open book examination	To have a thorough knowledge of the topics matrices, complex numbers, elementary functions and vectors. Application of the laws of thermodynamics on chemical systems. Calculation of the solubility of ionic compounds in aqueous solutions. Calculation of the pH of aqueous solutions. Understand and apply chemical equilibrium.
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design material with the desired properties.
			To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when use in specific situations.
E098512 Sustainability, Entrepreneurship and Ethics	lecture project	participation assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E020061 Physics I	demonstration 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.
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	To master the basic concepts of objectorientation and to realize an objectoriented program in Python. Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative,
E000662 Geometry and Linear Algebra	guided self-study lecture: plenary exercises seminar lecture	open book examination	differentiability, gradient, multiple integral, Jacobian and co-ordinate transform. Having acquired insight in the notions rank, image, kernel, invertability, and determinant of a linear transform. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them. Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto a subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear transform between abstract vector spaces. Having acquired insight in the notions vector space, linear dependence and independence, basis and dimension. Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired insight in the mathematical, physical and geometric meaning of eigenvalues and eigenvectors.
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.
E020220 Physics II	demonstration	written examination	Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients. To be able to solve physics problems by applying these laws and concepts.
E045120 Transport Phenomena	lecture lecture seminar: practical PC room classes seminar	participation open book examination	To understand the physical laws and concepts of the covered chapters. To understand the properties of fluids. To understand the similarities between transport of impulse, heat and mass. To solve problems of stationary heat transport. To know the basic laws of stationary heat transport and to be able to apply them. To understand the law of energy in open and closed systems and to be able to apply it. To master the laws of statics and dynamics and to be able to apply them.

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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.
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.
E005020 Analysis of Systems and Signals	lecture	written examination with multiple	To be familiar with the basic notions of linear elasticity theory. To identify systems and signals; to describe them in continuous time and discrete time.
, , ,	seminar: coached exercises	choice questions	To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.)
			To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications.
			To have gained insight in the various Fourier transforms. To have gained insight in the impulse response, the frequency response and the transfer function as an alternative description of a linear system, as well
			as in their mutual relationships.
			To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises	written examination	Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain
	Schillar. Coached Exercises		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.
E032510 Electronic Systems and Instrumentation for	lecture	written examination	Understand the operation of the basic electronic components
Biomedical Engineers	practicum	skills test	Have insight in the acquisition of biopotentials such as in ECG or EEG systems. To be able to build and experimentally evaluate analog and digital circuits at breadboard level with the required accuracy, perseverance and critical reflection.
			Have the skills to perform numerical simulations on electronic circuits using standard models and methods, in particular PSpice.
E068661 Biomedical Polymers and Processing	demonstration	job performance assessment	Analyze basic analog and digital electronic circuits and think about them in a conceptual, analytical and systemoriented way. ACQUIRED INSIGHTS: insight in structure-property relationships of biomedical polymers; capability to select most appropriate
	practicum	report	synthesis method for biomedical polymers; awareness of advantages and disadvantages of polymerization techniques; correlation between polymer
			structure and
			biodegradation; insight in suitability of specific polymers to serve biomedical applications; capability to select appropriate characterization techniques to acquire info on the basic properties of biomedical polymers; awareness of polymer compatibility with biomedically relevant
			processing techniques; insight in physico-chemical properties required to enable polymer processing into targeted scaffold design.
			Practical knowledge on the synthesis and characterization of biomedically relevant synthetic polymers
			Practical knowledge on the processing of biomedical polymers using 3D printing Practical knowledge on the functionalization and characterization of biomedically relevant biopolymers
E010390 Medical Signal Processing and Statistics	lecture seminar	written examination report	Python programming skills to apply and implement biomedical signal processing and statistics. Be able to identify which signal processing and statistical methods are suitable for the biomedical dataset at hand.
		simulation	Understand how practical numerical statistical and biomedical signal processing techniques work.
E099070 Cross-Course Project	microteaching	oral examination	Skills to search for and evaluate more advanced biomedical signal processing techniques required in Msc courses. Analyse a biomedical engineering problem.
	project	report	Develop a strategy for solving the problem under supervision. Apply theoretical knowledge and skills acquired in other courses on a practical biomedical problem.
E021520 Statistical Physics and Molecular Structure	lecture	written examination	Understand the need for a quantum mechanical description of phenomena at the atomic and molecular scale.
	seminar: coached exercises		Solve the Schrödinger equation for basic potential problems (1D or central). Understand the basic concepts of quantum mechanics (e.g. wave-particle duality, Schrödinger equation, orbital momentum,
			spherical harmonics). Understand the relation between the macroscopic and microscopic description of matter.
			Understand the importance of symmetry for spectroscopy.
			Master the quantum mechanical description of the hydrogen atom. Understand the various statistical distribution functions and apply them to systems with many degrees of freedom.
			Master and apply the basic concepts of statistical physics. Derive statistical quantities such as partition functions for simple and complex systems and apply them to determine macroscopically observable quantities.
FOOCOO Madallian of Physical sized Contains	lecture		Analysis, schematizing and mathematical modelling of physiological processes.
E092621 Modelling of Physiological Systems			
E092621 Modelling of Physiological Systems	seminar: practical PC room classes practicum		Use and development of code (Python) for the analysis and processing of physiological data and the implementation of mathematical models. Acquire basic knowledge of the anatomy and physiology of organ systems and the organism and insight into physiological
	seminar: practical PC room classes practicum	written examination	mathematical models. Acquire basic knowledge of the anatomy and physiology of organ systems and the organism and insight into physiological processes.
E070310 Organic Chemistry	seminar: practical PC room classes practicum lecture seminar: coached exercises	written examination report	mathematical models. Acquire basic knowledge of the anatomy and physiology of organ systems and the organism and insight into physiological processes. Ability to define and describe in detail reaction mechanisms, knowing relation between chemical structure and reactivity, knowing properties of most
	seminar: practical PC room classes practicum		mathematical models. Acquire basic knowledge of the anatomy and physiology of organ systems and the organism and insight into physiological processes. Ability to define and describe in detail reaction mechanisms, knowing relation between chemical structure and reactivity, knowing properties of most important organic molecules, describe stereochemistry of organic molecules, describe separation methods of molecules. Showing ability to make use of theory in creative way when designing chemical reactions; ability to use laboratory equipment; solving capability.
	seminar: practical PC room classes practicum lecture seminar: coached exercises	report job performance assessment	mathematical models. Acquire basic knowledge of the anatomy and physiology of organ systems and the organism and insight into physiological processes. Ability to define and describe in detail reaction mechanisms, knowing relation between chemical structure and reactivity, knowing properties of most important organic molecules, describe stereochemistry of organic molecules, describe separation methods of molecules. Showing ability to make use of theory in creative way when designing chemical reactions; ability to use laboratory equipment; solving capability. Having insight in 3D-structure of organic molecules, being able to make relations between chemical structures and properties of organic molecules; being
	seminar: practical PC room classes practicum lecture seminar: coached exercises	report job performance assessment	mathematical models. Acquire basic knowledge of the anatomy and physiology of organ systems and the organism and insight into physiological processes. Ability to define and describe in detail reaction mechanisms, knowing relation between chemical structure and reactivity, knowing properties of most important organic molecules, describe stereochemistry of organic molecules, describe separation methods of molecules. Showing ability to make use of theory in creative way when designing chemical reactions; ability to use laboratory equipment; solving capability. Having insight in 3D-structure of organic molecules, being able to make relations between chemical structures and properties of

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E074011 Quantitative Cell and Tissue Analysis

demonstration
online lecture
practicum
online discussion group
microteaching
lecture

written examination report participation

Understand the working principles of techniques to culture cells and tissues

Understand the relation between cell composition and cell function as inferred from the above mentioned technique

Understand various quantitative techniques for the quantitative analysis of cell morphology, cell properties, structure and
function and be able to apply
quantitative analysis

Understanding of histology and histological techniques and being able to interpret histological coupes

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche		
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 initivalue 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.
E032510 Electronic Systems and Instrumentation for Biomedical Engineers	practicum	skills test	Have the skills to perform numerical simulations on electronic circuits using standard models and methods, in particular PSpice To be able to build and experimentally evaluate analog and digital circuits at breadboard level with the required accuracy, perseverance and critical reflection.
E068661 Biomedical Polymers and Processing	demonstration practicum	job performance assessment report	Practical knowledge on the processing of biomedical polymers using 3D printing
E010390 Medical Signal Processing and Statistics	lecture seminar	written examination report simulation	Understand how practical numerical statistical and biomedical signal processing techniques work. Be able to identify which signal processing and statistical methods are suitable for the biomedical dataset at hand.
E099070 Cross-Course Project	project	oral examination report	Apply theoretical knowledge and skills acquired in other courses on a practical biomedical problem. Develop a strategy for solving the problem under supervision.
E099171 Engineering Project	group work project	assignment report	Systematic and targeted processing of scientific measurement data and presentation of these data
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

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Understanding of histology and histological techniques and being able to interpret histological coupes

EBingwBIOM1.1 Knowledge and understanding of the basic concepts and principles from anatomy, (cell) biology, molecular biology, Competences in one/more scientific discipline(s) << chemistry, physiology, biomechanics, medical and health sciences. Course Teaching methods **Evaluation methods** Course learning outcome Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche E092662 From Genome to Organism Basic knowledge of the structure and physiology of the cell; molecular biology; protein structure. lecture written examination Basic knowledge of the structure of DNA; de genetic code; DNA replication; gene expression; and protein synthesis. Basic knowledge of fertilization and embryogenesis of the human body. Basic knowledge of the anatomy and physiology of the skin, bone, muscle, immune system, nervous system, cardiovascular, respiratory and digestive system of the human body. Basic knowledge of the biomechanics of soft tissues, biofluid dynamics, human movement analysis and biomechanics of running E063682 Biomechanics guided self-study written examination online lecture Insight in human biomechanics for both normal and pathological conditions report seminar open book examination practicum lecture E092621 Modelling of Physiological Systems written examination with open Acquire basic knowledge of the anatomy and physiology of organ systems and the organism and insight into physiological lecture seminar: practical PC room classes questions processes. practicum written examination with multiple choice questions E099171 Engineering Project To be able to independently look up scientific biomedical oriented information in scientific sources guided self-study oral examination peer assessment Systematic and targeted processing of scientific measurement data and presentation of these data project Dissect a scientific article group work assignment E074011 Quantitative Cell and Tissue Analysis demonstration written examination Understand the working principles of techniques to culture cells and tissues Understand the relation between cell composition and cell function as inferred from the above mentioned technique online lecture report Understand various quantitative techniques for the quantitative analysis of cell morphology, cell properties, structure and practicum participation function and be able to apply online discussion group

quantitative analysis

microteaching

lecture

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EBingwBIOM1.2 Knowledge and understanding of the physical principles (electromagnetism, ionizing and non-ionizing radiation) that form the Competences in one/more scientific discipline(s) basis of medical imaging and therapy.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** v	werden niet teruggevonden in de studiefiche		
E020220 Physics II	guided self-study lecture: plenary exercises self-reliant study activities seminar practicum lecture demonstration	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.
E092735 Medical Physics	lecture practicum	written examination with open questions report	Understand physical concepts used in medicine for imaging and therapy To be able to apply the principles of radiation dosimetry Understand how ionizing and non-ionizing radiation interacts with matter
E022110 Electromagnetism I	lecture seminar: coached exercises project	written examination with open questions report written examination	To be able to describe, understand and discuss wave propagation in free space and in waveguides. To understand and to be able to obtain Green's functions for general free space current sources and for 2D problems. To understand, calculate and determine voltage and current behaviour on transmission lines. To be able to program a numerical technique as applied to a "simple" wave problem.

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EBingwBIOM1.3 Knowledge and understanding of the standard methods for quantitative measuring structure and function of biological systems at molecular, organ and system level.

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Competences in one/more scientific discipline(s)

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet te	ruggevonden in de studiefiche		
E092621 Modelling of Physiological Systems	seminar: practical PC room classes	written examination with open questions	Analysis, schematizing and mathematical modelling of physiological processes. Use and development of code (Python) for the analysis and processing of physiological data and the implementation of mathematical models.
E074011 Quantitative Cell and Tissue Analysis	demonstration online lecture practicum online discussion group microteaching lecture	written examination report participation	Understand the working principles of techniques to culture cells and tissues Understand the relation between cell composition and cell function as inferred from the above mentioned technique Understand various quantitative techniques for the quantitative analysis of cell morphology, cell properties, structure and function and be able to apply quantitative analysis Understanding of histology and histological techniques and being able to interpret histological coupes

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EBingwBIOM1.4 Knowledge and understanding of the composition and physicochemical properties of materials, in particular polymers for

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Competences in one/more scientific discipline(s)

biomedical applications.			
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet t	teruggevonden in de studiefiche		
E040420 Mechanics of Materials	lecture	written examination	To be familiar with the applications of linear elasticity theory.
	seminar: coached exercises	open book examination	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.
FOCOCCA Diamedical Dahimara and Drassacina	lo etcure	weitten eveninetien with enen	To be familiar with the basic notions of linear elasticity theory.
E068661 Biomedical Polymers and Processing	lecture	written examination with open	ACQUIRED INSIGHTS: insight in structure-property relationships of biomedical polymers; capability to select most appropriate
		questions	synthesis method for
			biomedical polymers; awareness of advantages and disadvantages of polymerization techniques; correlation between polymer structure and
			biodegradation; insight in suitability of specific polymers to serve biomedical applications; capability to select appropriate characterization techniques to
			acquire info on the basic properties of biomedical polymers; awareness of polymer compatibility with biomedically relevant processing techniques; insight in
			physico-chemical properties required to enable polymer processing into targeted scaffold design.
			KNOWLEDGE OF: basic knowledge of biomedical polymers; synthetic and natural polymers; biomedical polymer synthesis an functionalization; polymer
			properties, molecular weight, polydispersity; mechanical properties; visco-elastic properties; thermal properties; biocompatible polymerization techniques;
			biomedical polymer characterization techniques; polymer processing

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EBingwBIOM1.5 Have insight into the basic principles of structural and fluid mechanics and transport physics and apply this to biomechanical Competences in one/more scientific discipline(s) << and physiological processes and problems. Course Teaching methods **Evaluation methods** Course learning outcome Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche E045120 Transport Phenomena open book examination To understand the properties of fluids. To understand the similarities between transport of impulse, heat and mass. seminar: practical PC room classes To solve problems of stationary heat transport. seminar 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. E040420 Mechanics of Materials To be familiar with the applications of linear elasticity theory. written examination lecture open book examination Applications of the problem solving methods in elasticity theory. seminar: coached exercises

written examination

report

seminar: practical PC room classes open book examination

E063682 Biomechanics

guided self-study

online seminar

seminar practicum lecture demonstration To identify linear and non-linear behaviour.

To be familiar with the basic notions of linear elasticity theory.

Insight in human biomechanics for both normal and pathological conditions

Basic knowledge of the biomechanics of soft tissues, biofluid dynamics, human movement analysis and biomechanics of running

Practical knowledge on computational biomechanics (more specifically to run simple cases using computational fluid dynamics)

Collecting, processing and analyzing scientific measurement data and computational study results

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EBingwBIOM1.6 Analyse, design (based on well-defined technical specifications) and develop simple electrical circuits for measuring physiological signals.

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Competences in one/more scientific discipline(s)

pnysiological signals.			
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	uggevonden in de studiefiche		
E090320 Electrical Circuits and Networks	lecture	written examination	Draw amplitude and phase Bode diagrams for transfer functions and determine the poles and zeros.
	online seminar	skills test	Analyze basic electrical circuits containing diodes, bipolar transistors and MOSFETs.
	seminar: coached exercises		Determine the balance of active and reactive electrical power in a three-phase electrical network.
			Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients.
E032510 Electronic Systems and Instrumentation for	lecture	written examination	Understand the operation of the basic electronic components
Biomedical Engineers	practicum	skills test	Have insight in the acquisition of biopotentials such as in ECG or EEG systems.
٠	·		To be able to build and experimentally evaluate analog and digital circuits at breadboard level with the required accuracy,
			perseverance and critical
			reflection.
			Have the skills to perform numerical simulations on electronic circuits using standard models and methods, in particular PSpice.
			Analyze basic analog and digital electronic circuits and think about them in a conceptual, analytical and systemoriented way.

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< EBingwBIOM1.7 Apply mathen	natical models and numerical tech	niques for solving biome	dical engineering problems.	Competences in one/more scientific discipline(s
Course	Teaching methods	Evaluation methods	Course learning outcome	
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet	teruggevonden in de studiefiche			
E063682 Biomechanics	demonstration online seminar: practical PC room classes online seminar seminar: practical PC room classes seminar practicum	written examination report open book examination		namics, human movement analysis and biomechanics of running cifically to run simple cases using computational fluid dynamics) at and computational study results
E032510 Electronic Systems and Instrumentation for Biomedical Engineers	r practicum	skills test	Have the skills to perform numerical simulations on electronic ci	ircuits using standard models and methods, in particular PSpice.
E092735 Medical Physics	lecture seminar: coached exercises	written examination with open questions	To be able to apply the principles of radiation dosimetry	
E010390 Medical Signal Processing and Statistics	lecture seminar	written examination report simulation	Python programming skills to apply and implement biomedical single able to identify which signal processing and statistical method Understand how practical numerical statistical and biomedical signals.	ods are suitable for the biomedical dataset at hand.
E021520 Statistical Physics and Molecular Structure	lecture seminar: coached exercises	written examination	Understand the need for a quantum mechanical description of p Solve the Schrödinger equation for basic potential problems (1E Understand the basic concepts of quantum mechanics (e.g. was spherical harmonics). Understand the relation between the macroscopic and microscounderstand the importance of symmetry for spectroscopy. Master the quantum mechanical description of the hydrogen ato Understand the various statistical distribution functions and app Master and apply the basic concepts of statistical physics. Derive statistical quantities such as partition functions for simple macroscopically observable quantities.	O or central). ve-particle duality, Schrödinger equation, orbital momentum, ppic description of matter. om. lly them to systems with many degrees of freedom. e and complex systems and apply them to determine
E092621 Modelling of Physiological Systems	lecture seminar: practical PC room classes	written examination with open questions	Analysis, schematizing and mathematical modelling of physiologuse and development of code (Python) for the analysis and promathematical models.	
E002910 Introduction to Numerical Mathematics	lecture seminar: practical PC room classes	written examination	A critical usage of algorithms in practical applications using soft Understanding and mastering of standard numerical methods for initial problems for ODEs, boundary value problems and eigenvalue problems in 1D).	
E022110 Electromagnetism I	project	report	To be able to program a numerical technique as applied to a "si	imple" wave problem.

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Course		Teaching methods	Evaluation methods	Course learning outcome
	evaluatievormen voorafgegaan door ** werden niet terug		Evaluation motification	
E066012 M	aterials 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 St	ustainability, Entrepreneurship and Ethics	project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E098513 M	odelling, Making and Measuring	project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language.
E015041 In	formatics	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 M	odelling and Control of Dynamic Systems	lecture seminar: coached exercises	open book 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 evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback
E010390 M	edical Signal Processing and Statistics	seminar		control systems. Skills to search for and evaluate more advanced biomedical signal processing techniques required in Msc courses.
E099070 C	ross-Course Project	microteaching project	report	Analyse a biomedical engineering problem. Develop a strategy for solving the problem under supervision.
E021520 St	tatistical Physics and Molecular Structure	lecture seminar: coached exercises	written examination	Understand the need for a quantum mechanical description of phenomena at the atomic and molecular scale. Solve the Schrödinger equation for basic potential problems (1D or central). Understand the basic concepts of quantum mechanics (e.g. wave-particle duality, Schrödinger equation, orbital momentum, spherical harmonics). Understand the relation between the macroscopic and microscopic description of matter. Understand the importance of symmetry for spectroscopy. Master the quantum mechanical description of the hydrogen atom. Understand the various statistical distribution functions and apply them to systems with many degrees of freedom. Master and apply the basic concepts of statistical physics. Derive statistical quantities such as partition functions for simple and complex systems and apply them to determine macroscopically observable quantities.
E099171 Er	ngineering Project	group work project	assignment report	To be able to independently look up scientific biomedical oriented information in scientific sources Systematic and targeted processing of scientific measurement data and presentation of these data Dissect a scientific article
E074011 Q	uantitative Cell and Tissue Analysis	demonstration online lecture practicum online discussion group microteaching	written examination report participation	Understand the working principles of techniques to culture cells and tissues Understand the relation between cell composition and cell function as inferred from the above mentioned technique Understand various quantitative techniques for the quantitative analysis of cell morphology, cell properties, structure and function and be able to apply quantitative analysis

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EBingwALG2.2 Employ standard mod	els, methods and techniques in assignments.
EBingwALG2.2 Employ standard mod	els, methods and techniques in assignments.

Scientific co	ompetences
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Course	models, methods and techniqu Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	_	Lvaluation methods	
E001142 Basic Mathematics	lecture: plenary exercises	written examination	Being able to perform basic calculations quickly and efficiently by hand.
	seminar: coached exercises		To have a thorough knowledge of the topics matrices, complex numbers, elementary functions and vectors.
E003043 Probability and Statistics	guided self-study seminar: coached exercises lecture	written examination with multiple choice questions open book examination	To reason and to work with multi-dimensional random variables To identify an appropriate probabilistic model for the analysis of an event or experiment
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design material with the desired properties.
			To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when us 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 initivalue 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.
E015041 Informatics	lo et une	ittaa ayaminatian	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 paradign To design an algorithm solving a given problem, and to assess the complexity of this solution. To master the basic concepts of objectorientation and to realize an objectoriented program in Python.
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative,
E000662 Geometry and Linear Algebra	seminar	written examination open book examination	differentiability, gradient, multiple integral, Jacobian and co-ordinate transform. Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transform on them. Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto a subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear
E090320 Electrical Circuits and Networks	seminar: coached exercises	written examination	transform between abstract vector spaces. Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients.
E001321 Mathematical Analysis III	lecture seminar: coached exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations.
	lecture: plenary exercises		To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.
E040420 Mechanics of Materials	seminar: coached exercises	open book examination	To be familiar with the applications of linear elasticity theory.
E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	Applications of the problem solving methods in elasticity theory. 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.
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises practicum	report	To describe linear systems by means of the state model. (exclusively for the 6 credit points course.) Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) i order to obtain mathematical models of physical dynamic systems. To implement modeling and control on small scale setups by using personal laptop
E063682 Biomechanics	lecture online seminar: practical PC room classes online seminar seminar: practical PC room classes seminar practicum	written examination report open book examination	Basic knowledge of the biomechanics of soft tissues, biofluid dynamics, human movement analysis and biomechanics of runn Practical knowledge on computational biomechanics (more specifically to run simple cases using computational fluid dynamics Collecting, processing and analyzing scientific measurement data and computational study results Insight in human biomechanics for both normal and pathological conditions

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E032510 Electronic Systems and Instrumentation for Biomedical Engineers	lecture practicum	written examination skills test	Analyze basic analog and digital electronic circuits and think about them in a conceptual, analytical and systemoriented way. To be able to build and experimentally evaluate analog and digital circuits at breadboard level with the required accuracy, perseverance and critical reflection. Have the skills to perform numerical simulations on electronic circuits using standard models and methods, in particular PSpice.
E010390 Medical Signal Processing and Statistics	seminar		Python programming skills to apply and implement biomedical signal processing and statistics.
E099070 Cross-Course Project	project	report	Analyse a biomedical engineering problem. Develop a strategy for solving the problem under supervision.
E021520 Statistical Physics and Molecular Structure	lecture seminar: coached exercises	written examination	Understand the need for a quantum mechanical description of phenomena at the atomic and molecular scale. Solve the Schrödinger equation for basic potential problems (1D or central). Understand the basic concepts of quantum mechanics (e.g. wave-particle duality, Schrödinger equation, orbital momentum, spherical harmonics). Understand the relation between the macroscopic and microscopic description of matter. Understand the importance of symmetry for spectroscopy. Master the quantum mechanical description of the hydrogen atom. Understand the various statistical distribution functions and apply them to systems with many degrees of freedom. Master and apply the basic concepts of statistical physics. Derive statistical quantities such as partition functions for simple and complex systems and apply them to determine macroscopically observable quantities.
E092621 Modelling of Physiological Systems	seminar: practical PC room classes	written examination with open questions	Analysis, schematizing and mathematical modelling of physiological processes. Use and development of code (Python) for the analysis and processing of physiological data and the implementation of mathematical models.
E099171 Engineering Project	group work project	assignment report	Systematic and targeted processing of scientific measurement data and presentation of these data
E070310 Organic Chemistry	lecture seminar: coached exercises practicum	written examination report job performance assessment participation	Ability to define and describe in detail reaction mechanisms, knowing relation between chemical structure and reactivity, knowing properties of most important organic molecules, describe stereochemistry of organic molecules, describe separation methods of molecules. Showing ability to make use of theory in creative way when designing chemical reactions; ability to use laboratory equipment; solving capability. Having insight in 3D-structure of organic molecules, being able to make relations between chemical structures and properties of organic molecules; being able to develop multi-step reaction sequences.
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
E022110 Electromagnetism I	project	report	To be able to program a numerical technique as applied to a "simple" wave problem.

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	gevonden 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	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-
	lecture: plenary exercises seminar		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	written examination open book examination	Distinguishing and applying fundamental algebraic and discrete structures. Being fluent in graph algorithms and applying them to real problem situations.
	practicum	open book examination	Deploying deductively correct reasonings in an independent way.
	lecture		Evaluating logical reasonings with respect to correctness / identifying errors. Deploying mathematical reasoning and proof argumentation.
E001222 Mathematical Analysis II	guided self study	written examination	Using basic concepts from set theory, group theory, combinatorics and graph theory. Being able to perform the chain rules for differentiable functions.
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises	open book examination	Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions.
	lecture: plenary exercises lecture		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.
	lecture		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	written examination	Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in
	lecture: plenary exercises seminar	open book examination	threedimensional space, or of a linear transform between abstract vector spaces.
	Comma		Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms
E090320 Electrical Circuits and Networks	lecture	written examination	on them. Draw amplitude and phase Bode diagrams for transfer functions and determine the poles and zeros.
200020 Elouitoui olitouto dila Networko	seminar: coached exercises	Witten Gathination	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	written examination	To be able to solve physics problems by applying these laws and concepts.
E001321 Mathematical Analysis III	lecture lecture seminar: coached exercises	participation written examination	To understand the physical laws and concepts of the covered chapters. To master the basic theory of curves. To apply the residue theorem in a variety of situations.
	lecture: plenary exercises		To calculate complex line integrals both directly and by means of theoretical results.
			To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results.
			To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes.
			To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal
			vector fields.
E076040 Sustainable Business Operations	lecture	written examination with open	To have acquired skills in calculations with the nabla operator. Understand the technique of financial balance sheet reading and be able to apply it practically in simple accounting exercises
2070040 Gustamable Business Operations	lecture	questions written examination with multiple choice questions	
E005020 Analysis of Systems and Signals	lecture	written examination with multiple	To identify systems and signals; to describe them in continuous time and discrete time.
	seminar: coached exercises	choice questions	To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.)
			To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for
			the 6 credit points course.) To have understood the sampling theorem and its applications.
			To have gained insight in the various Fourier transforms. To have gained insight in the impulse response, the frequency response and the transfer function as an alternative description
			of a linear system, as well
			as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals.
			To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises		Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain
			mathematical models of physical dynamic systems.
E063682 Biomechanics	lecture	written examination	To derive transfer-function models and state-space models of physical systems and comprehend linear and nonlinear behavior. Basic knowledge of the biomechanics of soft tissues, biofluid dynamics, human movement analysis and biomechanics of running
	online seminar: practical PC room	report	Practical knowledge on computational biomechanics (more specifically to run simple cases using computational fluid dynamics)
	classes online seminar	open book examination	Collecting, processing and analyzing scientific measurement data and computational study results Insight in human biomechanics for both normal and pathological conditions
	online lecture seminar: practical PC room classes		
	seminar		
E092735 Medical Physics	practicum lecture	written examination with open	To be able to apply the principles of radiation dosimetry
•		questions	
E099070 Cross-Course Project	project	report	Analyse a biomedical engineering problem. Develop a strategy for solving the problem under supervision. Apply theoretical knowledge and skills acquired in other courses on a practical biomedical problem.
E021520 Statistical Physics and Molecular Structure	lecture seminar: coached exercises	written examination	Understand the need for a quantum mechanical description of phenomena at the atomic and molecular scale. Solve the Schrödinger equation for basic potential problems (1D or central).
	seminar. Coacheu exelcises		Understand the basic concepts of quantum mechanics (e.g. wave-particle duality, Schrödinger equation, orbital momentum,
			spherical harmonics).
			Understand the relation between the macroscopic and microscopic description of matter. Understand the importance of symmetry for spectroscopy.
			Master the quantum mechanical description of the hydrogen atom. Understand the various statistical distribution functions and apply them to systems with many degrees of freedom.
			Master and apply the basic concepts of statistical physics.
			Derive statistical quantities such as partition functions for simple and complex systems and apply them to determine

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E092621 Modelling of Physiological Systems	lecture seminar: practical PC room classes	written examination with open questions	Analysis, schematizing and mathematical modelling of physiological processes. Use and development of code (Python) for the analysis and processing of physiological data and the implementation of mathematical models.
E022110 Electromagnetism I		written examination with open questions written examination	To be able to describe, understand and discuss wave propagation in free space and in waveguides. To understand and to be able to obtain Green's functions for general free space current sources and for 2D problems. To understand, calculate and determine voltage and current behaviour on transmission lines.

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EBingwALG2.4 Justify decision-making processes on rational grounds. <<

		Teaching methods	Evaluation methods	Course learning outcome
Course Noot: leer- en eva	aluatievormen voorafgegaan door ** werden niet terug	_		
7070000 Cha	amical Thormadynamica	guidad aalf atudu	written exemination	Application of the laws of thermodynamics on shemical systems
1070080 Che	emical Thermodynamics	guided self-study seminar: coached exercises	written examination open book examination	Application of the laws of thermodynamics on chemical systems. Calculation of the solubility of ionic compounds in aqueous solutions.
		lecture	open book examination	Calculation of the pH of aqueous solutions.
		locturo		Understand and apply chemical equilibrium.
003043 Prot	bability and Statistics	lecture		To calculate probabilities of events and expectations of random variables
066012 Mate	erials Technology	guided self-study	written examination	To name materials properties and to be able to distinguish between the different groups of materials
	ionale 1961mology	seminar: practical PC room classes	milen examination	To be able to select, by using a material selection software program, the most appropriate material for a specific engineering
		seminar: coached exercises		problem taking into account
		lecture		various material properties
				To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design material with the desired
				properties.
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				To be able to correlate the structure and properties of materials
				To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when use
000E10 Cue	tainability Entrapropagrahin and Ethica	project	agaignment	in specific situations.
:098512 Sust	stainability, 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.
070070 Che	emistry: the Structure of Matter	guided self-study	written examination	Being able to perform stoichiometric calculations.
	,	seminar: coached exercises	open book examination	Identify and describe the different types of intermolecular interactions.
		lecture: plenary exercises	•	Being able to determine the molecular geometry of covalent compounds.
		lecture		Identify and describe the different types of chemical bonding.
				Being able to order atoms and ions based on their periodic properties Being able to write the electron configuration of atoms and ions.
098513 Mod	delling, Making and Measuring	project	report	Writing reports
.000010 10100	delining, Marking and Measuring	project	report	Oral presentation
001222 Matl	hematical Analysis II	guided self-study	written examination	Being able to perform the chain rules for differentiable functions.
	•	seminar: coached exercises	open book examination	Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions.
		lecture: plenary exercises		Being able to compute integrals in two and three dimensions by subsequent integration.
		lecture		Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative,
				partial derivative,
				differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
001321 Math	hematical Analysis III	lecture	written examination	To master the basic theory of curves.
		seminar: coached exercises lecture: plenary exercises		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 Mod	delling and Control of Dynamic Systems	lecture	written examination	To have insight regarding the static and dynamic behaviour of systems and to apply this insight when designing feedback loops
		seminar: coached exercises practicum	report	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
		practicum		control systems.
	an Course Brainet	project	oral examination	Apply theoretical knowledge and skills acquired in other courses on a practical biomedical problem.
	SS-Course Project			
E099070 Cros	ss-Course Project	p. 6,660	report	Show creativity, self-motivation and team spirit when carrying out a project.
E099070 Cros	ss-Course Project	p j c.	report	Collaborate in group.
E099070 Cros	ss-Course Project	p. 0,000	report	Collaborate in group. Report and present project progress, results and solutions orally and in writing.
				Collaborate in group. Report and present project progress, results and solutions orally and in writing. Develop a strategy for solving the problem under supervision.
	nineering Project	group work project	assignment report	Collaborate in group. Report and present project progress, results and solutions orally and in writing.
1099171 Engi		group work	assignment report	Collaborate in group. Report and present project progress, results and solutions orally and in writing. Develop a strategy for solving the problem under supervision.
E099171 Engi	ineering Project	group work project	assignment report	Collaborate in group. Report and present project progress, results and solutions orally and in writing. Develop a strategy for solving the problem under supervision. Reporting orally and in writing Describe trends in data and find correlations using regression analysis
E099171 Engi	ineering Project	group work project	assignment report written examination	Collaborate in group. Report and present project progress, results and solutions orally and in writing. Develop a strategy for solving the problem under supervision. Reporting orally and in writing Describe trends in data and find correlations using regression analysis Elaborate and interpret a statistical analysis of data, using statistical software
E099171 Engi	ineering Project	group work project	assignment report written examination	Collaborate in group. Report and present project progress, results and solutions orally and in writing. Develop a strategy for solving the problem under supervision. Reporting orally and in writing Describe trends in data and find correlations using regression analysis Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters
E099171 Engi	ineering Project	group work project	assignment report written examination	Collaborate in group. Report and present project progress, results and solutions orally and in writing. Develop a strategy for solving the problem under supervision. Reporting orally and in writing 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
- 	ineering Project	group work project	assignment report written examination	Collaborate in group. Report and present project progress, results and solutions orally and in writing. Develop a strategy for solving the problem under supervision. Reporting orally and in writing 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
E099171 Engi E003230 Stati	ineering Project	group work project	assignment report written examination	Collaborate in group. Report and present project progress, results and solutions orally and in writing. Develop a strategy for solving the problem under supervision. Reporting orally and in writing 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 Understand the working principles of techniques to culture cells and tissues
E099171 Engi E003230 Stati	ineering Project tistical Data Processing	group work project seminar: practical PC room classes demonstration online lecture	assignment report written examination report written examination report	Collaborate in group. Report and present project progress, results and solutions orally and in writing. Develop a strategy for solving the problem under supervision. Reporting orally and in writing 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 Understand the working principles of techniques to culture cells and tissues Understand the relation between cell composition and cell function as inferred from the above mentioned technique
E099171 Engi E003230 Stati	ineering Project tistical Data Processing	group work project seminar: practical PC room classes demonstration online lecture practicum	assignment report written examination report	Collaborate in group. Report and present project progress, results and solutions orally and in writing. Develop a strategy for solving the problem under supervision. Reporting orally and in writing 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 Understand the working principles of techniques to culture cells and tissues Understand the relation between cell composition and cell function as inferred from the above mentioned technique Understand various quantitative techniques for the quantitative analysis of cell morphology, cell properties, structure and
E099171 Engi E003230 Stati	ineering Project tistical Data Processing	group work project seminar: practical PC room classes demonstration online lecture	assignment report written examination report written examination report	Collaborate in group. Report and present project progress, results and solutions orally and in writing. Develop a strategy for solving the problem under supervision. Reporting orally and in writing 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 Understand the working principles of techniques to culture cells and tissues Understand the relation between cell composition and cell function as inferred from the above mentioned technique

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	_	Lvaluation methods	Course learning outcome
E001142 Basic Mathematics	seminar: coached exercises	written examination	To have a thorough knowledge of the topics matrices, complex numbers, elementary functions and vectors. Being able to formulate correctly and with mathematical precision. Being able to make a correct reasoning and to write it down in a structured way.
E003043 Probability and Statistics	guided self-study seminar: coached exercises lecture	written examination with multiple choice questions open book examination	To reason and to work with multi-dimensional random variables To perform a linear regression and to interpret its results To understand and to apply methods for hypothesis testing To understand and to apply methods for (parameter) estimation To interpret and to judge the results of statistical sampling, and to represent them in an appropriate form To identify an appropriate probabilistic model for the analysis of an event or experiment
E066012 Materials Technology	guided self-study	written examination	To calculate probabilities of events and expectations of random variables To name materials properties and to be able to distinguish between the different groups of materials
E000012 Materials recritiology	seminar: practical PC room classes seminar: coached exercises lecture	Willen 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 To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design material with the desired properties.
			To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when use in specific situations.
E001132 Mathematical Analysis I	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.
E015041 Informatics	guided self-study seminar: practical PC room classes	written examination open book examination	Being able to use power series for solving ordinary differential equations. To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm To design an algorithm solving a given problem, and to assess the complexity of this solution.
E001222 Mathematical Analysis II	lecture guided self-study seminar: coached exercises	written examination open book examination	To master the basic concepts of objectorientation and to realize an objectoriented program in Python. Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions.
	lecture: plenary exercises lecture		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, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, geometric and physical interpretation of the notions limit, continuity, derivative, geometric and physical interpretation of the notions limit.
E000662 Geometry and Linear Algebra	guided self-study	written examination open book examination	differentiability, gradient, multiple integral, Jacobian and co-ordinate transform. Having acquired skills in the manipulation of vectors.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations.
			To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.
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
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.
E021520 Statistical Physics and Molecular Structure	lecture seminar: coached exercises	written examination	Understand the need for a quantum mechanical description of phenomena at the atomic and molecular scale. Solve the Schrödinger equation for basic potential problems (1D or central). Understand the basic concepts of quantum mechanics (e.g. wave-particle duality, Schrödinger equation, orbital momentum, spherical harmonics). Understand the relation between the macroscopic and microscopic description of matter. Understand the importance of symmetry for spectroscopy. Master the quantum mechanical description of the hydrogen atom. Understand the various statistical distribution functions and apply them to systems with many degrees of freedom. Master and apply the basic concepts of statistical physics. Derive statistical quantities such as partition functions for simple and complex systems and apply them to determine
E099171 Engineering Project	group work	assignment	macroscopically observable quantities. Systematic and targeted processing of scientific measurement data and presentation of these data

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assignment report

Systematic and targeted processing of scientific measurement data and presentation of these data Reporting orally and in writing

E099171 Engineering Project

group work project E070310 Organic Chemistry

lecture

seminar: coached exercises

written examination

Ability to define and describe in detail reaction mechanisms, knowing relation between chemical structure and reactivity, knowing properties of most

important organic molecules, describe stereochemistry of organic molecules, describe separation methods of molecules. Showing ability to make use of theory in creative way when designing chemical reactions; ability to use laboratory equipment; solving capability.

Having insight in 3D-structure of organic molecules, being able to make relations between chemical structures and properties of organic molecules; being able to develop multi-step reaction sequences.

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Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	Teaching methods ggevonden in de studiefiche	Evaluation methods	Course learning outcome
E001142 Basic Mathematics	lecture seminar: coached exercises lecture: plenary exercises	written examination	Being able to make a correct reasoning and to write it down in a structured way.
E003043 Probability and Statistics	guided self-study seminar: coached exercises lecture	written examination with multiple choice questions open book examination	To reason and to work with multi-dimensional random variables To identify an appropriate probabilistic model for the analysis of an event or experiment To calculate probabilities of events and expectations of random variables
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design material with the desired properties.
			To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when us in specific situations.
E098512 Sustainability, Entrepreneurship and Ethics	project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E020061 Physics I	demonstration		To understand the physical laws and concepts of the covered chapters.
E001132 Mathematical Analysis I	lecture guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	To be able to solve problems by applying these laws and concepts. Being able to assess the convergence of numerical series and series of functions. To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral, improper integral and integrability. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding 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.
E098513 Modelling, Making and Measuring	project	report	Using basic concepts from set theory, group theory, combinatorics and graph theory. Concepts: working collaboration in a group, scientific techniques, use of scientific language.
E015041 Informatics	lecture	written examination	Use of software tools to make simulations and diagrams To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm
E001222 Mathematical Analysis II	seminar: practical PC room classes guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	To master the basic concepts of objectorientation and to realize an objectoriented program in Python. Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	Having acquired insight in the notions rank, image, kernel, invertability, and determinant of a linear transform. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them.
			Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto a subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear transform between abstract vector spaces. Having acquired insight in the notions vector space, linear dependence and independence, basis and dimension. Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired insight in the mathematical, physical and geometric meaning of eigenvalues and eigenvectors.
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.
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.
E040420 Mechanics of Materials	seminar: coached exercises	open book examination	To be familiar with the applications of linear elasticity theory.

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E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points
			course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications.
			To have gained insight in the various Fourier transforms. To have gained insight in the impulse response, the frequency response and the transfer function as an alternative description
			of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals.
E007120 Modelling and Control of Dynamic Systems	lecture		To describe linear systems by means of the state model. (exclusively for the 6 credit points course.) Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in
E007120 Modelling and Control of Dynamic Systems	seminar: coached exercises		order to obtain mathematical models of physical dynamic systems.
E063682 Biomechanics	guided self-study online seminar: practical PC room classes online seminar online lecture seminar: practical PC room classes seminar	written examination report open book examination	Basic knowledge of the biomechanics of soft tissues, biofluid dynamics, human movement analysis and biomechanics of running Practical knowledge on computational biomechanics (more specifically to run simple cases using computational fluid dynamics) Collecting, processing and analyzing scientific measurement data and computational study results
	practicum lecture		
E032510 Electronic Systems and Instrumentation for Biomedical Engineers	lecture practicum	written examination skills test	Understand the operation of the basic electronic components Have insight in the acquisition of biopotentials such as in ECG or EEG systems. To be able to build and experimentally evaluate analog and digital circuits at breadboard level with the required accuracy, perseverance and critical reflection. Have the skills to perform numerical simulations on electronic circuits using standard models and methods, in particular PSpice.
F040000 M. I'. 10'. 1D			Analyze basic analog and digital electronic circuits and think about them in a conceptual, analytical and systemoriented way.
E010390 Medical Signal Processing and Statistics	seminar	written examination	Be able to identify which signal processing and statistical methods are suitable for the biomedical dataset at hand.
E099070 Cross-Course Project	project	oral examination report	Apply theoretical knowledge and skills acquired in other courses on a practical biomedical problem. Collaborate in group. Develop a strategy for solving the problem under supervision.
E021520 Statistical Physics and Molecular Structure	lecture seminar: coached exercises	written examination	Understand the need for a quantum mechanical description of phenomena at the atomic and molecular scale. Solve the Schrödinger equation for basic potential problems (1D or central). Understand the basic concepts of quantum mechanics (e.g. wave-particle duality, Schrödinger equation, orbital momentum, spherical harmonics). Understand the relation between the macroscopic and microscopic description of matter.
			Understand the importance of symmetry for spectroscopy. Master the quantum mechanical description of the hydrogen atom. Understand the various statistical distribution functions and apply them to systems with many degrees of freedom. Master and apply the basic concepts of statistical physics. Derive statistical quantities such as partition functions for simple and complex systems and apply them to determine macroscopically observable quantities.
E092621 Modelling of Physiological Systems	lecture seminar: practical PC room classes	written examination with open questions	Analysis, schematizing and mathematical modelling of physiological processes. Use and development of code (Python) for the analysis and processing of physiological data and the implementation of mathematical models.
E099171 Engineering Project	group work project	assignment report	Systematic and targeted processing of scientific measurement data and presentation of these data
E002910 Introduction to Numerical Mathematics	lecture seminar: practical PC room classes	written examination	A critical usage of algorithms in practical applications using software.
E070310 Organic Chemistry	lecture seminar: coached exercises	written examination	Ability to define and describe in detail reaction mechanisms, knowing relation between chemical structure and reactivity, knowing properties of most important organic molecules, describe stereochemistry of organic molecules, describe separation methods of molecules. Showing ability to make use of theory in creative way when designing chemical reactions; ability to use laboratory equipment; solving capability.
			Having insight in 3D-structure of organic molecules, being able to make relations between chemical structures and properties of organic molecules; being able to develop multi-step reaction sequences.
E003230 Statistical Data Processing	seminar: coached exercises	written examination	Design an experiment
<u>-</u>	seminar: practical PC room classes	report	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
E022110 Electromagnetism I	project seminar: coached exercises	written examination with open questions report written examination	Describe trends in data and find correlations using regression analysis To be able to program a numerical technique as applied to a "simple" wave problem. To understand, calculate and determine voltage and current behaviour on transmission lines.

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Librig WALOS. Software precision, perseverance and critical reflection.	EBingwALG3.3 Show precision, perseverance and critical reflection.	Intellectual competence
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Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	Teaching methods ggevonden in de studiefiche	Evaluation methods	Course learning outcome
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 material with the desired properties.
			To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when use in specific situations.
E098512 Sustainability, Entrepreneurship and Ethics	project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E001132 Mathematical Analysis I	guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	Being able to assess the convergence of numerical series and series of functions. To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral, improper integral and integrability. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for solving initial value problems.
			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.

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E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response, the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises		To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback control systems.
E032510 Electronic Systems and Instrumentation for Biomedical Engineers	lecture practicum	written examination skills test	Analyze basic analog and digital electronic circuits and think about them in a conceptual, analytical and systemoriented way. Have insight in the acquisition of biopotentials such as in ECG or EEG systems. Have the skills to communicate about your own electronic system design via written text and graphs. To be able to build and experimentally evaluate analog and digital circuits at breadboard level with the required accuracy, perseverance and critical reflection. Have the skills to perform numerical simulations on electronic circuits using standard models and methods, in particular PSpice.
E068661 Biomedical Polymers and Processing	lecture practicum	written examination with open questions job performance assessment	ACQUIRED INSIGHTS: insight in structure-property relationships of biomedical polymers; capability to select most appropriate synthesis method for biomedical polymers; awareness of advantages and disadvantages of polymerization techniques; correlation between polymer structure and biodegradation; insight in suitability of specific polymers to serve biomedical applications; capability to select appropriate characterization techniques to acquire info on the basic properties of biomedical polymers; awareness of polymer compatibility with biomedically relevant processing techniques; insight in physico-chemical properties required to enable polymer processing into targeted scaffold design.
E099070 Cross-Course Project	project	oral examination report	Collaborate in group. Show creativity, self-motivation and team spirit when carrying out a project.
E021520 Statistical Physics and Molecular Structure	lecture seminar: coached exercises	written examination	Understand the need for a quantum mechanical description of phenomena at the atomic and molecular scale. Solve the Schrödinger equation for basic potential problems (1D or central). Understand the basic concepts of quantum mechanics (e.g. wave-particle duality, Schrödinger equation, orbital momentum, spherical harmonics). Understand the relation between the macroscopic and microscopic description of matter. Understand the importance of symmetry for spectroscopy. Master the quantum mechanical description of the hydrogen atom. Understand the various statistical distribution functions and apply them to systems with many degrees of freedom. Master and apply the basic concepts of statistical physics. Derive statistical quantities such as partition functions for simple and complex systems and apply them to determine macroscopically observable quantities.
E092621 Modelling of Physiological Systems	seminar: practical PC room classes		Analysis, schematizing and mathematical modelling of physiological processes. Use and development of code (Python) for the analysis and processing of physiological data and the implementation of mathematical models.
E099171 Engineering Project	group work project	assignment report	Systematic and targeted processing of scientific measurement data and presentation of these data Reporting orally and in writing
E003230 Statistical Data Processing	seminar: practical PC room classes		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
E074011 Quantitative Cell and Tissue Analysis	demonstration online lecture practicum online discussion group microteaching lecture	written examination report participation	Understand the working principles of techniques to culture cells and tissues Understand the relation between cell composition and cell function as inferred from the above mentioned technique Understand various quantitative techniques for the quantitative analysis of cell morphology, cell properties, structure and function and be able to apply quantitative analysis Understanding of histology and histological techniques and being able to interpret histological coupes

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<< Course	EBingwALG3.4 Show scientific cu	Teaching methods	Evaluation methods	Intellectual competence Course learning outcome
	evaluatievormen voorafgegaan door ** werden niet terug	_	Lvaluation methods	Course learning outcome
			written examination	Application of the laws of thermodynamics on chemical systems
E070080 C	Chemical Thermodynamics	guided self-study seminar: coached exercises lecture	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.
E066012 N	Naterials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture		Understand and apply chemical equilibrium. 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
		icotare		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 uses in specific situations.
E098512 S	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 F	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 C	Chemistry: the Structure of Matter	guided self-study seminar: coached exercises	written examination open book examination	Being able to perform stoichiometric calculations. Identify and describe the different types of intermolecular interactions.
		lecture: plenary exercises lecture		Being able to determine the molecular geometry of covalent compounds. Identify and describe the different types of chemical bonding. Being able to order atoms and ions based on their periodic properties
E000540 N	Modelling, Making and Measuring	project	participation	Being able to write the electron configuration of atoms and ions. Concepts: working collaboration in a group, scientific techniques, use of scientific language.
E090313 N	nodelling, Making and Measuring	project	report	Use of software tools to make simulations and diagrams
E001222 N	Mathematical Analysis II	guided self-study seminar: coached exercises	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions.
		lecture: plenary exercises lecture	open book examination	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 F	Physics II	demonstration	written examination	To be able to solve physics problems by applying these laws and concepts.
E076040 S	Sustainable Business Operations	lecture lecture	participation written examination with open questions written examination with multiple choice questions	To understand the physical laws and concepts of the covered chapters. Understanding sustainability aspects in an economic context
E005020 A	Analysis of Systems and Signals	lecture seminar: coached exercises	·	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.)
E068661 E	Biomedical Polymers and Processing	practicum	participation report	Practical knowledge on the processing of biomedical polymers using 3D printing
E099070 C	Cross-Course Project	project	-,	Apply theoretical knowledge and skills acquired in other courses on a practical biomedical problem. Show creativity, self-motivation and team spirit when carrying out a project. Develop a strategy for solving the problem under supervision.
E021520 S	Statistical Physics and Molecular Structure	lecture	written examination	Understand the need for a quantum mechanical description of phenomena at the atomic and molecular scale.
		seminar: coached exercises		Solve the Schrödinger equation for basic potential problems (1D or central). Understand the basic concepts of quantum mechanics (e.g. wave-particle duality, Schrödinger equation, orbital momentum, spherical harmonics).
				Understand the relation between the macroscopic and microscopic description of matter. Understand the importance of symmetry for spectroscopy. Master the quantum mechanical description of the hydrogen atom.
				Understand the various statistical distribution functions and apply them to systems with many degrees of freedom. Master and apply the basic concepts of statistical physics. Derive statistical quantities such as partition functions for simple and complex systems and apply them to determine macroscopically observable quantities.
E092621 N	Modelling of Physiological Systems	practicum		Analysis, schematizing and mathematical modelling of physiological processes.
		seminar: practical PC room classes		Use and development of code (Python) for the analysis and processing of physiological data and the implementation of mathematical models. Acquire basic knowledge of the anatomy and physiology of organ systems and the organism and insight into physiological
E099171 E	Engineering Project	group work	assignment	processes. To be able to independently look up scientific biomedical oriented information in scientific sources
		project	report	Formulate a scientific question Dissect a scientific article

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

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EbingWALO4.1 Master scientific	• •	57 \	•
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet ter	uggevonden in de studiefiche		
E001142 Basic Mathematics	lecture	written examination	To have a thorough knowledge of the topics matrices, complex numbers, elementary functions and vectors.
	seminar: coached exercises		Being able to formulate correctly and with mathematical precision.
	lecture: plenary exercises		Being able to make a correct reasoning and to write it down in a structured way.
E070080 Chemical Thermodynamics	guided self-study seminar: coached exercises	written examination open book examination	Application of the laws of thermodynamics on chemical systems. Calculation of the solubility of ionic compounds in aqueous solutions.
	lecture	орен воок ехапппаноп	Calculation of the pH of aqueous solutions.
	10014.10		Understand and apply chemical equilibrium.
E003043 Probability and Statistics	guided self-study	•	To reason and to work with multi-dimensional random variables
	seminar: coached exercises	choice questions	To perform a linear regression and to interpret its results
	lecture	open book examination	To understand and to apply methods for hypothesis testing To understand and to apply methods for (parameter) estimation
			To interpret and to judge the results of statistical sampling, and to represent them in an appropriate form
			To calculate probabilities of events and expectations of random variables
E066012 Materials Technology	guided self-study	written examination	To name materials properties and to be able to distinguish between the different groups of materials
	seminar: practical PC room classes seminar: coached exercises		To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account
	lecture		various material properties
			To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design
			material with the desired
			properties.
			To be able to correlate the structure and properties of materials
			To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when use
FOODF10 Custoinability Entrangenousehin and Ethica	lastina		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
	project	acoigninon	activities.
E020061 Physics I	demonstration		To understand the physical laws and concepts of the covered chapters.
	lecture		To be able to solve problems by applying these laws and concepts.
E001132 Mathematical Analysis I	guided self-study	written examination	Being able to assess the convergence of numerical series and series of functions.
	lecture: plenary exercises seminar	open book examination	To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral, improper integral and
	lecture		integrability.
			To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-
			linear differential equation, to
			be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initia 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		Being able to perform stoichiometric calculations.
	seminar: coached exercises		Identify and describe the different types of intermolecular interactions.
	lecture		Being able to determine the molecular geometry of covalent compounds. Identify and describe the different types of chemical bonding.
			Being able to order atoms and ions based on their periodic properties
			Being able to write the electron configuration of atoms and ions.
E098513 Modelling, Making and Measuring	project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language.
			Oral presentation Writing reports
E001222 Mathematical Analysis II	guided self-study	written examination	Being able to perform the chain rules for differentiable functions.
	seminar: coached exercises	open book examination	Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions.
	lecture: plenary exercises		Being able to compute integrals in two and three dimensions by subsequent integration.
	lecture		Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative,
			partial derivative,
			differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	guided self-study	written examination	Having acquired insight in the notions rank, image, kernel, invertability, and determinant of a linear transform.
	lecture: plenary exercises	open book examination	Having acquired skills in the manipulation of vectors. Reing able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms.
	seminar lecture		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. Reing able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in
			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.
E020220 Physics II	demonstration	written examination	Having acquired insight in the mathematical, physical and geometric meaning of eigenvalues and eigenvectors. To be able to solve physics problems by applying these laws and concents.
LUZUZZU FIIYSIUS 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	open book examination	To understand the properties of fluids.
•	seminar: practical PC room classes	•	To understand the similarities between transport of impulse, heat and mass.
	seminar		To solve problems of stationary heat transport.
			To know the basic laws of stationary heat transport and to be able to apply them. To understand the law of energy in open and closed systems and to be able to apply it.
			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	written examination	To master the basic theory of curves.
	seminar: coached exercises		To apply the residue theorem in a variety of situations.
	lecture: plenary exercises		To coloulate assumbly Box Sates and Lody Providence 11.
			To calculate complex line integrals both directly and by means of theoretical results.
			To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results.
			To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes.
			To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields,
			conservative and solenoidal
			vector fields.
			To have acquired skills in calculations with the nabla operator.

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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.
E092662 From Genome to Organism	lecture seminar	written examination	Basic knowledge of the structure and physiology of the cell; molecular biology; protein structure. Basic knowledge of the structure of DNA; de genetic code; DNA replication; gene expression; and protein synthesis. Basic knowledge of fertilization and embryogenesis of the human body. Basic knowledge of the anatomy and physiology of the skin, bone, muscle, immune system, nervous system, cardiovascular, respiratory and digestive system of the human body.
E032510 Electronic Systems and Instrumentation for Biomedical Engineers	practicum	skills test	Have the skills to communicate about your own electronic system design via written text and graphs.
E099070 Cross-Course Project	project	oral examination report	Report and present project progress, results and solutions orally and in writing.
E092621 Modelling of Physiological Systems	lecture seminar: practical PC room classes practicum	written examination with open questions written examination with multiple choice questions	Acquire basic knowledge of the anatomy and physiology of organ systems and the organism and insight into physiological processes.
E099171 Engineering Project	group work project	assignment report	Dissect a scientific article Reporting orally and in writing Formulate a scientific question
E070310 Organic Chemistry	lecture seminar: coached exercises	written examination	Ability to define and describe in detail reaction mechanisms, knowing relation between chemical structure and reactivity, knowing properties of most important organic molecules, describe stereochemistry of organic molecules, describe separation methods of molecules. Showing ability to make use of theory in creative way when designing chemical reactions; ability to use laboratory equipment; solving capability. Having insight in 3D-structure of organic molecules, being able to make relations between chemical structures and properties of organic molecules; being able to develop multi-step reaction sequences.
E074011 Quantitative Cell and Tissue Analysis	demonstration online lecture practicum online discussion group microteaching lecture	written examination report participation	Understand the working principles of techniques to culture cells and tissues Understand the relation between cell composition and cell function as inferred from the above mentioned technique Understand various quantitative techniques for the quantitative analysis of cell morphology, cell properties, structure and function and be able to apply quantitative analysis Understanding of histology and histological techniques and being able to interpret histological coupes

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EBingwALG4.2 Carry out concrete assignments systematically.

<<	EBingwALG4.2 Carry out concrete	e assignments systematically.		Competences in cooperation and communication
Course		Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- e	en evaluatievormen voorafgegaan door ** werden niet terug	gevonden 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.
	Electronic Systems and Instrumentation for Biomedical Engineers	practicum	skills test	To be able to build and experimentally evaluate analog and digital circuits at breadboard level with the required accuracy, perseverance and critical reflection.
E010390	Medical Signal Processing and Statistics	seminar	simulation report	Python programming skills to apply and implement biomedical signal processing and statistics.
E099070	Cross-Course Project	project	oral examination report	Develop a strategy for solving the problem under supervision. Collaborate in group. Report and present project progress, results and solutions orally and in writing.
E021520	Statistical Physics and Molecular Structure	lecture seminar: coached exercises	written examination	Understand the need for a quantum mechanical description of phenomena at the atomic and molecular scale. Solve the Schrödinger equation for basic potential problems (1D or central). Understand the basic concepts of quantum mechanics (e.g. wave-particle duality, Schrödinger equation, orbital momentum, spherical harmonics). Understand the relation between the macroscopic and microscopic description of matter. Understand the importance of symmetry for spectroscopy. Master the quantum mechanical description of the hydrogen atom. Understand the various statistical distribution functions and apply them to systems with many degrees of freedom. Master and apply the basic concepts of statistical physics. Derive statistical quantities such as partition functions for simple and complex systems and apply them to determine macroscopically observable quantities.
E099171	Engineering Project	group work project	assignment report peer assessment	Systematic and targeted processing of scientific measurement data and presentation of these data Working in a group
E070310	Organic Chemistry	lecture seminar: coached exercises practicum	written examination report job performance assessment participation	Ability to define and describe in detail reaction mechanisms, knowing relation between chemical structure and reactivity, knowing properties of most important organic molecules, describe stereochemistry of organic molecules, describe separation methods of molecules. Showing ability to make use of theory in creative way when designing chemical reactions; ability to use laboratory equipment; solving capability. Having insight in 3D-structure of organic molecules, being able to make relations between chemical structures and properties of organic molecules; being able to develop multi-step reaction sequences.
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
E022110	Electromagnetism I	project	report	To be able to program a numerical technique as applied to a "simple" wave problem.
E074011	Quantitative Cell and Tissue Analysis	demonstration practicum online discussion group microteaching	participation report	Understand the working principles of techniques to culture cells and tissues Understand the relation between cell composition and cell function as inferred from the above mentioned technique Understand various quantitative techniques for the quantitative analysis of cell morphology, cell properties, structure and function and be able to apply quantitative analysis Understanding of histology and histological techniques and being able to interpret histological coupes

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EBingwALG4.3 Work as part of a team.

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Competences in cooperation and communication

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
098512 Sustainability, Entrepreneurship and Ethics project assignment		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.
E032510 Electronic Systems and Instrumentation for Biomedical Engineers	practicum	skills test	To be able to build and experimentally evaluate analog and digital circuits at breadboard level with the required accuracy, perseverance and critical reflection. Have the skills to communicate about your own electronic system design via written text and graphs.
E099070 Cross-Course Project	project	oral examination report	Collaborate in group. Show creativity, self-motivation and team spirit when carrying out a project.
E099171 Engineering Project	group work project	peer assessment	Working in a group
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
E022110 Electromagnetism I	project	report	To be able to program a numerical technique as applied to a "simple" wave problem.
E074011 Quantitative Cell and Tissue Analysis	demonstration practicum online discussion group microteaching	participation report	Understand the working principles of techniques to culture cells and tissues Understand the relation between cell composition and cell function as inferred from the above mentioned technique Understand various quantitative techniques for the quantitative analysis of cell morphology, cell properties, structure and function and be able to apply quantitative analysis Understanding of histology and histological techniques and being able to interpret histological coupes

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet te	eruggevonden 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
E063682 Biomechanics	demonstration practicum	report	Collecting, processing and analyzing scientific measurement data and computational study results
E032510 Electronic Systems and Instrumentation for Biomedical Engineers	•	skills test	Have the skills to communicate about your own electronic system design via written text and graphs.
E092735 Medical Physics	practicum	report	To be able to apply the principles of radiation dosimetry
E010390 Medical Signal Processing and Statistics	seminar	report	Python programming skills to apply and implement biomedical signal processing and statistics.
E099070 Cross-Course Project	project	oral examination report	Report and present project progress, results and solutions orally and in writing.
E099171 Engineering Project	group work project lecture	assignment report peer assessment	Reporting orally and in writing
E070310 Organic Chemistry	practicum	participation report job performance assessment	Ability to define and describe in detail reaction mechanisms, knowing relation between chemical structure and reactivity, knowing properties of most important organic molecules, describe stereochemistry of organic molecules, describe separation methods of molecules. Showing ability to make use of theory in creative way when designing chemical reactions; ability to use laboratory equipment; solving capability. Having insight in 3D-structure of organic molecules, being able to make relations between chemical structures and properties of organic molecules; being able to develop multi-step reaction sequences.
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
E022110 Electromagnetism I	project	report	To be able to program a numerical technique as applied to a "simple" wave problem.
E074011 Quantitative Cell and Tissue Analysis	practicum	participation report	Understand the working principles of techniques to culture cells and tissues Understand the relation between cell composition and cell function as inferred from the above mentioned technique Understand various quantitative techniques for the quantitative analysis of cell morphology, cell properties, structure and function and be able to apply quantitative analysis Understanding of histology and histological techniques and being able to interpret histological coupes

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

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche		
E066012 Materials Technology	seminar: practical PC room classes	written examination	To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties
E098512 Sustainability, Entrepreneurship and Ethics	lecture project	participation assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E076040 Sustainable Business Operations	lecture	written examination with open questions written examination with multiple choice questions	Critical, creative thinking and scientific reasoning Be able to think carefully about social, scientific and ethical problems and possible solutions to these problems
E099070 Cross-Course Project	project		Apply theoretical knowledge and skills acquired in other courses on a practical biomedical problem. Develop a strategy for solving the problem under supervision.
E099171 Engineering Project	group work project		Systematic and targeted processing of scientific measurement data and presentation of these data

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

Societal competences

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche		
E098512 Sustainability, Entrepreneurship and Ethics	lecture project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E076040 Sustainable Business Operations	lecture	written examination with open questions assignment written examination with 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

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

Societal competences

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	gevonden in de studiefiche		
E032510 Electronic Systems and Instrumentation for Biomedical Engineers	lecture practicum	written examination skills test	To be able to build and experimentally evaluate analog and digital circuits at breadboard level with the required accuracy, perseverance and critical reflection.
			Have insight in the acquisition of biopotentials such as in ECG or EEG systems.

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EBingwBIOM5.1 Be aware of the ethical and safety aspects of the biomedical practice.

Societal competences

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
E032510 Electronic Systems and Instrumentation for	lecture	written examination	To be able to build and experimentally evaluate analog and digital circuits at breadboard level with the required accuracy,
Biomedical Engineers	practicum	skills test	perseverance and critical
			reflection.
			Have insight in the acquisition of biopotentials such as in ECG or EEG systems.
E092735 Medical Physics	lecture	written examination with open	Understand physical concepts used in medicine for imaging and therapy
		questions	To be able to apply the principles of radiation dosimetry
			Understand how ionizing and non-ionizing radiation interacts with matter
E099070 Cross-Course Project	project		Apply theoretical knowledge and skills acquired in other courses on a practical biomedical problem.
·			Develop a strategy for solving the problem under supervision.
E092621 Modelling of Physiological Systems	lecture		Acquire basic knowledge of the anatomy and physiology of organ systems and the organism and insight into physiologica
			processes.
E099171 Engineering Project	group work		Systematic and targeted processing of scientific measurement data and presentation of these data
,	project		
E074011 Quantitative Cell and Tissue Analysis	demonstration	participation	Understand the working principles of techniques to culture cells and tissues
·	online lecture	report	Understand the relation between cell composition and cell function as inferred from the above mentioned technique
	practicum	•	Understand various quantitative techniques for the quantitative analysis of cell morphology, cell properties, structure and
	online discussion group		function and be able to apply
	microteaching		quantitative analysis
	lecture		Understanding of histology and histological techniques and being able to interpret histological coupes

25-01-2022 Status GOEDGEKEURD op 2020-09-17 13:09:35.94 35/36