

**APPENDIX**  
**to the**  
**Degree Statute and Education and Examination Regulations**  
**for the Bachelor of Mechanical Engineering**

**2020-2021 academic year**

**Chapter 9 Description of the education (the units of study)**

Date of most recent adoption by dean	19-08-2020
Date of most recent consent by school council	19-08-2020
Date of most recent consent by degree committee	07-07-2020

Date of adoption of amendment 1	not applicable
Date of adoption of amendment 2	not applicable

## 9 Description of the education (the units of study)

This chapter describes the education provided in your degree course in the form of a curriculum overview and description of the units of study, starting with the units of study in the propaedeutic phase and those in the minors. It also specifies whether the course offers modules and/or elective units.

Below is a schematic overview of the degree formats and tracks for the degree course.

<b>Name of degree course: Werktuigbouwkunde / Mechanical Engineering</b>		
CROHO number: 34280		
Degree format	Full-time	Part-time
Language	Dutch and English	Dutch
Variants and tracks	Minors	Abridged from associate to bachelor degree Minors

Below is a schematic overview that gives you an overall impression of the degree course. It also indicates the units of study and modules contained in the degree course.

semester	term	code	Name	Number ECTS credits
1	1	e-WTB-1PRJa	Project 1a: Wind Turbine	5
1	1	e-WTB-1CRS1a	Course 1a: Mechanical Design	5
1	1	e-WTB-1CRS2a	Course 2a: Mechanical Calculations	5
1	2	e-WTB-1PRJb	Project 1b: Wind Turbine	5
1	2	e-WTB-1CRS1b	Course 1b: Mechanical Design	5
1	2	e-WTB-1CRS2b	Course 2b: Mechanical Calculations	5
2	3	e-WTB-2PRJa	Project 2a: Energy System Design in a Bi-Disciplinary Context	5
2	3	e-WTB-2CRS1a	Course 1a: Energy System Design	5
2	3	e-WTB-2CRS2a	Course 2a: Energy System Design	5
2	4	e-WTB-2PRJb	Project 2b: Energy System Design in a Bi-Disciplinary Context	5
2	4	e-WTB-2CRS1b	Course 1b: Energy System Design	5
2	4	e-WTB-2CRS2b	Course 2b: Energy System Design	5

semester	term	code	Name	Number ECTS credits
3	5+6	e-WTB-3PRJ	Project: Mechanical Design	15
3	5+6	e-WTB-3CRS	Course: Mechanical Design	15
4	7+8	e-WTB-4PRJ	Project 4: Design of Energy Systems	15
4	7+8	e-WTB-4CRS	Course 4: Energy & Control Systems	15
5	9+10	e-WTB-5STAGE	Internship	30
6	11+12	e-WTB-6PLG	S6 Smart Industry PLC	30

Semester	term	code	Name	Number ECTS credits
7	13+14	Elective minor Mechanical Engineering offers the following two minors:		30
		M_W-M-MB-VT	Machine Design minor (Mechanical Engineering FT/PT)	
		M_W-M-EPM-VT	Wind Energy minor (Research Group for Sustainable Energy)	
8	15+16	e-WTB-8AFST	Graduation project	30

## 9.1 Units of study and the propaedeutic phase

WTB - table – 01 – e-WTB-1PRJa

<b>General information</b>		
Changed compared to 2019-2020	PRAC1-V renamed VCA1-V	
Unit of study name	Project 1a: windmolen	
English name of unit of study	Project 1a: wind turbine	
Unit of study code	e-WTB-1PRJa	
Term	Term 1	
ECTS credits / Study load in hours / Study time	5 ECTS credits / 140 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	32
	Programmed study time for self-study and internship	108
	<b>Total programmed study time</b>	<b>140</b>
Entry requirements for unit of study	Not applicable.	
<b>Content and organisation</b>		
General description	Project, continued in Project 1b Wind Turbine. Students work together on preparations for building a wind turbine, and develop professional and practical skills.	
Exit qualifications	C2 Design (1) C3 Realisation (1) C4 Control (1)	C5 Management (1) C6 Consultation (1) C8 Professionalisation (1)
Professional tasks	BT1 Mechanical Development	
Relationship	The other two units of study in term 1 are related to this unit to a greater or lesser degree. (See also curriculum diagram).	
Activities and/or instructional formats	Project and classroom lessons.	
Required literature / description of learning material	<ul style="list-style-type: none"> <li>• PBNA: VCA - VOL Coursebook (via HAN)</li> <li>• Elling, R. <i>Writing for readers with little time</i>.</li> </ul> See study resource list for a full description.	
Required software / required materials	<ul style="list-style-type: none"> <li>• MS Office</li> <li>• SolidWorks</li> </ul> See study resource list for a full description.	
<b>Examination</b>		
Assessment dimensions:	The student works together with others on a mono-disciplinary project.	
<b>Name of exam/modular exam</b>	<b>Veilig werken (VCA)</b>	
English name exam/modular exam	Work Safely (VCA)	
Code of modular exam	VCA1-V	
Assessment criteria	The student <ol style="list-style-type: none"> <li>1. has knowledge of safety regulations at the level of the VCA VOL exam.</li> <li>2. follows safety regulations and uses personal protection equipment.</li> </ol>	
Exam and modular exam format(s)	Theoretical exam individual assessment written	

Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 1 term 2
Number of examiners	Organised by PBNA at HAN.
Permitted resources	None. Must bring ID and copy of ID.
Method of registration for exam/registration period	Not applicable.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Project 1a</b>
English name exam/modular exam	Project 1a
Code of modular exam	PRJ1a-V
Assessment criteria	The student can carry out a mono-disciplinary project with students from their own degree course.
Exam and modular exam format(s)	PP (Professional product) individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 1 term 2
Number of examiners	Assessment by two examiners (content supervisor and process supervisor).
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Professional Skills 1a</b>
English name exam/modular exam	Professional Skills 1a
Code of modular exam	SKILLS1a-V
Assessment criteria	The student: <ul style="list-style-type: none"> <li>• knows the tasks, roles and responsibilities of the chair, minute-taker and participants.</li> <li>• can describe the importance of structured meetings with the BOB and ODAT methods.</li> <li>• can critically reflect (in first person 'I') on their own role in project group meetings and describe possible improvements for their own project meeting.</li> <li>• can draft agenda items with subject, purpose and timestamps in the Agenda format provided.</li> <li>• can substantiate decisions and define action points (SMART) in the Minutes format provided.</li> </ul>
Exam and modular exam format(s)	P (Product) individual assessment written
Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 1 term 2
Number of examiners	2 examiners for the construction and evaluation.

	Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

WTB - table – 02 – e-WTB-1CRS1a

General information		
Changed compared to 2019-2020		
Unit of study name	Course 1a: mechanisch ontwerpen	
English name of unit of study	Course 1a: Mechanical Engineering	
Unit of study code	e-WTB-1CRS1a	
Term	Term 1	
ECTS credits / Study load in hours / Study time	5 ECTS credits / 140 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	42
	Programmed study time for self-study and internship	98
	<b>Total programmed study time</b>	140
Entry requirements for unit of study	Not applicable.	
Content and organisation		
General description	Course: Mechanical Design. Students acquire knowledge and develop skills related to mechanical design, computer-aided design, materials science and production technologies.	
Exit qualifications	C2 Design (1) C3 Realisation (1)	
Professional tasks	BT1 Mechanical Development	
Relationship	The other two units of study in term 1 are related to this unit to a greater or lesser degree. (See also curriculum diagram).	
Activities and/or instructional formats	Classroom lessons.	
Required literature / description of learning material	<ul style="list-style-type: none"> <li>• Simmons, C. H. <i>Manual of Engineering Drawing</i>.</li> <li>• Ashby: Materials</li> <li>• Kals: Industrial Production</li> </ul> See study resource list for a full description.	
Required software / required materials	<ul style="list-style-type: none"> <li>• CES EduPack</li> <li>• SolidWorks</li> </ul> See study resource list for a full description.	
Examination		
Assessment dimensions:	The student can draw a mechanical design and select appropriate materials and processes.	
<b>Name of exam/modular exam</b>	<b>Computer Aided Design 1 - Werktuigbouwkundig Ontwerpen 1</b>	
English name exam/modular exam	Computer Aided Design 1 - Mechanical Engineering Design 1	
Code of modular exam	CAD1-WON1-V	
Assessment criteria	The student <ol style="list-style-type: none"> <li>1. can use the sketch function and associated tools to extrude and revolve shapes and make adjustments to these.</li> <li>2. can make a technical drawing with the projections of a part.</li> </ol>	

	<ol style="list-style-type: none"> <li>3. can determine the right cross-section and special views of a component and place them on a technical drawing.</li> <li>4. has knowledge of and insight into the basic principles of designing a technical drawing: scale, paper size, views and cross-section.</li> <li>5. has knowledge of and insight into choices regarding dimensioning, primary dimensions, F dimensions (functional dimensions), incremental dimensions, parallel dimensions.</li> </ol>
Exam and modular exam format(s)	Application exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 1 term 2
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Laptop with wireless Internet connection, Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models), drawing equipment, theory book Producttekenen en documenteren by A. Breedveld.
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Materiaalkunde 1 - Productietechnieken 1</b>
English name exam/modular exam	Materials Science 1 – Production Technologies 1
Code of modular exam	MAT1-PTEC1-V
Assessment criteria	<p>The student</p> <ol style="list-style-type: none"> <li>1. understands the role of material selection in the design process.</li> <li>2. has a global overview of materials and production processes.</li> <li>3. knows the definitions and units of and the relationship between the basic concepts.</li> <li>4. can apply the basic concepts in simple situations.</li> <li>5. can draw and interpret a tensile curve.</li> <li>6. understands atom and molecule structures in relation to material properties.</li> <li>7. knows the basic functionalities of CES EduPack.</li> <li>8. has knowledge of and insight into the history, design and characteristics of production technologies.</li> <li>9. has knowledge of and insight into the archotyping, remodelling, separating and machining metalworking techniques.</li> <li>10. can make application choices.</li> </ol>



Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 1 term 2
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models)</li> <li>• MAT1: self-made EN-NL and/or NL-EN word list (only translations, not definitions)</li> <li>• PTEC1: formula list (will be provided).</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

ME - table – 03 – e-WTB-1CRS2a

<b>General information</b>		
Changed compared to 2019-2020	<i>Click or type and enter changes. Note: if the assessment has changed, an equivalence or conversion must be given below this table.</i>	
Unit of study name	Course 2a: mechanische berekeningen	
English name of unit of study	Course 2a: Mechanical Calculations	
Unit of study code	e-WTB-1CRS2a	
Term	Term 1	
ECTS credits / Study load in hours / Study time	5 ECTS credits / 140 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	53
	Programmed study time for self-study and internship	87
	<b>Total programmed study time</b>	140
Entry requirements for unit of study	Not applicable.	
<b>Content and organisation</b>		
General description	Course: Mechanical Calculations. Students learn to perform mechanical calculations, in particular calculations on machine parts and statics calculations. Students work on their development together in learning teams.	
Exit qualifications	C1 Analysis (1) C2 Design (1) C8 Professionalisation (1)	
Professional tasks	BT1 Mechanical Development	
Relationship	The other two units of study in term 1 are related to this unit to a greater or lesser degree. (See also curriculum diagram).	
Activities and/or instructional formats	Classroom lessons and learning team.	
Required literature / description of learning material	<ul style="list-style-type: none"> <li>• Hibbeler, R. <i>Engineering Mechanics: Statics in SI Units, 14/E</i></li> <li>• Budynas, Richard, G. <i>Ise Shigley's Mechanical Engineering Design</i></li> <li>• Muhs c.s. <i>Roloff Matek Machine-onderdelen, deel tabellenboek.</i></li> </ul> See study resource list for a full description	
Required software / required materials	<ul style="list-style-type: none"> <li>• SoWiSo</li> </ul> See study resource list for a full description.	
<b>Examination</b>		
Assessment dimensions:	The student can make calculations in a mechanical design. <ul style="list-style-type: none"> <li>• The student progresses in his or her professional development.</li> </ul>	
<b>Name of exam/modular exam</b>	<b>Mechanica 1 -Wiskunde 1</b>	
English name exam/modular exam	Mechanics 1 - Mathematics 1	
Code of modular exam	MEC1-WIS1-V	
Assessment criteria	The student <ol style="list-style-type: none"> <li>1. can design a full model of a structure showing only the external forces and torques.</li> <li>2. can replace support points by forces and torques.</li> </ol>	

	<ol style="list-style-type: none"> <li>3. can divide a structure into free bodies, and apply loads.</li> <li>4. understands the concepts of two and three force elements.</li> <li>5. can resolve and compose forces.</li> <li>6. can prepare equilibrium equations (sum of forces and torques).</li> <li>7. can solve equilibrium equations of various equations with multiple unknowns, including trigonometry.</li> <li>8. has mastered mathematical skills in algebra, trigonometric functions and geometric trigonometry.</li> <li>9. can apply mathematical skills in simple technical calculations.</li> </ol>
Exam and modular exam format(s)	Application exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 1 term 2
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models)
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Werktuigonderdelen 2</b>
English name exam/modular exam	Mechanical Components 2
Code of modular exam	WTO2-V
Assessment criteria	<p>The student</p> <ol style="list-style-type: none"> <li>1. can select different types of mechanical components and dimensioning. These may be bearings, springs, belt and/or chain transmissions and splined connections.</li> <li>2. can select tables and graphs and read the data for components.</li> <li>3. can draw up a correct structure sketch of the component for visual support in the calculation. Can use flowcharts.</li> </ol>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 1

	term 2
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models).</li> <li>• Roloff Matek Machine-onderdelen, formuleboek</li> <li>• Roloff Matek Machine-onderdelen, tabellenboek</li> <li>• Notes on 1 double-sided piece of A4 paper</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

ME - table – 04 – e-WTB-1PRJb

<b>General information</b>		
Changed compared to 2019-2020	SKILLS1b-V assessment criteria changed	
Unit of study name	Project 1b: windmolen	
English name of unit of study	Project 1b: Wind Turbine	
Unit of study code	e-WTB-1PRJb	
Term	Term 2	
ECTS credits / Study load in hours / Study time	5 ECTS credits / 140 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	38
	Programmed study time for self-study and internship	102
	<b>Total programmed study time</b>	140
Entry requirements for unit of study	Not applicable.	
<b>Content and organisation</b>		
General description	Project continuation of Project 1a Wind Turbine. Students work together on building and designing a wind turbine, and develop professional, practical and design skills.	
Exit qualifications	C1 Analysis (1) C2 Design (1) C3 Realisation (1) C4 Control (1)	C5 Management (1) C6 Consultation (1) C7 Research (1) C8 Professionalisation (1)
Professional tasks	BT1 Mechanical Development	
Relationship	The other two units of study in term 2 are related to this unit to a greater or lesser degree. (See also curriculum diagram).	
Activities and/or instructional formats	Project and classroom lessons.	
Required literature / description of learning material	<ul style="list-style-type: none"> <li>• Elling, R. <i>Report writing for readers with little time.</i></li> <li>• Zeiler, W. <i>Design Handbook, a methodical framework.</i></li> </ul> See study resource list for a full description.	
Required software / required materials	<ul style="list-style-type: none"> <li>• MS Office</li> <li>• SolidWorks</li> <li>• CES EduPack</li> </ul> See study resource list for a full description.	
<b>Examination</b>		
Assessment dimensions:	The student works together with others on a mono-disciplinary project.	
<b>Name of exam/modular exam</b>	<b>Project 1b</b>	
English name exam/modular exam	Project 1b	
Code of modular exam	PRJ1b-V	
Assessment criteria	The student can carry out a mono-disciplinary project with students from their own degree course.	
Exam and modular exam format(s)	PP (Professional product) individual assessment written	
Weighting factor for modular exams	1	
Minimum result	5.5	
Exam opportunities	term 2	

	term 3
Number of examiners	Assessment by two examiners (content supervisor and process supervisor).
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Professional Skills 1b</b>
English name exam/modular exam	Professional Skills 1b
Code of modular exam	SKILLS1b-V
Assessment criteria	<p>The student:</p> <ol style="list-style-type: none"> <li>1. can link the topic and adapt the content of their presentation to the audience.</li> <li>2. can clearly express the point/core/message of their presentation.</li> <li>3. can explain why this topic is of interest to the engineering public.</li> <li>4. knows how to structure their presentation based on audience questions <ul style="list-style-type: none"> <li>• Start</li> <li>• Middle</li> <li>• End</li> </ul> </li> <li>5. can give a presentation with an original and attention-grabbing start and a concise conclusion.</li> <li>6. manages to give a compelling presentation of their topic.</li> <li>7. uses the right nonverbal communication (tone of voice, eye contact, posture, pace) to support their presentation.</li> <li>8. Can prepare their project presentation with a planned approach</li> </ol>
Exam and modular exam format(s)	P (Product) individual assessment written
Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 2 term 3
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

ME - table – 05 – e-WTB-1CRS1b

<b>General information</b>		
Changed compared to 2019-2020	<ul style="list-style-type: none"> <li>Permitted resources for MAT2-PTEC2-V changed</li> <li>LT1-V assessment criteria changed</li> </ul>	
Unit of study name	Course 1b: mechanisch ontwerpen	
English name of unit of study	Course 1b: Mechanical Engineering	
Unit of study code	e-WTB-1CRS1b	
Term	Term 2	
ECTS credits / Study load in hours / Study time	5 ECTS credits / 140 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	53
	Programmed study time for self-study and internship	87
	<b>Total programmed study time</b>	140
Entry requirements for unit of study	Not applicable.	
<b>Content and organisation</b>		
General description	Course: Mechanical Design. Students acquire knowledge and develop skills related to mechanical design, computer aided design, visualisation, materials science and production technologies. Students work on their development together in learning teams.	
Exit qualifications	C2 Design (1) C3 Realisation (1)	C8 Professionalisation (1)
Professional tasks	BT1 Mechanical Development	
Relationship	The other two units of study in term 2 are related to this unit to a greater or lesser degree. (See also curriculum diagram).	
Activities and/or instructional formats	Classroom lessons and learning team.	
Required literature / description of learning material	<ul style="list-style-type: none"> <li>Ashby: Materials</li> <li>Kals: Industrial Production</li> <li>Reader 6119</li> </ul> See study resource list for a full description.	
Required software / required materials	<ul style="list-style-type: none"> <li>CES EduPack</li> <li>SolidWorks</li> </ul> See study resource list for a full description.	
<b>Examination</b>		
Assessment dimensions:	<ul style="list-style-type: none"> <li>The student can draw a mechanical design and select appropriate materials and processes.</li> <li>The student makes progress in their professional development.</li> </ul>	
<b>Name of exam/modular exam</b>	<b>Computer Aided Design 2 - Werktuigbouwkundig Ontwerpen 2</b>	
English name exam/modular exam	Computer Aided Design 2 - Mechanical Engineering Design 2	
Code of modular exam	GT-CAD2-V	
Assessment criteria	The student <ol style="list-style-type: none"> <li>can work with assemblies, both top-down and bottom-up</li> <li>can dimension a technical drawing.</li> </ol>	

	<ol style="list-style-type: none"> <li>3. can create a picture package for a simple product.</li> <li>4. can work with special features: mirror, chamfer, fillet, rib, loft and pattern.</li> <li>5. has knowledge of and insight into the requirements for a 2D composition drawing: filled bottom right-hand corner, BOM, position numbers, head sizes and relevant caption (e.g. assembly instructions).</li> <li>6. has knowledge of and insight into the implementation form of the 2D welding assembly drawings for simple and complex welded assemblies (principle of combination and mono-drawing).</li> <li>7. can draw up a complete and correct BOM (parts list) on a welding assembly drawing in accordance with the combination principle.</li> <li>8. has knowledge of and insight into concepts: nominal size, size deviation, largest limit size, smallest limit size, dimensional tolerance and clearance.</li> <li>9. can calculate tolerances and fits.</li> <li>10. has knowledge of and insight into the concept of surface roughness, Ra.</li> <li>11. has knowledge of and insight into the meaning of ISO roughness symbols.</li> <li>12. can select a surface roughness value based on functionality and production method.</li> <li>13. can select tolerances based on the required functionality and production method.</li> <li>14. has knowledge of and insight into ISO tolerance classes/fits, the concepts of positive and negative clearance, largest and smallest clearance, clearance tolerance and nominal clearance.</li> <li>15. has knowledge of and insight into fit types: loose, transition and fixed (press or interference) fit.</li> <li>16. can select fits based on the required functionality and production method.</li> </ol>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 2 term 3
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models)</li> <li>• Arnoud Breedveld - Producttekenen en documenteren</li> <li>• Roloff/Matek - Tabellenboek</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the



	academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Materiaalkunde 2 - Productietechnieken 2</b>
English name exam/modular exam	Materials Science 2 – Production Technologies 2
Code of modular exam	MAT2-PTEC2-V
Assessment criteria	<p>The student</p> <ol style="list-style-type: none"> <li>1. knows the most relevant properties of stiffness and strength.</li> <li>2. can determine and validate the specified properties based on experimental results.</li> <li>3. can formulate the (fixed and variable) requirements for a design set with regard to the materials that will be selected.</li> <li>4. can determine which properties need to be optimised and in which direction this optimisation should be made.</li> <li>5. can reach a reasoned selection of a group of suitable materials by using a material database.</li> <li>6. has knowledge of and insight into injection moulding processes.</li> <li>7. can design for injection moulding processes.</li> </ol>
Exam and modular exam format(s)	Application exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 2 term 3
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models)</li> <li>• MAT2: Book: Materials Engineering, Science, Processing and Design (Ashby, Shercliff &amp; Cebon) 4th ed. (or printout of digital version)</li> <li>• PTEC2: HAN reader no. 6119 PTEC2 Injection Moulding.</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Leerteam 1</b>
English name exam/modular exam	Learning team 1
Code of modular exam	LT1-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student sufficiently participated in the learning team activities.</li> <li>• The learning team portfolio is complete</li> <li>• The learning team portfolio contains the learning results related to personal and professional development of the student in the first semester.</li> </ul>

	<ul style="list-style-type: none"> <li>• In the notes, the student looks back on their personal and professional development, based on documents in their portfolio.</li> <li>• In the notes, the student describes what they will subsequently work on with regard to their personal and substantive development in the Personal Development Plan (PDP).</li> </ul>
Exam and modular exam format(s)	PF (Assessment portfolio) individual assessment written
Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 2 term 3
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	Not applicable.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

ME - table – 06 – e-WTB-1CRS2b

<b>General information</b>		
Changed compared to 2019-2020	<i>Click or type and enter changes. Note: if the assessment has changed, an equivalence or conversion must be given below this table.</i>	
Unit of study name	Course 2b: mechanische berekeningen	
English name of unit of study	Course 2b: Mechanical Calculations	
Unit of study code	e-WTB-1CRS2b	
Term	Term 2	
ECTS credits / Study load in hours / Study time	5 ECTS credits / 140 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	42
	Programmed study time for self-study and internship	98
	<b>Total programmed study time</b>	140
Entry requirements for unit of study	Not applicable.	
<b>Content and organisation</b>		
General description	Course: Mechanical Calculations. Students learn to perform mechanical calculations, in particular strength of materials calculations and statics calculations. In the final (event) week, students reflect and look ahead.	
Exit qualifications	C2 Design (1)	
Professional tasks	BT1 Mechanical Development	
Relationship	The other two units of study in term 2 are related to this unit to a greater or lesser degree. (See also curriculum diagram).	
Activities and/or instructional formats	Classroom lessons.	
Required literature / description of learning material	<ul style="list-style-type: none"> <li>Hibbeler, R. <i>Engineering Mechanics: Statics in SI Units, 14/E</i></li> <li>Hibbeler, R. <i>Mechanics of Materials in SI Units, 10th Edition.</i></li> <li>Hibbeler, R. <i>Engineering Mechanics: Dynamics in SI Units, 14/E</i></li> </ul> See study resource list for a full description.	
Required software / required materials	<ul style="list-style-type: none"> <li>SoWiSo</li> </ul> See study resource list for a full description.	
<b>Examination</b>		
Assessment dimensions:	The student can make calculations in a mechanical design.	
<b>Name of exam/modular exam</b>	<b>Mechanica 2</b>	
English name exam/modular exam	Mechanics 2	
Code of modular exam	MEC2-V	
Assessment criteria	The student <ol style="list-style-type: none"> <li>can draw up a correct free body diagram of a design/design parts.</li> <li>can correctly calculate the internal loads in a design/design parts (pull/pressure, bending and torsion).</li> </ol>	

	<p>3. can schematically represent the internal loads in a design/design parts in a shear force diagram and on a moment flow line.</p> <p>4. can draw up a function procedure for internal loads as a function of a variable location in the design.</p> <p>5. can correctly calculate tensions and deformation in a design/design parts (pull/pressure, bending and torsion).</p>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 2 term 3
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models)</li> <li>• formula sheet (will be provided).</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Mechanica 3</b>
English name exam/modular exam	Mechanics 3
Code of modular exam	MEC3-V
Assessment criteria	<p>The student:</p> <ul style="list-style-type: none"> <li>• can draw up a correct model/free body diagram</li> <li>• can draw up correct kinematic equations for translation and rotation</li> <li>• can draw up correct equations of motion for translation</li> <li>• applies differential and integral calculations correctly to dynamic problems</li> <li>• can correctly perform mathematical calculations.</li> <li>• draws up a correct model/free body diagram.</li> <li>• can determine the derived functions and primitives of multivariable functions.</li> <li>• can apply determined and undetermined integrals of multivariable functions in a kinematic context.</li> </ul>
Exam and modular exam format(s)	Application exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 2 term 3
Number of examiners	2 examiners for the construction and evaluation.

	Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models)</li> <li>• formula sheet (will be provided).</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Wiskunde 7</b>
English name exam/modular exam	Mathematics 7
Code of modular exam	WIS7-V
Assessment criteria	<p>The student must be able to:</p> <ol style="list-style-type: none"> <li>1. perform operations with vectors.</li> <li>2. perform calculations on the length of vector and inner product</li> <li>3. calculate the angle between two vectors.</li> <li>4. perform calculations on an exterior product.</li> </ol>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 2 term 3
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models)</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

WTB - table – 07 – e-WTB-2PRJa

<b>General information</b>		
Changed compared to 2019-2020	SKILLS2a-V assessment criteria changed	
Unit of study name	Project 2a: energetisch ontwerpen in een bi-disciplinaire context	
English name of unit of study	Project 2a: Engineering Energy Systems in a Bi-Disciplinary Context	
Unit of study code	e-WTB-2PRJa	
Term	Term 3	
ECTS credits / Study load in hours / Study time	5 ECTS credits / 140 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	24
	Programmed study time for self-study and internship	116
	<b>Total programmed study time</b>	140
Entry requirements for unit of study	Not applicable.	
<b>Content and organisation</b>		
General description	Project. Students work together with students from one other degree course (bi-disciplinary) on designing and/or building a product or prototype and thereby develop professional and practical skills.	
Exit qualifications	C1 Analysis (1) C2 Design (1) C3 Realisation (1) C4 Control (1)	C5 Management (1) C6 Consultation (1) C7 Research (1) C8 Professionalisation (1)
Professional tasks	BT2 Energy Development	
Relationship	The other two units of study in term 3 are related to this unit to a greater or lesser degree. (See also curriculum diagram).	
Activities and/or instructional formats	Project and classroom lessons.	
Required literature / description of learning material	<ul style="list-style-type: none"> <li>• Grit, R. <i>Project Management – A Practical Approach</i>. See study resource list for a full description.</li> </ul>	
Required software / required materials	<ul style="list-style-type: none"> <li>• MS Office</li> <li>• SolidWorks</li> </ul> See study resource list for a full description.	
<b>Examination</b>		
Assessment dimensions:	<ul style="list-style-type: none"> <li>• Students can carry out a bi-disciplinary project with students from one other degree course.</li> <li>• Students possess the basic skills in (written) communication, consultation, reflection and cooperation.</li> <li>• Students can communicate in English and to extend their English vocabulary.</li> <li>• Students can give a structured overview of sources and examine the reliability of sources.</li> </ul>	
<b>Name of exam/modular exam</b>	<b>Project 2a</b>	
English name exam/modular exam	Project 2a	
Code of modular exam	PRJ2a-V	
Assessment criteria	Students can carry out a bi-disciplinary project with students from another degree course.	

Exam and modular exam format(s)	PP (Professional product) individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 3 term 4
Number of examiners	Assessment by two examiners (content supervisor and process supervisor).
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Professional Skills 2a</b>
English name exam/modular exam	Professional Skills 2a
Code of modular exam	SKILLS2a-V
Assessment criteria	The student: 1. can write professional reports for clients, lecturers and fellow students about the approach, preliminary results and final results of projects.
Exam and modular exam format(s)	P (Product) individual assessment written
Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 3 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

ME - table – 08 – e-WTB-2CRS1a

<b>General information</b>		
Changed compared to 2019-2020		
Unit of study name	Course 1a: energetisch ontwerpen	
English name of unit of study	Course 1a: Energy System Design	
Unit of study code	e-WTB-2CRS1a	
Term	Term 3	
ECTS credits / Study load in hours / Study time	5 ECTS credits / 140 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	44
	Programmed study time for self-study and internship	96
	<b>Total programmed study time</b>	140
Entry requirements for unit of study	Not applicable.	
<b>Content and organisation</b>		
General description	Theory course in basic knowledge and skills. This unit of study comprises courses and/or practicals on electrical and electronic engineering, control engineering and thermodynamics, thus providing knowledge and skills that are needed to some extent to carry out the project.	
Exit qualifications	C2 Design (1) C3 Realisation (1)	C7 Research (1)
Professional tasks	BT2 Energy Development	
Relationship	The other two units of study in term 3 are related to this unit to a greater or lesser degree. (See also curriculum diagram).	
Activities and/or instructional formats	Classroom lessons	
Required literature / description of learning material	See study resource list for a full description.	
Required software / required materials	<ul style="list-style-type: none"> <li>• Minitab</li> <li>• DrStat</li> </ul> See study resource list for a full description.	
<b>Examination</b>		
Assessment dimensions:	<ol style="list-style-type: none"> <li>1. The student has basic knowledge of electrical engineering concepts such as voltage, current, resistance, induction and <math>\cos(f)</math> and of devices such as electric motors, transformers and current rectifiers and can apply them in practical problems.</li> <li>2. The student has basic knowledge of probability calculus and statistics (descriptive statistics and probability distributions).</li> <li>3. The student has basic knowledge of the First Law of thermodynamics and thermodynamic terms such as energy, heat, work, power, output, specific heat, specific mass, combustion value, gas law, partial pressure and state quantities, knows the SI units, can apply the aforementioned in relation to simple problems and can draw up a simple energy model and calculate the algebra.</li> </ol>	



<b>Name of exam/modular exam</b>	<b>Wiskunde 9</b>
English name exam/modular exam	Mathematics 9
Code of modular exam	WIS9-V
Assessment criteria	<ol style="list-style-type: none"> <li>1. The student can analyse and solve risks/problems.</li> <li>2. The student can display statistics using central tendency and dispersion measures.</li> <li>3. The student can calculate probabilities of normal distribution, binomial distribution and Poisson distribution.</li> </ol>
Exam and modular exam format(s)	Application exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 3 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models)</li> <li>• formula sheet (will be provided).</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Elektrotechniek 1</b>
English name exam/modular exam	Electrical and Electronic Engineering 1
Code of modular exam	ELT1-V
Assessment criteria	<ol style="list-style-type: none"> <li>1. The student has knowledge of the basic terms used in electrical and electronic engineering.</li> <li>2. The student is aware of how batteries, fuel cells, solar cells and generators work.</li> <li>3. The student can carry out calculations with regard to simple electrical circuits.</li> <li>4. The student has knowledge of magnetism and induction.</li> <li>5. The student can carry out calculations with regard to transformers, coils and capacitors.</li> <li>6. The student understands how motors operate and can carry out simple calculations.</li> </ol>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 3 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment

	model.
Permitted resources	2x double-sided A4 written or typed. NOT permitted are sample exams and calculations of exercises.
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Thermodynamica 1</b>
English name exam/modular exam	Thermodynamics 1
Code of modular exam	TDY1-V
Assessment criteria	<ol style="list-style-type: none"> <li>1. The student has knowledge of energy-aware concepts such as heating value, power, energy, capacity and output.</li> <li>2. The student can work with quantities and units from the SI system and use adaptations from other systems.</li> <li>3. The student can draw up and calculate a (physical) model.</li> <li>4. The student is familiar with the gas law and can use it to perform calculations including with molar and partial pressure.</li> <li>5. The student can apply the first law to a closed system.</li> <li>6. The student can apply differentiation and integration to energy-aware systems.</li> </ol>
Exam and modular exam format(s)	Application exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 3 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models)</li> <li>• formula sheet (will be provided).</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

ME - table – 09 – e-WTB-2CRS2a

General information		
Changed compared to 2019-2020	<i>Click or type and enter changes. Note: if the assessment has changed, an equivalence or conversion must be given below this table.</i>	
Unit of study name	Course 2a: energetisch ontwerpen	
English name of unit of study	Course 2a: Energy System Design	
Unit of study code	e-WTB-2CRS2a	
Term	Term 3	
ECTS credits / Study load in hours / Study time	5 ECTS credits / 140 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	37.5
	Programmed study time for self-study and internship	102.5
	<b>Total programmed study time</b>	<b>140</b>
Entry requirements for unit of study	Not applicable.	
Content and organisation		
General description	Theory course in basic knowledge and skills. This unit of study comprises courses and/or practicals in energy systems for mechanical engineering, materials science, research skills, software (Microsoft Excel) and coaching, thus providing knowledge and skills that are to some extent needed to carry out the project.	
Exit qualifications	C1 Analysis (1) C2 Design (1)	C5 Management (1) C8 Professionalisation (1)
Professional tasks	BT2 Energy Development	
Relationship	The other two units of study in term 3 are related to this unit to a greater or lesser degree. (See also curriculum diagram).	
Activities and/or instructional formats	Classroom lessons.	
Required literature / description of learning material	<ul style="list-style-type: none"> <li>• Ashby: Materials</li> <li>•</li> <li>• Baarda Dr. D.B. <i>Research. This is it!</i></li> </ul> See study resource list for a full description.	
Required software / required materials	<ul style="list-style-type: none"> <li>• MS Office</li> <li>• CES EduPack</li> </ul> See study resource list for a full description.	
Examination		
Assessment dimensions:	The student has basic knowledge of the functioning and dimensioning formulas of wind turbines, solar thermal collectors and photovoltaic solar panels. <ul style="list-style-type: none"> <li>• The student can analyse the energy and power requirement of a system and if needed balance it with the production and availability of energy using temporary storage where energy generators, transducers and storage are dimensioned.</li> <li>• The student has the knowledge to communicate with specialists about a wide range of material properties.</li> <li>• The student can translate technical design problems and</li> </ul>	

	<p>use a structured approach to reach an acceptable solution.</p> <ul style="list-style-type: none"> <li>• Students can give a structured overview of sources and examine the reliability of sources.</li> </ul>
<b>Name of exam/modular exam</b>	<b>Materiaalkunde 3</b>
English name exam/modular exam	Materials Science 3
Code of modular exam	MAT3-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student has the knowledge to communicate with specialists in the field of material properties (such as friction/wear, thermal, electrical, magnetic and optical properties).</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 3 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models). Formula list will be provided.
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Energiesystemen 1</b>
English name exam/modular exam	Electric Energy Systems 1
Code of modular exam	ES1-V
Assessment criteria	<p>The student has knowledge of and can perform calculations in the areas of:</p> <ol style="list-style-type: none"> <li>1. Energy and power</li> <li>2. Identify the power and energy demand</li> <li>3. Dimensioning energy storage; diagrams and partial energy output</li> <li>4. Sunlight, solar thermal</li> <li>5. Wind, wind turbines</li> <li>6. Solar panels</li> </ol>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 3 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.

Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82MS or Texas Instruments TI-30Xa.</li> <li>• Formula list will be provided.</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

ME - table – 10 – e-WTB-2PRJb

<b>General information</b>		
Changed compared to 2019-2020	SKILLS2b-V assessment criteria changed	
Unit of study name	Project 2b: energetisch ontwerpen in een bi-disciplinaire context	
English name of unit of study	Project 2b: Engineering Energy Systems in a Bi-Disciplinary Context	
Unit of study code	e-WTB-2PRJb	
Term	Term 4	
ECTS credits / Study load in hours / Study time	5 ECTS credits / 140 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	30
	Programmed study time for self-study and internship	110
	<b>Total programmed study time</b>	140
Entry requirements for unit of study	Not applicable.	
<b>Content and organisation</b>		
General description	Project. Students work together with students from one other degree course (bi-disciplinary) on designing and/or building a product or prototype and thereby develop professional and practical skills.	
Exit qualifications	C1 Analysis (1) C2 Design (1) C3 Realisation (1) C4 Control (1)	C5 Management (1) C6 Consultation (1) C7 Research (1) C8 Professionalisation (1)
Professional tasks	BT2 Energy Development	
Relationship	The other two units of study in term 4 are related to this unit to a greater or lesser degree. (See also curriculum diagram).	
Activities and/or instructional formats	Classroom lessons and project work.	
Required literature / description of learning material	<ul style="list-style-type: none"> <li>Grit, R. <i>Project Management – A Practical Approach</i>. See study resource list for a full description.</li> </ul>	
Required software / required materials	<ul style="list-style-type: none"> <li>MS Office</li> <li>SolidWorks</li> </ul> See study resource list for a full description.	
<b>Examination</b>		
Assessment dimensions:	<ul style="list-style-type: none"> <li>Students can carry out a bi-disciplinary project with students from one other degree course.</li> <li>Students possess the basic skills in (written) communication, consultation, reflection and cooperation.</li> </ul>	
<b>Name of exam/modular exam</b>	<b>Project 2b</b>	
English name exam/modular exam	Project 2b	
Code of modular exam	PRJ2b-V	
Assessment criteria	Students can carry out a bi-disciplinary project with students from other degree courses.	
Exam and modular exam format(s)	PP (Professional product) individual assessment written	
Weighting factor for modular exams	1	

Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	Assessment by two examiners (content supervisor and process supervisor).
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Professional Skills 2b</b>
English name exam/modular exam	Professional Skills 2b
Code of modular exam	SKILLS2b-V
Assessment criteria	The student: 1. can use an efficient writing approach to write a clearly structured text (e.g. a CV or application letter) that is geared to the reader in terms of both content and language and meets the report requirements.
Exam and modular exam format(s)	P (Product) individual assessment written
Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

General information		
Changed compared to 2019-2020	WSSKS cancelled. Assessment criteria PLC 1 & Logic Circuits 1 and CAD3 changed Exam GT-PLC1-V split into TT and P	
Unit of study name	Course 1b: energetisch ontwerpen	
English name of unit of study	Course 1b: Energy System Design	
Unit of study code	e-WTB-2CRS1b	
Term	Term 4	
ECTS credits / Study load in hours / Study time	5 ECTS credits / 140 hours	
	Study programme	Number of clock hours
	Programmed contact hours	42
	Programmed study time for self-study and internship	98
	<b>Total programmed study time</b>	<b>140</b>
Entry requirements for unit of study	Not applicable.	
Content and organisation		
General description	Theory course in basic knowledge and skills. This unit of study comprises courses and/or practicals on CAD and requirements engineering, thus providing knowledge and skills that are to some extent needed to carry out the project.	
Exit qualifications	C1 Analysis (1) C2 Design (1) C3 Realisation (1)	C7 Research (1)
Professional tasks	BT2 Energy Development	
Relationship	The other two units of study in term 4 are related to this unit to a greater or lesser degree. (See also curriculum diagram).	
Activities and/or instructional formats	Classroom lessons.	
Required literature / description of learning material	<ul style="list-style-type: none"> <li>• Simmons, C. H. <i>Manual of Engineering Drawing</i>.</li> <li>• Douglas, J.F. <i>Solving problems in Fluid Mechanics Volume 1</i>.</li> <li>• Reader xxxx <i>Introduction to automation and logical circuits</i> (this is being revised, more information to follow) See study resource list for a full description.</li> </ul>	
Required software / required materials	<ul style="list-style-type: none"> <li>• CoDeSys</li> <li>• SolidWorks</li> </ul> See study resource list for a full description	
Examination		
Assessment dimensions:	<ul style="list-style-type: none"> <li>• The student can use the Sheet Metal and Hole Wizard functions in 3D CAD software to design and manufacture parts.</li> <li>• The student knows and can work with (ISO) welding symbols</li> <li>• The student has the knowledge and skills to dimension parts in a technical drawing for production (incl. fits/tolerances) and provide the annotation for screw threads.</li> </ul>	



	<ul style="list-style-type: none"> <li>• The student has basic knowledge of algebra and decimal, binary and hexadecimal number systems and can prepare and simplify control formulas.</li> <li>• The student knows how a PLC works, can write and load a PLC program and test how it works.</li> <li>• The student can draw a circuit diagram.</li> </ul>
<b>Name of exam/modular exam</b>	<b>Logische circuits</b>
English name exam/modular exam	Logic Circuits
Code of modular exam	LOGCIR-V
Assessment criteria	<ol style="list-style-type: none"> <li>1. The student has knowledge of Boolean algebra</li> <li>2. The student has knowledge of memory elements</li> <li>3. The student can apply numeral systems</li> <li>4. The student has knowledge of pneumatic, hydraulic and electronic controllers</li> </ol>
Exam and modular exam format(s)	Application exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>PLC 1</b>
English name exam/modular exam	PLC 1
Code of modular exam	PLC1-V
Assessment criteria	<ol style="list-style-type: none"> <li>1. The student is familiar with languages of application, construction and programming for PLCs.</li> <li>2. The student can write a PLC program and implement it in a practical set-up.</li> </ol>
Exam and modular exam format(s)	P (Product) individual assessment written
Weighting factor for modular exams	pass
Minimum result	tick
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Name of exam/modular exam</b>	<b>Practicum 9</b>
English name exam/modular exam	Practical 9
Code of modular exam	PRAC9-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student clearly describes the objective of the tests</li> <li>• The student makes a clear diagram with an explanatory description</li> <li>• The student specifies the used components to ensure that the tests can be reproduced</li> <li>• The student specifies the environmental conditions to ensure that tests can be reproduced</li> <li>• The student clearly describes how the tests were performed</li> <li>• The student makes a distinction between the setting values, measuring data and calculated values in a report</li> <li>• The student ensures that, in addition to measured data, other observations become visible (if applicable and relevant, for example, ambient temperature)</li> <li>• The student's calculations and/or graphs are included and are substantiated correctly.</li> <li>• The student describes the applied technologies concisely and in their own words.</li> <li>• The student's report answers the questions set in the assignment (practical instruction)</li> <li>• The student draws up conclusions that reflect on the objectives.</li> </ul>
Exam and modular exam format(s)	P (Product) individual assessment written
Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Computer Aided Design 3</b>
English name exam/modular exam	Computer Aided Design 3
Code of modular exam	CAD3-V
Assessment criteria	<p>The student</p> <ol style="list-style-type: none"> <li>1. can use all the functions of the sheet metal tab and use them to manufacture a more complex sheet steel component.</li> <li>2. can dimension a component for production.</li> <li>3. can dimension for production: functional, incremental and parallel dimensions.</li> <li>4. can work with the Hole Wizard and add annotations for the screw threads.</li> </ol>

	<ul style="list-style-type: none"> <li>5. has knowledge of and insight into dimensional tolerances and their representation on technical drawings.</li> <li>6. has knowledge of and insight into geometrical tolerances and the ISO fit system and their representation in technical drawing.</li> <li>7. has knowledge of Model Based Definition (MBD) and can place the information from production (PMI) in the 3D part according to current ISO standards.</li> </ul>
Exam and modular exam format(s)	PP (Professional product) individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

ME - table – 12 – e-WTB-2CRS2b

General information		
Changed compared to 2019-2020	Assessment criteria LT2-v changed	
Unit of study name	Course 2b: energetisch ontwerpen	
English name of unit of study	Course 2b: Energy System Design	
Unit of study code	e-WTB-2CRS2b	
Term	Term 4	
ECTS credits / Study load in hours / Study time	5 ECTS credits / 140 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	21
	Programmed study time for self-study and internship	119
	<b>Total programmed study time</b>	140
Entry requirements for unit of study	Not applicable.	
Content and organisation		
General description	Theory course in basic knowledge and skills. This unit of study comprises courses and/or practicals in ethics, environment, society, linear algebra, differentiation and integration, fluid mechanics and coaching, thus providing knowledge and skills that are to some extent needed to carry out the project. In a final (event) week, students get an overview of their own degree course and beyond.	
Exit qualifications	C2 Design (1)	C8 Professionalisation (1)
Professional tasks	BT2 Energy Development	
Relationship	The other two units of study in term 4 are related to this unit to a greater or lesser degree. (See also curriculum diagram).	
Activities and/or instructional formats	Classroom lessons.	
Required literature / description of learning material	<ul style="list-style-type: none"> <li>• Douglas, J.F. <i>Solving problems in Fluid Mechanics Volume 1</i>.</li> </ul> See study resource list for a full description.	
Required software / required materials	<ul style="list-style-type: none"> <li>• SoWiSo</li> </ul> See study resource list for a full description.	
Examination		
Assessment dimensions:	<ul style="list-style-type: none"> <li>• The student has knowledge of fluid mechanics terms, definitions, symbols and units, knows the continuity equation, the concept of hydrostatic pressure and Bernoulli's principle and can apply them to real-life problems.</li> <li>• The student can calculate the pressure difference/differential pressure as a result of (viscous) flow resistance.</li> <li>• The student is proficient in vector calculus in R2 and can apply this in a technical context.</li> <li>• The student can guide their own development and reflect on it.</li> <li>• The student can be flexible and can deal with feedback and with professional and ethical dilemmas.</li> </ul>	
Name of exam/modular exam	Stromingsleer 1	

English name exam/modular exam	Fluid Mechanics 1
Code of modular exam	STL1-V
Assessment criteria	The student must be able to: <ol style="list-style-type: none"> <li>1. can apply SI units;</li> <li>2. has knowledge of continuity equations;</li> <li>3. can perform calculations on fluid pressure.</li> <li>4. can apply Bernoulli's principle;</li> <li>5. has knowledge of measurement principles of flow velocity (Pitot, Prandtl, static);</li> <li>6. can perform calculations with viscosity and flow resistances.</li> </ol>
Exam and modular exam format(s)	Application exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models)</li> <li>• Own formula sheet 1 double-sided A4 written/typed or copied without calculations.</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Wiskunde 2 en 3</b>
English name exam/modular exam	Mathematics 2 and 3
Code of modular exam	WIS2-WIS3-V
Assessment criteria	The student: <ol style="list-style-type: none"> <li>1. is familiar with the derived functions from the standard functions</li> <li>2. has mastered conventions in formula language and notation.</li> <li>3. has mastered differentiation by using differentiation rules (sum, different, multiple, product, quotient and chain rule).</li> <li>4. can apply differential calculations in mathematical and technical contexts.</li> <li>5. knows the relationship between primitive functions and differentiation and can use it to determine whether a function <math>F</math> is a primitive of a function <math>f</math>;</li> <li>6. is familiar with primitives of standard functions.</li> <li>7. can geometrically estimate a particular integral;</li> <li>8. can determine the primitive of simple functions by applying the sum, difference, multiple and substitution rules and partial fraction decompositions;</li> </ol>

	9. can apply and calculate definite and indefinite integrals in mathematical and technical contexts.
Exam and modular exam format(s)	Application exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	• Casio fx-82 calculator (all models( or Texas Instruments TI-30 (all models) • formula sheet (will be provided).
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Leerteam 2b</b>
English name exam/modular exam	Learning team 2b
Code of modular exam	LT2-V
Assessment criteria	<ol style="list-style-type: none"> <li>1. The student sufficiently participated in the learning team activities.</li> <li>2. The student can comment on their development</li> <li>3. The learning team portfolio is complete.</li> <li>4. The student can reflect on results, study behaviour and study attitude in S2.</li> <li>5. The student can reflect on the aspect of team work and their role in project in S2.</li> <li>6. The student can describe their own skills and learning objectives for S3.</li> <li>7. The student can describe and explain their choice for project S3.</li> <li>8. The student has an overview of their study results</li> </ol>
Exam and modular exam format(s)	PF (Assessment portfolio) individual assessment written
Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	Not applicable.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

## 9.2 Units of study in the post-propaedeutic phase

ME - table – 13 – e-WTB-3PRJ

<b>General information</b>		
Changed compared to 2019-2020		
Unit of study name	Project Mechanisch ontwerpen	
English name of unit of study	Project: Mechanical Design	
Unit of study code	e-WTB-3PRJ	
Term	Semester 3	
ECTS credits / Study load in hours / Study time	15 ECTS credits / 420 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	84
	Programmed study time for self-study and internship	336
	<b>Total programmed study time</b>	420
Entry requirements for unit of study	At least 45 ECTS credits in P. The learning team coach may decide to deviate from this.	
<b>Content and organisation</b>		
General description	Project. Students work on designing and/or building a product or prototype and thereby develop professional and practical skills. The project can be carried out in a mono-disciplinary, bi-disciplinary or multidisciplinary way, either at HAN or on location. In the project, the students learn to apply various mechanical calculations. This results in a design for a driven mechanical construction that is recorded in a Technical Construction portfolio.	
Exit qualifications	C1 Analysis (2) C2 Design (2) C3 Realisation (1)	C5 Management (1) C6 Consultation (1) C7 Research (1) C8 Professionalisation (2)
Professional tasks	BT1 Mechanical Development	
Relationship	The other unit of study in semester 3 is more or less related to this unit of study. (See also curriculum diagram).	
Activities and/or instructional formats	Tutorial, practical, project work.	
Required literature / description of learning material	Not applicable.	
Required software / required materials	Not applicable.	
<b>Examination</b>		
Assessment dimensions:		
<b>Name of exam/modular exam</b>	<b>Project 3</b>	
English name exam/modular exam	Project 3	
Code of modular exam	PRJ3-V	
Assessment criteria	<ul style="list-style-type: none"> <li>• The student writes an action plan that has a clear structure and gives a detailed description of the project.</li> <li>• The student lists activities and products to be delivered.</li> <li>• The student describes the scope of the project, project organisation and draws up a realistic and detailed</li> </ul>	

	<p>schedule.</p> <ul style="list-style-type: none"> <li>• The student creates a design and manufacturing schedule portfolio that meets the client's requirements.</li> <li>• The student produces a design for a structure using a methodical approach.</li> <li>• The student makes calculations of dimensions (such as in relation to strength, deformation and drive) for a driven construction.</li> <li>• The student selects mechanical components.</li> <li>• The student makes control calculations using a finite element analysis and studies the dynamic behaviour of a construction (oscillation Theory).</li> <li>• The student can clarify the design in a 3D model, drawings or a motion analysis. The can use a CAD package for this.</li> <li>• The student studies relevant standards and patents/ regulations.</li> <li>• The student can convincingly present the project results and uses relevant resources in their presentation.</li> </ul>
Exam and modular exam format(s)	PP (Professional product) individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 2 term 3
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Professional Skills 3</b>
English name exam/modular exam	Professional Skills 3
Code of modular exam	SKILLS3-V
Assessment criteria	<p>The student:</p> <ul style="list-style-type: none"> <li>• can give a structured presentation about a critical choice in the project and underpin the choice with convincing arguments.</li> <li>• demonstrates the ability to think critically about projects and their own actions (type 2 thinking).</li> <li>• can adequately answer critical questions.</li> <li>• can use an efficient writing approach to write a clearly structured text (e.g. an action plan, agenda, notes, memo and/or summary) that is geared to the reader in terms of both content and language.</li> </ul>
Exam and modular exam format(s)	P (Product) individual assessment written



Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 2 term 3
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Programmable Logic Controller 2-3</b>
English name exam/modular exam	Programmable Logic Controller 2-3
Code of modular exam	PLC2-3-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student analyses the process and sets alerts and commands.</li> <li>• The student draws a Sequential Flow Chart and describes the program.</li> <li>• The student creates a working control system for a simple practical configuration.</li> </ul>
Exam and modular exam format(s)	PP (Professional product) group assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 2 term 3
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the examiner(s).

WTB - table – 14 – e-WTB-3CRS

General information		
Changed compared to 2019-2020	<ol style="list-style-type: none"> <li>1) The subject ADT12 has been cancelled. The WTO3-ADT12-V modular exam has been replaced by WTO3-V. Students who have already passed WTO3-ADT12-V also have a pass for WTO3-V.</li> <li>2) The subject EEM4 has been cancelled. The modular exam MEC7-EEM4-V has been replaced by MEC7-V. Students who have already passed MEC7-EEM4-V also have a pass for MEC7-V.</li> <li>3) Professional task BT3 Industrial automation has been cancelled</li> </ol>	
Unit of study name	Course: Mechanisch ontwerpen	
English name of unit of study	Course: Mechanical Design	
Unit of study code	e-WTB-3CRS	
Term	Semester 3	
ECTS credits / Study load in hours / Study time	15 ECTS credits / 420 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	116
	Programmed study time for self-study and internship	304
	<b>Total programmed study time</b>	<b>420</b>
Entry requirements for unit of study	Not applicable.	
Content and organisation		
General description	In this course, students learn to make various mechanical calculations. These are dynamic calculations, oscillation theory, strength and deformation calculations and calculations related to mechanical engineering parts. The entire unit of study provides knowledge and insight into a driven mechanical construction.	
Exit qualifications	C1 Analysis (2) C2 Design (2)	
Professional tasks	BT1 Mechanical Development	
Relationship	The other unit of study in semester 3 is more or less related to this unit of study. (See also curriculum diagram).	
Activities and/or instructional formats	Lecture, tutorial.	
Required literature / description of learning material	<ul style="list-style-type: none"> <li>• Hibbeler, R. <i>Mechanics of Materials in SI Units, 10th Edition</i>. Pearson.</li> <li>• Hibbeler, R. <i>Engineering Mechanics: Dynamics in SI Units, 14/E</i>. Pearson</li> <li>• Budynas, Richard, G. <i>Ise Shigley's Mechanical Engineering Design</i></li> <li>• Kals, H. <i>Industrial Production</i>. Boom</li> <li>• Ashby, M.F. <i>Materials</i> Elsevier</li> <li>• Muhs, D. <i>Roloff/Matek Machineonderdelen, deel Tabellenboek</i>. Academic Service</li> </ul>	
Required software / required materials	Siemens NX student licence.	

<b>Examination</b>	
Assessment dimensions:	<i>Click or type and enter the learning objectives or learning outcomes here.</i>
<b>Name of exam/modular exam</b>	<b>Mechanica 4 en 5</b>
English name exam/modular exam	Mechanics 4 and 5
Code of modular exam	MEC4-5-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student sets up the correct model/FBD.</li> <li>• The student can define the correct equations for strength/deformation calculations (static determined/undetermined situations).</li> <li>• The student uses differential and integral calculus correctly.</li> <li>• The student can work out calculations correctly from a mathematical perspective.</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 1 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82MS or Texas Instruments TI-30Xa</li> <li>• Notes: 1 A4 double-sided; no work related to solving problems may be included on this sheet.</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Mechanica 6</b>
English name exam/modular exam	Mechanics 6
Code of modular exam	MEC-6-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student sets up the correct model/FBD.</li> <li>• The student defines the correct kinematic equations for translation and rotation.</li> <li>• The student can calculate mass inertias.</li> <li>• The student can calculate work and energy.</li> <li>• The student applies differential and integral calculations correctly.</li> <li>• The student can work out calculations correctly from a mathematical perspective.</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 1

	term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82MS or Texas Instruments TI-30Xa.</li> <li>• Formula sheet brought along by student: 1 A4, double-sided</li> <li>• Formula sheet enclosed with the exam.</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Productietechnieken 3 en 4 – Materiaalkunde 4 en 6</b>
English name exam/modular exam	Materials Science 3 and 4 - Materials Science 4 and 6
Code of modular exam	PTC34-MAT46-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student has knowledge and insight into the processing technologies for thermoplastics and thermoset plastics.</li> <li>• The student can make application choices for plastics.</li> <li>• The student has knowledge of rapid prototyping techniques and additive manufacturing.</li> <li>• The student can minimise the risk of accidents due to material degradation.</li> <li>• The student can assess the choice of material in light of the proposed production methods and design.</li> <li>• The student is familiar with crystal lattices (know/remember) and can indicate planes and directions.</li> <li>• The student use phase and transformation diagrams in relation to the choice of material.</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 1 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models)
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Werktuigonderdelen 3</b>
English name exam/modular exam	Mechanical Components 3

Code of modular exam	WTO3-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student defines the correct equations for the calculation of the mechanical engineering parts.</li> <li>• The student can calculate a reduced mass inertia moment.</li> <li>• The student can use motor and load characteristics in calculations.</li> <li>• The student can calculate the static and dynamic load.</li> </ul>
Exam and modular exam format(s)	Application exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 2 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82MS or Texas Instruments TI-30Xa.</li> <li>• Book: Roloff/Matek, Formuleboek.</li> <li>• Book: Roloff/Matek, Tabellenboek.</li> <li>• Notes: 3 st. 1 A4, double-sided The work related to working out problems may not be included.</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Mechanica 7</b>
English name exam/modular exam	Mechanics 7
Code of modular exam	MEC7-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student is familiar with different forms of vibrations and can make mathematical calculations by using (damped) free and forced vibrations.</li> <li>• The student is familiar with the term eigenfrequency (also known as natural frequency) and can describe the resonance phenomenon from a mathematical perspective.</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 2 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82MS or Texas Instruments TI-30Xa.</li> <li>• Notes: 1 A4, double-sided</li> </ul>
Method of registration for	Registration for the modular exam through SIS. The

exam/registration period	registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	Discussion and review held in consultation with the examiner(s).

WTB - table – 15 – e-WTB-4PRJ

<b>General information</b>		
Changed compared to 2019-2020		
Unit of study name	Project 4: Design of Energy Systems	
English name of unit of study	Project 4: Design of Energy Systems	
Unit of study code	e-WTB-4PRJ	
Term	Semester 4	
ECTS credits / Study load in hours / Study time	15 ECTS credits / 420 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	60
	Programmed study time for self-study and internship	360
	<b>Total programmed study time</b>	<b>420</b>
Entry requirements for unit of study	At least 45 ECTS credits in P. The learning team coach may decide to deviate from this.	
<b>Content and organisation</b>		
General description	<p>Project. The students work on designing and/or building a product or prototype and thereby develop professional and practical skills. The project can be carried out in a mono-disciplinary, bi-disciplinary or multidisciplinary way, either at HAN or on location.</p> <p>The aim of the unit of study is to learn how to work in a team and apply knowledge and skills to a realistic and multidisciplinary problem. As a means to achieve these goals, supervision is offered in the form of workshops and supervised group discussions.</p>	
Exit qualifications	C1 Analysis (2) C2 Design (2) C3 Realisation (1)	C5 Management (1) C6 Consultation (2) C7 Research (2) C8 Professionalisation (2)
Professional tasks	BT2 Energy Development	
Relationship	The other unit of study in semester 4 is more or less related to this unit of study. (See also curriculum diagram).	
Activities and/or instructional formats	Classroom lessons and project work.	
Required literature / description of learning material	Not applicable.	
Required software / required materials	Not applicable.	
<b>Examination</b>		
Assessment dimensions:		
<b>Name of exam/modular exam</b>	<b>Project 4</b>	
English name exam/modular exam	Project 4	
Code of modular exam	PRJ4-V	
Assessment criteria	<ul style="list-style-type: none"> <li>• The student is able to identify the knowledge and skills relevant to the issue (see e-WTB-4CRS unit of study) and apply them correctly and in a sufficiently in-depth manner.</li> <li>• The student chooses a suitable research method, substantiates their choice and applies this method.</li> <li>• The student performs a stakeholder analysis and</li> </ul>	

	<p>translates the results into relevant requirements, which in turn are used to substantiate the design choices.</p> <ul style="list-style-type: none"> <li>• The student draws up relevant design specifications for dimensioning.</li> <li>• The student verifies whether the final product meets the set requirements and specifications.</li> <li>• The student actively applies themselves to the task of achieving the project objectives.</li> <li>• The students applies skills in terms of communication, reflection and cooperation.</li> <li>• The student writes an essay in which they discuss the following aspects based on the project they carried out. <ul style="list-style-type: none"> <li>○ Cradle-2-cradle.</li> <li>○ CO<sub>2</sub>-footprint.</li> <li>○ Life-cycle analysis.</li> <li>○ Effects of material choice on environment.</li> </ul> </li> </ul>
Exam and modular exam format(s)	P (Product) group assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Professional Skills 4</b>
English name exam/modular exam	Professional Skills 4
Code of modular exam	SKILLS4-V
Assessment criteria	<p>The student:</p> <ul style="list-style-type: none"> <li>• uses an efficient writing approach to write a clearly structured text that is geared to the reader in terms of both complex content and use of business language.</li> <li>• can deal with conflicts efficiently and effectively.</li> <li>• can use theory to reflect on team work in the project group, for example, theory on: assertive action, leadership, conflict management.</li> </ul>
Exam and modular exam format(s)	P (Product) individual assessment written
Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation.



	Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the examiner(s).

WTB - table – 16 – e-WTB-4CRS

General information		
Changed compared to 2019-2020	1) The exam criteria for the subject FMT has been moved from modular exam MREG-V to modular exam LAB1-2-3-V. 2) As a result, the above modular exam MREG-V has been replaced by modular exam REG-V. Students who have already passed MREG-V also have a pass for REG-V. 3) Assessment criteria for the EWK modular exam have been reformulated	
Unit of study name	Course 4: Energy & Control Systems	
English name of unit of study	Course 4: Energy & Control Systems	
Unit of study code	e-WTB-4CRS	
Term	Semester 4	
ECTS credits / Study load in hours / Study time	15 ECTS credits / 420 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	121
	Programmed study time for self-study and internship	299
	<b>Total programmed study time</b>	<b>420</b>
Entry requirements for unit of study	None.	
Content and organisation		
General description	Theory course in basic knowledge and skills. It teaches courses and/or practicals in energy systems, thermodynamics, measuring and control systems engineering, fluid mechanics and coaching, thus providing knowledge and skills that are to some extent needed to carry out the project.	
Exit qualifications	C1 Analysis (2) C2 Design (2)	C7 Research (2) C8 Professionalisation (2)
Professional tasks	BT2 Energy Development	
Relationship	The other unit of study in semester 4 is more or less related to this unit of study. (See also curriculum diagram).	
Activities and/or instructional formats	Classroom lessons.	
Required literature / description of learning material	<ul style="list-style-type: none"> <li>All other documents published online via OnderwijsOnline.</li> </ul>	
Required software / required materials	Matlab/Simulink Siemens NX student licence.	
Examination		
Assessment dimensions:		
<b>Name of exam/modular exam</b>	<b>Energiewerktuigen</b>	
English name exam/modular exam	Energy Tools	
Code of modular exam	EWK-V	
Assessment criteria	<ul style="list-style-type: none"> <li>The student can explain the operation of energy tools (e.g. piston engines, cooling machines, heat pumps, gas turbines) and calculate the incoming and outgoing energy flows and the thermodynamic efficiency.</li> <li>The student can use the <math>\log p-h</math>-diagram in calculations</li> </ul>	

	<ul style="list-style-type: none"> <li>- The student can identify the functions (energy conversion, storage or transport) of components in an energy system.</li> <li>- The student can calculate the incoming and outgoing energy flows of various energy systems, consisting of several components, and thus calculate the chain efficiency of the system.</li> <li>- The student can use and sketch a Sankey-diagram belonging to a given energy system.</li> </ul>
Exam and modular exam format(s)	Application exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 3 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82MS or Texas Instruments TI-30Xa</li> <li>• 1 A4, double-sided</li> <li>• Formula sheet enclosed with exam</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Thermodynamica 2</b>
English name exam/modular exam	Thermodynamics 2
Code of modular exam	TDY2-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student has knowledge of the first law for closed systems.</li> <li>• The student has knowledge of and can make calculations with regard to condition changes: polytropes, isotherms, the adiabatic process, isochores and isobar.</li> <li>• The student is familiar with the term irreversibility.</li> <li>• The student is familiar with and can make calculations in relation to cyclic processes (Carnot, Joule and Stirling).</li> <li>• The student has knowledge of: open systems.</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 3 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82MS or Texas Instruments TI-30Xa</li> </ul>

	<ul style="list-style-type: none"> <li>• 1 A4, double-sided</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Wiskunde 4 &amp; 5</b>
English name exam/modular exam	Mathematics 4 & 5
Code of modular exam	WIS4-5-V
Assessment criteria	<p>The student must be able to:</p> <ul style="list-style-type: none"> <li>• can solve first order homogenous and non-homogenous differential equations.</li> <li>• can solve second order homogenous and non-homogenous differential equations.</li> <li>• can perform Laplace transforms.</li> <li>• can perform inverse Laplace transforms by using partial fraction decompositions.</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 3 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82MS or Texas Instruments TI-30Xa.</li> <li>• Formula sheet enclosed with the exam.</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Stromingsleer 2</b>
English name exam/modular exam	Fluid Mechanics 2
Code of modular exam	STL2-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student has knowledge of and can make calculations in relation to heat transfer due to conductivity, convection and radiation.</li> <li>• The student can make calculations in relation to heat exchanger.</li> <li>• The student has knowledge of thermal comfort and can use the Mollier diagram.</li> <li>• The student can make calculations in relation to air handling.</li> </ul>
Exam and modular exam format(s)	Application exam individual assessment written

Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82MS or Texas Instruments TI-30Xa</li> <li>• A formula sheet brought along by the student may be supplemented with notes.</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Regeltechniek</b>
English name exam/modular exam	Control Systems Engineering
Code of modular exam	REG-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student has knowledge of the parts in a steering and a control system.</li> <li>• The student has knowledge and has insight into the characteristics of transfer functions of the basic processes.</li> <li>• The student has knowledge of pole and zero plots and can derive the process behaviour from these plots.</li> <li>• The student can draw response graphs based on transfer functions and can retrieve information from these graphs..</li> <li>• The student can draw a block diagram for a controlled process in which transfer functions are included and can apply mathematical rules.</li> <li>• The student can define transfer functions in the frequency domain and make the connection with Bode plots, Leidt Bode amplitude plots and Bode phase plots based on asymptotes.</li> <li>• The student sets the P-, I- and D-action of a controller based on the used control criteria (stability, phase and amplification margin, overshoot, settling time and end error) and uses the PN image response graph and Bode plots.</li> <li>• The student uses simulation software when analysing the process model and deriving and optimising the controller design.</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation.

	Assessment by one examiner based on the assessment model.
Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82MS or Texas Instruments TI-30Xa.</li> <li>• A formula sheet brought along by the student may be supplemented with notes.</li> </ul>
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Labview 1-2-3</b>
English name exam/modular exam	LabView 1-2-3
Code of modular exam	LAB1-2-3-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student is methodical in selecting sensors and has knowledge of operational principles.</li> <li>• The student uses factory information for sensors.</li> <li>• The student programs in a structured manner using a State Diagram.</li> <li>• The student creates a full and clear user interface.</li> <li>• The student simulates the process in a realistic manner..</li> <li>• The student describes the correct operation of the program by means of a description and figures.</li> <li>• The student uses monitoring and protection in relation to a State Diagram.</li> </ul>
Exam and modular exam format(s) P (Product)	PP (Professional product) group assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Leerteam 4</b>
English name exam/modular exam	Learning Team 4
Code of modular exam	LT4-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student sufficiently participated in the learning team activities.</li> <li>• The student can verbally comment on their development.</li> <li>• The learning team portfolio is complete.</li> <li>• The student can reflect on their results, study behaviour and study attitude in S3 and S4</li> </ul>

	<ul style="list-style-type: none"> <li>• The student can reflect on the aspect of team work and their role in the projects in S3 and S4.</li> <li>• The student can explain their choice of projects in S3 and S4 and how these fit with the direction of their studies.</li> <li>• The student can explain their choice of internship in S5 and minor in S7 and how these fit with the direction of their studies.</li> <li>• The student can describe their own qualities and SMART learning objectives (at least four learning objectives for S5, 2 related to technical competences and 2 to general university of applied sciences competences).</li> <li>• The student has an overview of their study results</li> </ul>
Exam and modular exam format(s)	P (Product) individual assessment written
Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 4 term 4
Number of examiners	2 examiners for the construction and evaluation. Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the examiner(s).

WTB - table – 17 – e-WTB-5STAGE

General information		
Changed compared to 2019-2020		
Unit of study name	Stage	
English name of unit of study	Internship	
Unit of study code	e-WTB-5STAGE	
Term	Semester 5	
ECTS credits / Study load in hours / Study time	30 ECTS credits / 840 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	12
	Programmed study time for self-study and internship	828
	<b>Total programmed study time</b>	<b>840</b>
Entry requirements for unit of study	<p>At the start of the internship with the internship organisation:</p> <ul style="list-style-type: none"> <li>• the student has at least 60 credits.</li> <li>• the student has passed the S3 project.</li> <li>• the student has demonstrated they have a professional attitude and has updated and discussed their profile portfolio with the learning team coach.</li> <li>• the profile portfolio should be signed off with a “p” in SIS by the end of Semester S4.</li> <li>• the student has acquired an internship assignment and described the assignment in their own words in a basic plan of approach (max. 3 A4 pages).</li> <li>• has approval for the assignment from the ME internship coordinator.</li> </ul> <p>The exam times listed in this table are based on an internship starting in September of the academic year in question and ending in January of the same academic year.</p> <p>Internships that start at different times always need approval by the graduation coordinator: the deadlines then shift pro rata.</p>	
Content and organisation		
General description	<p><u>Specialisation</u> in the field of mechanical engineering.</p> <p>The main objective is to further expand/specialise the mechanical engineering knowledge and skills in a context chosen by the student (level 2). You are <u>introduced</u> to the professional tasks you will encounter in the work field, and you build your <u>profile</u> based on these. You work on larger assignments/projects, which serve as a prelude to <u>graduation project</u> (level 3). You may work with other students during your internship, but you carry out an <u>individual assignment</u>.</p>	
Exit qualifications	C1 Analysis (2) C2 Design* (2)	C5 Management (2) C6 Consultation (2)



	C3 Realisation (2) C4 Control (2)	C7 Research (2) C8 Professionalisation (2)
	* students choose from these three competences.	
Professional tasks	BT1 Mechanical Development BT2 Energy Development BT3 Industrial Automation BT6 Product-oriented development BT7 Operations management* BT8 Establishing and changing organisations* * Comm. If the student chooses between the professional tasks BT7 and/or BT8, they need to explain to the LT coach and Internship Coordinator how they will acquire the missing theoretical knowledge.	
Relationship	See also curriculum diagram.	
Activities and/or instructional formats	Project on location with the internship organisation, presentation days and lectures.	
Required literature / description of learning material	Not applicable for Mechanical Engineering students started in 2019-2020 Academic year or in 2020-2021 Academic year.	
Required software / required materials	Not applicable.	
<b>Examination</b>		
Assessment dimensions:	Internship report: <ul style="list-style-type: none"> <li>• The student carries out the project in line with their action plan (AP).</li> <li>• The student reports on their internship activities in a final report in line with the applicable report requirements (Internship Report).</li> <li>• The student links learning activities to their predetermined learning objectives (in the Profile Portfolio) and reflects on their competence development (Reflection Report).</li> <li>• The student presents their results to the internship company in a presentation supported by a PowerPoint.</li> </ul> Product Data Management: <ul style="list-style-type: none"> <li>• The student acquires knowledge of Product Data Management (PDM; may also be ERP) and can describe the aspects of the system. They can write a proposal for setting up a product data system for a business process (preferably for the internship organisation) (PDM Report).</li> </ul> Ethics Report: <ul style="list-style-type: none"> <li>• The student applies ethical knowledge in a mechanical context (Ethics Report).</li> </ul>	
<b>Name of exam/modular exam</b>	<b>Internship report</b>	
English name exam/modular exam	Internship report	
Code of modular exam	RAP5-V	
Assessment criteria	<ul style="list-style-type: none"> <li>• The student drafts an AP that describes the project in detail.</li> <li>• The student reports on the technical content of the</li> </ul>	

	<p>internship activities.</p> <ul style="list-style-type: none"> <li>• The student applies mechanical knowledge and insights to a chosen case study.</li> <li>• The student makes responsible decisions throughout the project by using a quantifiable method.</li> <li>• The student reports on the content of the internship activities and on the entire internship process in writing, in a structured, concise, appropriate and correct manner.</li> <li>• The student presents their results in a company presentation supported by a PowerPoint.</li> </ul> <p>- The student asks for <b>feedback</b> from the company supervisor both <u>halfway through the internship</u> and <u>at the end</u> via the form available for this purpose.</p> <p>- The student demonstrates reflective ability (e.g. on the above feedback!)</p>
Exam and modular exam format(s)	PP (Professional product) individual assessment written
Weighting factor for modular exams	4
Minimum result	5.5
Exam opportunities	term 2 term 4
Number of examiners	Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	Submission of professional product at the end of the internship period for the relevant assignment in the digital learning environment.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Product Data Management</b>
English name exam/modular exam	Product Data Management
Code of modular exam	PDM5-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student writes a proposal for optimising a Product Data Management System (can also be an ERP system) for a business process.</li> <li>• The student draws up rules for a proper design management process and can show this in a workflow diagram.</li> <li>• The student can define product variants, while also considering standardisation.</li> </ul>
Exam and modular exam format(s)	PP (Professional product) individual assessment written
Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 1 term 2
Number of examiners	Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for	You do not need to formally register for (professional)

exam/registration period	products. For resits, contact the examiner.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Verslag ethiek</b>
English name exam/modular exam	Ethics Report
Code of modular exam	ETH5-V
Assessment criteria	<ul style="list-style-type: none"> <li>• The student recognises and defines an ethical issue from their personal situation.</li> <li>• The student uses ethical knowledge.</li> <li>• The student analyses the moral aspects of a real-life case study.</li> <li>• They define possible action and argue that action taken should be morally responsible.</li> </ul>
Exam and modular exam format(s)	PP (Professional product) individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 1 term 2
Number of examiners	Assessment by one examiner based on the assessment model.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

ME - table – 18 – e-WTB-6PLG

<b>General information</b>		
Changed compared to 2019-2020		
Unit of study name	S6 Smart Industry PLG	
English name of unit of study	S6 Smart Industry PLC	
Unit of study code	e-WTB-6PLG/n	
Term	Semester 6	
ECTS credits / Study load in hours / Study time	30 ECTS credits / 840 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	220
	Programmed study time for self-study and internship	620
	<b>Total programmed study time</b>	<b>840</b>
Entry requirements for unit of study	Earned minimum of 135 credits. The learning team coach may decide to deviate from this.	
<b>Content and organisation</b>		
General description	<p>Students work in a multidisciplinary Professional Learning Community that consists of (international) students, lecturers, researchers and experts, with whom they work together to develop knowledge by means of applied research with the aim of generating solutions for issues from industry: Students work on subjects within the Engineering themes: Sustainable Electrical Energy, Smart Industry and Health Technology.</p> <p>The knowledge areas to be developed are Integrated Design &amp; Engineering and Modelling &amp; Simulation. Further specialisation is also offered in the field of mechanical engineering. Supporting workshops are available for e.g. professional skills and intercultural skills.</p> <p>If there are international students participating, the official language in this semester will be English.</p>	
Exit qualifications	C1 Analysis (2) C2 Design (3) C3 Realisation (2) C4 Control (2)	C5 Management (2) C6 Consultation (2) C7 Research (2) C8 Professionalisation (3)
Professional tasks	BT1 Mechanical Development BT2 Energy Development	
Relationship	See also curriculum diagram.	
Activities and/or instructional formats	Participation in PLC (professional learning community) with alternating periods of multidisciplinary project work and specialisation of knowledge. The following instructional formats can be used: Professional Learning Community Workshops Conferences Lectures and guest lectures	
Required literature / description of learning material	(Not applicable for Mechanical Engineering students started in 2019-2020 Academic year or in 2020-2021 Academic year.) Within the PLC, students decide which literature they	

	need together with their lecturers and the company supervisors. They also decide together which learning material is needed to carry out the project/research. The lecturer monitors the level of the literature and learning material.
Required software / required materials	Within the PLC, students decide which software they need together with their lecturers and the company supervisors. They also decide together which material is needed to carry out the project/research.
<b>Examinations</b>	
Assessment dimensions:	<p><b>Project</b></p> <ul style="list-style-type: none"> <li>• Attitude and development</li> <li>• Project skills</li> <li>• Design process &amp; product creation</li> </ul> <p><b>Expert sessions</b></p> <ul style="list-style-type: none"> <li>• The student knows how to ask the right questions, can collect and interpret information in the field of <i>Integrated Design, Modelling and Mechanical Engineering</i>.</li> <li>• The student can apply knowledge in the field of <i>Integrated Design, Modelling and Mechanical Engineering</i> to selected cases and within the project context where applicable.</li> <li>• Students have the skills to transfer information, provide consultation and lead a workshop or give a presentation.</li> </ul>
<b>Name of exam/modular exam</b>	<b>Project (PRJ)</b>
English name exam/modular exam	Project (PRJ)
Code of modular exam	PRJ6-V
Assessment criteria	<p>The student demonstrates an inquisitive, critical attitude:</p> <ul style="list-style-type: none"> <li>• Sympathising and asking the right questions.</li> <li>• Acting proactively and responsibly.</li> <li>• Reflecting on progress and results.</li> <li>• Dealing with uncertainties.</li> </ul> <p>The student works on self-development:</p> <ul style="list-style-type: none"> <li>• Personal development, also within the field</li> <li>• Taking feedback on board</li> </ul> <p>The student works effectively with others:</p> <ul style="list-style-type: none"> <li>• Effective use of the various disciplines in the project</li> <li>• Questioning and supporting team members</li> <li>• Giving feedback</li> </ul> <p>The student can manage with a methodical approach:</p> <ul style="list-style-type: none"> <li>• Apply Agile project &amp; visual management (main planning, events, sprints, daily stand up meetings, visualisation of goals)</li> </ul> <p>The student communicates effectively:</p> <ul style="list-style-type: none"> <li>• Advising and involving stakeholders</li> <li>• Presenting interim and final results to stakeholders</li> </ul> <p>The student analyses and defines:</p> <ul style="list-style-type: none"> <li>• Identification of problem, research objectives (incl.</li> </ul>

	<p>main &amp; sub questions)</p> <ul style="list-style-type: none"> <li>• Selection of theory and applied research methods</li> <li>• Data acquisition and interpretation</li> </ul> <p>The student creates and takes responsibility for this:</p> <ul style="list-style-type: none"> <li>• various well-thought-out solutions to the problem</li> <li>• developing solutions for concepts, keeping in mind course-specific aspects</li> <li>• methodical design selection</li> <li>• appropriately use components, processes, methods, norms and standards</li> </ul> <p>The student evaluates and suggests improvements:</p> <ul style="list-style-type: none"> <li>• production of prototypes</li> <li>• proposing design improvements based on conclusions from test/simulation/research</li> </ul>
Exam and modular exam format(s)	PP (Professional product) individual assessment oral assessment
Weighting factor for modular exams	3
Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	1 examiner (with input from experts)
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Integrated Design</b>
English name exam/modular exam	Integrated Design
Code of modular exam	ID-V
Assessment criteria Assessment model WTB S6–to follow	<ul style="list-style-type: none"> <li>• The student can master subjects such as the following and apply them in a meaningful way: Addressing and integrating all relevant aspects when designing a new product or system: <ul style="list-style-type: none"> <li>• Product/system life cycle</li> <li>• Abstraction levels (form, structure, function)</li> <li>• Disciplines/processes</li> </ul> </li> </ul> <p>Here the student demonstrates a learning attitude.</p>
Exam and modular exam format(s)	PP (Professional product) individual assessment oral assessment
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	2
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the

	examiner(s).
<b>Name of exam/modular exam</b>	<b>Modeleren</b>
English name exam/modular exam	Modelling
Code of modular exam	MOD-V
Assessment criteria Assessment model WTB S6–to follow	<ul style="list-style-type: none"> <li>The student can master subjects such as the following and apply them in a meaningful way: Simplifying reality in a computational model or (computer) simulation with the goal of copying reality in order to obtain insight into the operation of a system and to produce a better mechanical, energy, control technology, production technology, sustainable or circular design.</li> </ul>
Exam and modular exam format(s) PP (Professional product)	PP (Professional product) individual assessment oral assessment
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	2.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Mechanical Engineering</b>
English name exam/modular exam	Mechanical Engineering
Code of modular exam	ME-V
Assessment criteria Assessment model WTB S6–to follow	<p>The student uses and deepens their knowledge and application of mechanical engineering in a subject of their choice.</p> <p>Assessment is by means of a performance assessment (criterion-based interview) based on approved learning objectives drawn up by the student him/herself.</p> <p>Assessment criteria for the learning objectives:</p> <ul style="list-style-type: none"> <li>The student demonstrates proficiency at level 2 of the competence Analysis (C1) (see course handbook for further specification).</li> <li>The student demonstrates proficiency at level 3 of the competence Design (C2) (see course handbook for further specification).</li> <li>The student is a valuable discussion partner in terms of the chosen learning objectives.</li> </ul>
Exam and modular exam format(s)	PP (Professional product) with CBI individual assessment oral assessment
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	2.

Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Vrij project</b>
English name exam/modular exam	Flexible Project
Code of modular exam	VP-V
Assessment criteria	<p>The student</p> <ul style="list-style-type: none"> <li>• can identify new roles and knowledge for themselves and is able and prepared to master these</li> <li>• is enterprising and inquisitive</li> <li>• plans and executes a self-selected project of at least 80 hours independently (on their own or in a small group) and takes responsibility for this.</li> <li>• reflects on their own learning process and has the learning skills to continuously learn</li> <li>• presents the project in an inspiring way, shows how it was carried out and that the (minimum) 80 hours were effectively spent and how the self-chosen criteria were met.</li> </ul>
Exam and modular exam format(s) PP (Professional product)	PP (Professional product) individual assessment oral assessment
Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 4 term 4
Number of examiners	1.
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner. This modular exam is separate from the PLG-related study activities.
Discussion and review	Discussion and review held in consultation with the examiner(s).



WTB - table – 19 – e-WTB-8AFST

General information		
Changed compared to 2019-2020	<i>Click or type and enter changes. Note: if the assessment has changed, an equivalence or conversion must be given below this table.</i>	
Unit of study name	Afstuderen	
English name of unit of study	Graduation Project	
Unit of study code	e-WTB-8AFST	
Term	Semester 8	
ECTS credits / Study load in hours / Study time	30 ECTS credits / 840 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	12
	Programmed study time for self-study and internship	828
	<b>Total programmed study time</b>	<b>840</b>
Entry requirements for unit of study	<ul style="list-style-type: none"> <li>• At the start of the graduation internship, the student has in principle completed S1 to S6.</li> <li>• The student has permission from the LT coach. The LT coach makes a decision based on the achieved course results. In principle, the student must be able to complete any units of study or minor components not yet completed during the graduation assignment.</li> <li>• The Profile Portfolio has been signed off by the LT coach with a “p” in SIS at the start of semester S8.</li> </ul> <p>- The student makes a proposal for a graduation assignment and has completed the application form.</p> <ul style="list-style-type: none"> <li>• The student has described the assignment in their own words in a basic action plan (max. 3 A4 pages).</li> <li>• The student has approval for the assignment from the ME graduation coordinator.</li> </ul> <p>The exam times listed in this table are based on a graduation assignment starting in February of the academic year in question and ending in June of the same academic year.</p> <p>- As a rule, students can start their graduation assignment 4 times a year, at the start of each term. Alternative starting times always after approval from the graduation coordinator: graduation assignments should be spread over at least 2 terms. The hand-in deadlines are aligned to this.</p>	
Content and organisation		
General description	<p>During the graduation phase, the student works individually on a design, research or advisory assignment in which a complex problem is researched, analysed and solved autonomously. The student must demonstrate they are capable of independently applying the competences acquired during the course in a professional context.</p> <p>It is a test of one’s ability and as such an integrated test in which the student shows they are able to take on the work (professional tasks) of a starting practitioner at university of applied sciences level.</p>	
Exit qualifications	C1 Analysis (3)	C5 Management (2)

	C2 Design* (3) C3 Realisation* (2) C4 Control* (3)	C6 Consultation (2) C7 Research (2) C8 Professionalisation (3)
	* students choose from these three competences.	
Professional tasks	BT1 Mechanical Development BT2 Energy Development BT3 Industrial Automation BT6 Product-oriented development BT7 Operations management BT8 Establishing and changing organisations	
Relationship	The applicable (minimum) 6 competences for the graduation assignment are applied and demonstrated in the graduation assignment. The remaining competences (a maximum of 2: C2, C3 and/or C4) must be demonstrated in the Profile Portfolio at the start of the graduation internship..	
Activities and/or instructional formats	Attend graduation information session, 2x a year: in April and October. Have Profile Portfolio approved by LT coach. Find assignments and have them approved by the graduation coordinator. Project carried out on location with the internship organisation, presentation days and lectures. Presentation and defence at the graduation session.	
Required literature / description of learning material	Not applicable for Mechanical Engineering students started in 2019-2020 Academic year or in 2020-2021 Academic year.	
Required software / required materials	Not applicable.	
<b>Examination</b>		
Assessment dimensions:	<ul style="list-style-type: none"> <li>The student draws up a profile portfolio in which they examine the field of mechanical engineering, reflect on their competence development and describe the learning objectives for the graduation assignment (PPF8-V).</li> <li>Following their Profile Portfolio (competence profile), the student carries out a graduation assignment based on a plan, executes that plan, substantiates it, reports on and presents it. They also reflect on the outcomes and execution of the plan and on the predefined learning objectives (ME GRADUATION ASSIGNMENT).</li> </ul>	
<b>Name of exam/modular exam</b>	<b>Profileringsportfolio afstuderen</b>	
English name exam/modular exam	Profile Portfolio Graduation	
Code of modular exam	PPF8-V	
Assessment criteria	<p>The student:</p> <ul style="list-style-type: none"> <li>presents a picture of themselves and of the professional field in a reflection report.</li> <li>they also reflect on their connection with the professional field, describe where they want to be in the future and motivate their choice of graduation internship (professional task, "cold versus hot ME", sector, type + size of company, international, etc.).</li> <li>makes a personal SWOT analysis, gives a good picture of their own knowledge and skills with respect to personal development</li> </ul>	

	<p>in the professional field (professional development report within the PPF).</p> <ul style="list-style-type: none"> <li>• reflects on the pre-determined learning objectives and their development of the degree competences in the graduation phase.</li> <li>• explains relationship with underlying evidence; competences not included in the graduation assignment must be demonstrated in this portfolio.</li> <li>• formulates new SMART Learning objectives and learning activities for the graduation project.</li> </ul>
Exam and modular exam format(s)	PPF (Profile Portfolio) individual assessment written
Weighting factor for modular exams	0
Minimum result	tick
Exam opportunities	term 2 term 4 if studies progress as intended. In consultation with LT coach (also for other starting dates).
Number of examiners	1 Assessment by LT coach (possibly by supervising lecturer for graduation project; or with other examiner for peer review purposes).
Permitted resources	Not applicable.
Method of registration for exam/registration period	In consultation with LT coach. Submit to InleverApp under the relevant assignment.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>Toets afstuderen</b>
English name exam/modular exam	<b>Graduation project assessment</b>
Code of modular exam	WTB-AFST
Assessment criteria	<ul style="list-style-type: none"> <li>• The student is assessed for all degree course exit qualifications, as mentioned above under "exit qualifications / competences". These assessment criteria are adopted from the national 'Bachelor of Engineering' profile and can be found in the 'Assessment form for graduation assignment', as appendix in the Engineering Graduation Guide.</li> <li>• The student writes an Action Plan (AP) and executes it. The plan contains a detailed description of the project in which a problem is solved by means of a methodical approach.</li> <li>• The student reports on the technical content of the graduation project activities.</li> <li>• The student applies mechanical knowledge and insights to a chosen case study.</li> <li>• The student makes responsible decisions throughout the project by using a quantifiable method.</li> <li>• The student reports (in writing) and presents (orally) in a structured, concise, appropriate and correct manner about the content of the graduation project activities and about the entire graduation internship process.</li> </ul>

	<ul style="list-style-type: none"> <li>The student demonstrates a professional manner of working and reflective skills.</li> </ul> <p>The assessment form can also be found in the digital learning environment.</p>	
Exam and modular exam format(s)	PF (Assessment portfolio)	GM (Graduation meeting)
	individual assessment	individual assessment
	written	oral assessment
Weighting factor for modular exams	1	
Minimum result	5.5	
Exam opportunities	term 4 term 2	
Number of examiners	2	
Permitted resources	Not applicable.	
Method of registration for exam/registration period	<p>The draft report is reviewed by the supervising lecturer no later than 2 weeks before the submission deadline so they can give feedback. The lecturer gives an estimate of whether the final report is suitable for assessment.</p> <p>The Engineering Business Relations and Placement Office organises and plans the sessions if no cancellations are made. Submit final report online in InleverApp.</p>	
Discussion and review	<p>Feedback on final results will be given straight after the session. Review of written assessment forms at the request of the student and by appointment with the examiners.</p> <p>If the graduation internship is not given a sufficiently positive assessment, the resit will generally take place in the next round.</p>	

### 9.3 Minors of the degree course

ME - table – 20 – Minor Machinebouw (M\_W-M-MB-VT)

General information		
Changed compared to 2019-2020		
Unit of study name	Machinebouw (voltijd)	
English name of unit of study	Machine Construction (full-time)	
Unit of study code	W-M-MB-VT/1	
Term	Semester 7	
ECTS credits / Study load in hours / Study time	30 ECTS credits / 840 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	300
	Programmed study time for self-study and internship	540
	<b>Total programmed study time</b>	<b>840</b>
Entry requirements for unit of study	<ul style="list-style-type: none"> <li>• University of applied sciences student of Mechanical Engineering.</li> <li>• Prior knowledge of dynamics (kinematics), strength of materials, materials science, 3D-CAD drawing, propulsion technology, project-based work, communication.</li> <li>• The required level of this prior knowledge (main phase 2nd and 3rd year).</li> <li>• Experience with real-life case studies and external clients.</li> </ul>	
Content and organisation		
General description	<p>From client request to machine. This is the central theme of the mechanical engineering minor. You learn how you design complex machines in this minor. This not only refers to the functionality of the machine, but also the interaction between people and the machine and the life cycle of the machine.</p> <p>General set-up: groups of students (no more than 5) design a machine for an external customer. This could be anything from a crane to a copier. All these machines have as the common denominator that they are driven and are dynamically loaded. Educational activities are also offered in addition to the project to ensure a good design is possible. The knowledge gained within this context will enable students to bring their design qualities to a higher level.</p>	
Exit qualifications	C1 Analysis (3) C2 Design (3)	C5 Management (2) C7 Research (3) C8 Professionalisation (3)
Professional tasks	BT1 Mechanical Development	
Relationship	Semester 3 and Semester 5 (see also curriculum overview).	
Activities and/or instructional formats	Lectures, guest lectures, real-life assignment/project.	
Required literature / description of	Not applicable for Mechanical Engineering students started	

learning material	in 2019-2020 Academic year or in 2020-2021 Academic year.
Required software / required materials	Not applicable.
<b>Examination</b>	
Assessment dimensions:	<p>Both individual (exams and performance assessment) and per group (project)</p> <ul style="list-style-type: none"> <li>• The student has knowledge and skills in the field of dynamics and strength.</li> <li>• The student has knowledge and skills in the field of propulsion technology and mechanical components.</li> <li>• The student draws up an extensive project plan (AP), including detailed planning, which shows knowledge of the problem area and insight into the assignment.</li> <li>• On the basis of a problem analysis and research into possible solutions, the student presents a well-founded conceptual choice. This then forms the basis for the further engineering of the solution.</li> <li>• The student uses knowledge, insight and judgement to design a solution that the client can use to address the problem.</li> <li>• The verbal and written communication about the technical realisation of the result is clear, effective and efficient.</li> <li>• The student has knowledge and insight in the field of machine and equipment construction and applies it to a case study.</li> <li>• The student can substantiate all their design choices and can assess the value of the results of their own work.</li> <li>• The student writes clear reports.</li> </ul>
<b>Name of exam/modular exam</b>	<b>KT Machinebouw-1</b>
English name exam/modular exam	KT Machine Construction-1
Code of modular exam	KT MB-1
Assessment criteria	<ul style="list-style-type: none"> <li>• The student has knowledge of and insight into strength and stiffness theory (e.g. principal stresses, maximum shear force, failure hypothesis).</li> <li>• The student has knowledge of and insight into dynamic systems aimed at kinematic analyses (relative speeds and accelerations).</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 1 term 2
Number of examiners	2
Permitted resources	Formula sheets Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models).
Method of registration for	Registration for the modular exam through SIS. The

exam/registration period	registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>BP Plan van Aanpak</b>
English name exam/modular exam	PP Action Plan
Code of modular exam	BP PvA
Assessment criteria	<ul style="list-style-type: none"> <li>• Problem and objective have been drawn up based on thorough investigation.</li> <li>• The project assignment and boundaries have been formulated in such a way that it is completely clear to the client what will and will not be carried out by the project group.</li> <li>• Activities are formulated in such a way that the client gains insight into the work method that will be used.</li> <li>• Risks and control measures have been identified.</li> <li>• Realistic planning that identifies the products and milestones to be delivered; schedule has also been followed.</li> </ul>
Exam and modular exam format(s)	PP (Professional product) group assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 1 term 2
Number of examiners	1
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>P Conceptkeuze (design review)</b>
English name exam/modular exam	P Draft Choice (design review)
Code of modular exam	P DESIGN
Assessment criteria	<ul style="list-style-type: none"> <li>• Based on a complete set of requirements (schedule of requirements), extensive research has been performed into the contemplated operation (functions) of the machine (parts) to be designed.</li> <li>• Sufficient function fulfillers (working methods) have been defined for each subfunction.</li> <li>• A sufficient quantity of concepts will be elaborated further in a general manner to obtain realistic design structures.</li> <li>• Based on the schedule of requirements, the most suitable design structure will be selected methodically and form the basis for the further engineering of the solution.</li> </ul>
Exam and modular exam format(s)	P (Product) group assessment

	written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 1 term 2
Number of examiners	1
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>KT Machinebouw-2</b>
English name exam/modular exam	KT Machine Construction 2
Code of modular exam	KT MB-2
Assessment criteria	<ul style="list-style-type: none"> <li>• The student has knowledge of and insight into hydraulic systems.</li> <li>• The student has knowledge of and insight into mechanical engineering systems focusing on calculation and dimensioning of mechanical engineering parts.</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 2 term 3
Number of examiners	2
Permitted resources	Formula sheets Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models).
Method of registration for exam/registration period	Registration for the modular exam through SIS. The registration period is several weeks prior to the exam period or the resit period. The period is shown in the academic calendar.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>BP Project-rapportage en Presentatie</b>
English name exam/modular exam	PP Project Reports and Presentation
Code of modular exam	BP RAP
Assessment criteria	<ul style="list-style-type: none"> <li>• Current mechanical engineering knowledge and insight can be demonstrated for the design of the proposed solution.</li> <li>• Dimensioning choices are substantiated with sufficient complex and in-depth calculations.</li> <li>• Design choices are demonstrably linked to the requirements and design specifications in a methodical manner.</li> <li>• The submitted written work is of a sufficient quality level with regard to formatting and contents and can be used by interested parties.</li> </ul>



	<ul style="list-style-type: none"> <li>• Verifies the design based on the schedule of requirements.</li> <li>• The presentation is convincing to a technically-biased audience.</li> <li>• The message is clear for a technically-biased audience.</li> <li>• A distinction is made between main and side issues.</li> </ul>
Exam and modular exam format(s)	PP (Professional Product) and PR (Presentation) group assessment written and oral
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 2 term 3
Number of examiners	1
Permitted resources	Not applicable.
Method of registration for exam/registration period	You do not need to formally register for (professional) products. For resits, contact the examiner.
Discussion and review	Discussion and review held in consultation with the examiner(s).
<b>Name of exam/modular exam</b>	<b>PF+G Performance Assessment</b>
English name exam/modular exam	PF+G Performance Assessment
Code of modular exam	PF+G PA
Assessment criteria	<p><i>Constructs for stiffness</i></p> <p>The student:</p> <ul style="list-style-type: none"> <li>• substantiates the selection form for the structure or parts thereof.</li> <li>• substantiates the implementation of connections.</li> <li>• substantiates the choice of bearings, conductivities and elastic elements.</li> <li>• pays attention to eigenfrequencies.</li> <li>• creates (a) good 2D-drawing(s).</li> <li>• systematically chooses materials based on relevant properties.</li> <li>• selects heat and/or surface treatments.</li> <li>• uses material coding in accordance with the standards.</li> </ul> <p><i>Makes FEM and/or manual calculations.</i></p> <p>The student:</p> <ul style="list-style-type: none"> <li>• makes correct FBD fixings, mesh (optimal).</li> <li>• shows several load cases.</li> <li>• calculates static strength and static stiffness.</li> <li>• calculates dynamic eigenfrequencies.</li> <li>• draws transverse forces and moment lines.</li> <li>• calculates equivalent stresses.</li> <li>• makes fatigue calculations.</li> </ul> <p><i>Constructs based on degrees of freedom</i></p> <p>The student:</p> <ul style="list-style-type: none"> <li>• analyses the required degrees of freedom.</li> <li>• constructs while observing the degrees of freedom.</li> </ul>

	• takes thermal effects into account.
Exam and modular exam format(s)	PF (Assessment portfolio) individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 2 term 3
Number of examiners	2
Permitted resources	Not applicable.
Method of registration for exam/registration period	Not applicable.
Discussion and review	Discussion and review held in consultation with the examiner(s).

ME - table – 21 – Minor Wind Energy (M\_W-M-EPM-VT)

General information		
Changed compared to 2019-2020	Various minor adjustments, e.g. entry requirements,	
Unit of study name	Wind Energy Minor (voltijd)	
English name of unit of study	Wind Energy Minor (full-time)	
Unit of study code	Includes three units of study: 1. WEPM – Commerce (WEPM-C) 7,5 EC 2. WEPM - Engineering (WEPM-E/n) 10 EC 3. WEPM – Project (WEPM-PM/n) 12,5 EC	
Term	Semester 7	
ECTS credits / Study load in hours / Study time	30 ECTS credits / 840 hours	
	<b>Study programme</b>	<b>Number of clock hours</b>
	Programmed contact hours	195
	Programmed study time for self-study and internship	645
	<b>Total programmed study time</b>	<b>840</b>
Entry requirements for unit of study	<p>University of applied sciences student in one of the following degree courses or a comparable degree course:</p> <ul style="list-style-type: none"> <li>• Mechanical Engineering</li> <li>• Elektrotechniek</li> <li>• Industrial Design</li> <li>• Industrial Engineering &amp; Management</li> <li>• Architecture and Construction Engineering</li> <li>• Civil Engineering</li> <li>• Automotive Engineering</li> <li>• Environmental Science</li> </ul> <p>If the degree course is not listed here but is comparable, enrolment will be assessed and in most cases admission should not be a problem. External students must have completed the propaedeutic phase and have the required level of prior knowledge at university of applied sciences level (main phase 2nd and 3rd years). Students from Dutch universities of applied sciences must have earned at least 120 ECTS. A student must have permission from their own degree course to start a minor. The minor coordinator assesses the admission of non-HAN students. In doubtful cases, the student may be asked to do an intake. Students participating in the minor are expected to be able to follow classes in English.</p>	
Content and organisation		
General description	<p>The minor consists of three modules, each consisting of three subcourses:</p> <p><b>Commerce</b> (WEPM-C, 7.5 ECTS credits): This module of the Wind Energy minor covers the following subjects: financing, contract management, legal and supply-chain management aspects of (off-shore) wind energy project developments.</p> <p><b>Engineering</b> (WEPM-E/n, 10.0 ECTS credits): This module of the Wind Energy minor covers the following subjects: mechanical engineering, energy yield</p>	

	<p>and civil engineering related construction management aspects of (off-shore) wind energy developments.</p> <p><b>Project</b> (WEPM-PM/n, 12.5 ECTS credits): This module of the Wind Energy minor covers the following subjects: mechanical engineering, energy yield and civil engineering related construction management aspects of (off-shore) wind energy project developments, interface- and risk management.</p>	
Exit qualifications	<p>C1 Analysis (2) C2 Design (2)</p>	<p>C5 Management (2) C6 Consultation (2) C7 Research (2) C8 Professionalisation (2)</p>
Professional tasks	<p>BT2 Energy Development BT7 Operations management BT8 Establishing and changing organisations BT9 Entrepreneurship</p>	
Relationship	Not applicable.	
Activities and/or instructional formats	<p>Lectures, which are listed under contact hours &amp; guest-lectures by companies working in the field which are listed under self-study hours since we are dependent on external speakers &amp; companies when planning this.</p> <p>Working in project teams that are formed during the start of the minor consisting of a team leader, assistant team leader and team members that specialise in specific aspects of (off-shore) wind energy construction projects.</p>	
Required literature / description of learning material	<p>(Not applicable for Mechanical Engineering students started in 2019-2020 Academic year or in 2020-2021 Academic year.) Relevant literature will be provided during the course. This includes references to relevant documentation for wind energy construction projects.</p>	
Required software / required materials	Not applicable.	
<b>Examination</b>		
Assessment dimensions:	<p><i>Important: each module falling under a subject requires a minimum grade of 5.5. The weighting of the modular exams is relative to the module they belong to.</i></p> <p>As mentioned, this module is comprised of three units of study.</p> <p><b>Module Wind Energy – Commerce (WEPM-C, 7.5 ECTS credits):</b> <b>Law</b> (WEPM-C-LW-FC, 1/3rd of module result): At the end of the class the student must have gained the relevant knowledge regarding the subject of law and must be able to:</p> <ul style="list-style-type: none"> <li>• Explain how to obtain the most important permits for a wind energy park in the Netherlands and the duration of such procedures;</li> <li>• Explain how legal rights are warranted in the project and</li> </ul>	

	<p>how they have an effect on the project's timetable;</p> <ul style="list-style-type: none"> <li>• Research and identify the most important types of contract for establishing a wind energy park and explain its most important conditions;</li> <li>• Apply the relevant incoterms;</li> <li>• Explain the most important actions against a party who commits 'breach of contract';</li> <li>• Explain the risks that are involved in wind energy park;</li> <li>• Explain the most important aspects of a Service Level Agreement (SLA);</li> </ul> <p><b>Finance</b> (WEPM-C-LW-FC, 1/3rd of module result): At the end of the class the student must have gained the relevant knowledge regarding the subject of project finance and should be able to:</p> <ul style="list-style-type: none"> <li>• Construct the financial part of the business for the final project of this minor;</li> <li>• Be able to assess the feasibility of this project from a financial perspective;</li> <li>• Establish sound financial models and understand concepts such as PPAs (Power Purchase Agreements)</li> </ul> <p><b>SCM</b> (WEPM-C-SC, 1/3rd of module result): At the end of the class the student must have:</p> <ul style="list-style-type: none"> <li>• All knowledge regarding the subject of processes with the supply or value chain; not only the workings of each process, but also their interactivity and the effect they have on each other</li> <li>• Insight into the elements of optimisation versus sub-optimisation as well as sustainability within supply chains</li> </ul> <p>The student must be able to:</p> <ul style="list-style-type: none"> <li>• Construct an SCM flow chart with regard to the production and assembly of WTGs;</li> <li>• Be able to implement sustainability concepts within supply chains</li> </ul> <p><b>Module Wind Energy – Engineering (WEPM-E/n, 10.0 ECTS credits):</b></p> <p><b>Mechanical Engineering</b> (WEPM-E-ME, 40% of module result): At the end of the class the student must have gained the relevant knowledge regarding the subject of Mechanical Engineering involved in wind turbines. At the end of the course the student must be able to:</p> <ul style="list-style-type: none"> <li>• Understand the concept of the power generation from wind including aerodynamic principles and the main forces acting on a wind turbine</li> <li>• Discriminate all the different parts used in the construction or assembly of a WTG and assess their importance</li> <li>• Have an understanding of mechanics acting in a WTG</li> </ul> <p><b>Construction</b> (WEPM-E-CS, 30% of module result): At the end of the class the student must have gained the relevant knowledge regarding construction of WTG farms. The</p>
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	<p>student must:</p> <ul style="list-style-type: none"> <li>• Have a basic understanding of construction aspects in WTG parks including building, operation &amp; maintenance concept, decommissioning and transmission to the grid;</li> <li>• Be able to distinguish between different WTG types, based upon overall specifications;</li> <li>• Have a basic understanding of the applications, functions and use of the public electrical power grid and the relevant components used therein;</li> <li>• Have a basic understanding of which other electrical and auxiliary components are used around WTGs.</li> </ul> <p><b>Energy (WEPM-E-EN, 30% of module result):</b> At the end of the class the student must have gained the relevant knowledge regarding energy generation by WTGs. This includes a general understanding of the working of electrical components as well as understanding how to calculate the energy yield of wind turbines including factoring in uncertainty. At the end of the class the student must:</p> <ul style="list-style-type: none"> <li>• Have a basic understanding of electrical aspects involved and WTG energy generation yield</li> <li>• Be able to distinguish between different WTG types, based upon global electrical and power specifications;</li> <li>• Have a basic understanding of which other electrical components are used in and around WTG.</li> <li>• Understand how energy yield is calculated and how to factor in uncertainty.</li> </ul> <p><b>Module Wind Energy – Project (WEPM-PM, 12.5 ECTS credits):</b>  This module has three modular exams:: (WEPM-P-PM, WEPM-P-MS, WEPM-P-FR, 20%, 30% and 50% respectively of the result of this module).  The main objective of this minor is to aid students and their teams in successfully designing, organising, managing and implementing a wind park within a determined budget and time span. The secondary objective is to research an innovation, either technical or commercial, that may be applicable in wind park development in the near future.</p> <p>The report should give a general survey of everything the team produced. This report will be presented by project teams; students will be assessed in pairs on their knowledge of the report and the subject of off-shore wind energy, for which they get an individual score; and the final report the project teams produced will be assessed.</p>
<b>Name of exam/modular exam (part of Commerce module)</b>	<b>Law &amp; Finance</b>
English name exam/modular exam	Law & Finance

Code of modular exam	WEPM-C-LW-FC
Assessment criteria	<p>Relating questions on Law and Finance as stated under <i>beoordelingsdimensies</i>, the student should:</p> <ul style="list-style-type: none"> <li>• Use the correct terminology in the answers.</li> <li>• Apply the correct methodology.</li> </ul> <p>Relating to Finance, the student should be able to:</p> <ul style="list-style-type: none"> <li>• Recognise trends in the wind energy market.</li> <li>• Analyse an annual report of a wind energy supplier.</li> <li>• Construct a cash flow overview of a wind energy project.</li> <li>• Establish risk awareness (project, exchange, interest rate and political risks).</li> <li>• Formulate decision criteria for an investment in a wind energy project (PBP, ROI, NPV, IRR and BET).</li> <li>• Have knowledge on financial sourcing for a wind energy project and selling energy using PPAs.</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	2
Minimum result	5.5
Exam opportunities	term 1 term 2
Number of examiners	1
Permitted resources	Non-graphing calculator, English dictionary.
Method of registration for exam/registration period	Enrolment is automatic for everyone participating in the minor.
Discussion and review	Appointment with teacher or during class if possible.
Assessment criteria	<p>Relating questions on SCM as stated under <i>assessment dimensions</i>, the student should:</p> <ul style="list-style-type: none"> <li>• Use the correct terminology in the answers.</li> <li>• Apply the correct methodology.</li> </ul>
<b>Name of exam/modular exam (part of Commerce module)</b>	<b>International Supply Chain Management (SCM)</b>
English name exam/modular exam	International Supply Chain Management (SCM)
Code of modular exam	WEPM-C-SC
Assessment criteria	<p>Relating questions on SCM as stated under <i>assessment dimensions</i>, the student should:</p> <ul style="list-style-type: none"> <li>• Use the correct terminology in the answers.</li> <li>• Apply the correct methodology.</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 2 term 2
Number of examiners	1
Permitted resources	Non-graphing calculator, English dictionary.
Method of registration for exam/registration period	Enrolment is automatic for everyone participating in the minor.

Discussion and review	Appointment with teacher or during class if possible.
<b>Name of exam/modular exam (part of Engineering module)</b>	<b>Mechanical Engineering</b>
English name exam/modular exam	Mechanical Engineering
Code of modular exam	WEPM-E-ME
Assessment criteria	The following criteria are evaluated: <ul style="list-style-type: none"> <li>• Basic mechanical engineering calculations for WTGs.</li> <li>• Understanding of aerodynamic concepts and forces acting on a WTG.</li> <li>• Recognising and understanding mechanical engineering principles relating to WTGs.</li> <li>• Recognising and understanding all machinery functions</li> </ul> Understanding basics of energy conversions that occur.
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	4
Minimum result	5.5
Exam opportunities	term 1 term 2
Number of examiners	1
Permitted resources	Non-graphing calculator, English dictionary.
Method of registration for exam/registration period	Enrolment is automatic for everyone participating in the minor.
Discussion and review	Appointment with teacher or during class if possible.
<b>Name of exam/modular exam (part of Engineering module)</b>	<b>Construction</b>
English name exam/modular exam	Construction
Code of modular exam	WEPM-E-CS
Assessment criteria	The following criteria are evaluated: <ul style="list-style-type: none"> <li>• Recognising and understanding WTG farm principles including building, operation &amp; maintenance concept, decommissioning and transmission to the grid;</li> <li>• Recognising different WTG types, based upon overall specifications;</li> <li>• Demonstrate a basic understanding of the applications, functions and use of the public electrical power grid and the relevant components used therein;</li> <li>• Show a basic understanding of which auxiliary components are used around WTGs.</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	3
Minimum result	5.5
Exam opportunities	term 1 term 2
Number of examiners	1
Permitted resources	Non-graphing calculator, English dictionary.
Method of registration for	Enrolment is automatic for everyone participating in the



exam/registration period	minor.
Discussion and review	Appointment with teacher or during class if possible.
<b>Name of exam/modular exam (part of Engineering module)</b>	<b>Energy</b>
English name exam/modular exam	Energy
Code of modular exam	WEPM-E-EN
Assessment criteria	<p>The following is evaluated</p> <ul style="list-style-type: none"> <li>• Calculation of energy yield based on wind data information and wind turbine characteristics</li> <li>• Understanding of the most important electrical power engineering concepts and performance of basic electrical power engineering calculations;</li> <li>• Discrimination between different WTG types, based on global electrical and power specifications and performance of basic calculations on energy yield.</li> <li>• Understanding and ability to apply in calculations the concept of uncertainty on energy yield using wind distributions, power curves, Weibull distributions, standard deviations in datasets to determine P90 from P50 values and vice-versa.</li> <li>• Basic understanding of which other electrical components are used in and around WTG and how they work.</li> </ul>
Exam and modular exam format(s)	Theoretical exam individual assessment written
Weighting factor for modular exams	3
Minimum result	5.5
Exam opportunities	term 2 term 2
Number of examiners	1
Permitted resources	Non-graphing calculator, English dictionary.
Method of registration for exam/registration period	Enrolment is automatic for everyone participating in the minor.
Discussion and review	Appointment with teacher or during class if possible.
<b>Name of exam/modular exam (part of Project module)</b>	<b>P.M. Presentation</b>
English name exam/modular exam	P.M. Presentation
Code of modular exam	WEPM-P-PM
Assessment criteria	<p>Project teams present their work project report. They get a score for this presentation as a group. The presentation must meet the following criteria:</p> <ul style="list-style-type: none"> <li>• The research question(s) must be answered in full.</li> <li>• Research methodology must be motivated.</li> <li>• Findings and results must be implementable.</li> <li>• All team members must be present and fulfil part of the presentation and must be knowledgeable about the report.</li> <li>• The use of the English language must be sufficient.</li> </ul> <p>If the presentation is deemed insufficient, the group</p>

	presenting is asked to supply a written clarification on sections deemed insufficient by the examiners. The exam form for this resit is a P (Product) for which the presentation serves as the outline and about which the examiners can formulate questions to be answered.
Exam and modular exam format(s)	PR (Presentation) group assessment oral assessment
Weighting factor for modular exams	2
Minimum result	5.5
Exam opportunities	term 2 term 3
Number of examiners	At least 3
Permitted resources	Presentation notes allowed.
Method of registration for exam/registration period	Enrolment is automatic for everyone participating in the minor.
Discussion and review	Students receive feedback scores on their presentation.
<b>Name of exam/modular exam (part of Project module)</b>	<b>M.S. Assessment</b>
English name exam/modular exam	M.S. Assessment
Code of modular exam	WEPM-P-MS
Assessment criteria	<p>In the minor, student assessment interviewing is done in pairs with also two examiners present. Scoring is done individually (except with odd number of students; then a student can be interviewed individually by two examiners).</p> <p>Items that will be evaluated for the individual students:</p> <ol style="list-style-type: none"> <li>1. Level of knowledge about the wind trade;</li> <li>2. Answering of questions (asked to students separately);</li> <li>3. Professionalism (use of language and terminology);</li> <li>4. Power to analyse and interpret;</li> <li>5. Disposition (professional attitude, logical presentation build-up, degree of ease and relaxation).</li> </ol> <p>The assessment will be in pairs, or with three students if we have uneven numbers.</p> <p>If the minor student assessment is deemed insufficient, the student is asked to supply a written clarification on sections deemed insufficient by the examiners. The exam form for this resit is a P (Product) for which the minor student assessment serves as the outline and about which the examiners can formulate questions to be answered.</p>
Exam and modular exam format(s)	CBI (criterion-based interview) individual assessment oral assessment
Weighting factor for modular exams	3
Minimum result	5.5
Exam opportunities	term 2 term 3
Number of examiners	2

Permitted resources	English dictionary.
Method of registration for exam/registration period	Enrolment is automatic for everyone participating in the minor.
Discussion and review	Students receive feedback scores on their assessment.
<b>Name of exam/modular exam (part of Project module)</b>	<b>Final Report</b>
English name exam/modular exam	Final Report
Code of modular exam	WEPM-P-FR
Assessment criteria	<p>The students participating in the minor work in project teams that deliver an advisory report on the construction of a large off-shore wind-park. This report is graded per team on the following aspects:</p> <ul style="list-style-type: none"> <li>• Handing in an Action Plan (AP) and Report Outline (RO) containing a table of content and overall structure deemed sufficient in term 1. The submission deadlines in term 1 will be specified in a timetable that will be supplied.</li> <li>• Overall formatting, layout and structure of the report</li> <li>• Quality of research into law, finance, supply chain management, construction aspects, mechanical engineering and energy related research</li> <li>• Outcomes of the report related to the initial research question(s) and criteria that are relevant for tenders of off-shore wind turbine construction projects.</li> </ul> <p>If the final report is deemed insufficient, the group presenting is asked to hand in a revision of the report. For this resit, the examiners can formulate questions to be answered or specify sections to be improved.</p>
Exam and modular exam format(s)	P (Product) group assessment written
Weighting factor for modular exams	5
Minimum result	5.5
Exam opportunities	term 2 term 3
Number of examiners	At least 3
Permitted resources	A template for reporting is supplied by the minor in term 1 as well an overall timetable.
Method of registration for exam/registration period	You do not have to register formally for (professional) products. For resits, you must contact the examiner.
Discussion and review	Students will receive feedback on the Action Plan (AP) and Report Outline (RO) they hand in during term 1. Students receive feedback scores on their final report.

ME - table – 22 – Minor Semi-conductor Packaging (M\_W-M-SPFT)

<b>General information</b>									
Changed compared to 2019-2020	New minor								
Unit of study name	Minor Halfgeleider Packaging (voltijd)								
English unit of study name	Minor Semi-conductor Packaging (full-time)								
Unit of study code	W-M-SPFT								
Term	Spring semester, Semester 7								
Credits/study load in hours	30 ECTS credits / 840 hours								
Study hours (contact hours)	56 course contact hours, 480 workplace learning hours, 140 self-study/specialisation hours: total 676 hours								
Unit of study entry requirements	<ul style="list-style-type: none"> <li>- Part-time: at least two completed main modules in Electrical and Electronic Engineering, Mechanical Engineering, Automotive Engineering, Engineering Physics or Industrial Engineering &amp; Management.</li> <li>- Full-time: Internship completed.</li> <li>- Affinity for the semiconductor industry and a desire to delve into technology in particular.</li> <li>- Sufficient proficiency in English</li> </ul>								
<b>Content and organisation</b>									
General description	<p>This English-taught minor focuses on the design and manufacture of advanced semi-conductor packaging and assembly techniques and has the following components: Introduction to Semi-conductor Front-End &amp; Packaging; Advanced Packaging, Applications &amp; Markets; Basic Simulation, Prototyping &amp; Testing; Design Quality, Reliability &amp; Economic Sustainability. These topics are complemented by practicals and two specialisation themes from a choice of six: Multi-Constraint Simulation; Advanced Materials; Quality Control &amp; Reliability; Industrialization &amp; Equipment; Testing; Data Analysis. The minor will be concluded with a multidisciplinary project. On completion, the student can fully collaborate and communicate with experts from the semi-conductor industry in general and from the semi-conductor assembly and packaging community in particular.</p>								
Exit qualifications	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">C1 Analysis (3)</td> <td style="width: 50%;">C5 Management (2)</td> </tr> <tr> <td>C2 Design (2)</td> <td>C6 Consultation (2)</td> </tr> <tr> <td>C3 Realisation (2)</td> <td>C7 Research (3)</td> </tr> <tr> <td>C4 Control (2)</td> <td>C8 Professionalisation (2)</td> </tr> </table>	C1 Analysis (3)	C5 Management (2)	C2 Design (2)	C6 Consultation (2)	C3 Realisation (2)	C7 Research (3)	C4 Control (2)	C8 Professionalisation (2)
C1 Analysis (3)	C5 Management (2)								
C2 Design (2)	C6 Consultation (2)								
C3 Realisation (2)	C7 Research (3)								
C4 Control (2)	C8 Professionalisation (2)								
Professional task	<p>BT1 Mechanical Development                      BT6 Product-oriented development                      BT11 User-oriented Design</p>								
Relationship	<p>See curriculum diagram at the beginning of chapter 9. Minor for 4th year students of different technical disciplines. This minor is part of the Bachelor in Mechanical Engineering.</p>								

Activities and/or instructional formats	The minor runs for 2 terms of approx. 10 weeks. A first term with lectures on theory and practical tutorials, and a second term with in-depth material and multidisciplinary projects. The aim of the projects is to design, develop and test a prototype at the Centrum voor IC Technologie or one of its affiliated companies. Parallel to this, there are two in-depth elective subjects, depending on the project and the personal learning needs. They are based on self-study.
Required literature / description of learning material	(Not applicable for Mechanical Engineering students started in 2019-2020 Academic year or in 2020-2021 Academic year.) Course material, documents, articles and references will be provided during the minor.
Required software / required materials	N/a
<b>Examination</b>	
<b>Name of exam/modular exam</b>	<b>Semiconductor Packaging Theory Exam</b>
English name exam/modular exam	Semiconductor Packaging Theory Exam
Code of exam or modular exam	SCP-TT
Assessment criteria	The student demonstrates they have mastered the theory sufficiently. They know the most important concepts and have knowledge of semiconductor manufacturing, assembly and testing, as well as semiconductor package development, simulation and reliability in terms of understanding and application. The student can perform complex calculations on semi-conductor packaging and is able to describe a test setup and test design.
Exam and modular exam format	Theoretical exam individual assessment written
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 3 term 4
Number of examiners	1
Permitted resources	Casio fx-82 calculator (all models), Casio fx-991 (all models) or Texas Instruments TI-30 (all models).
Method of registration for exam or modular exam/registration period	Registration for the written theory modular exam via SIS. The registration period is several weeks prior to the exam or the resit period. The period is shown in the academic calendar.
Discussion and review	See 8.9.1 and 8.9.2.
<b>Name of exam/modular exam</b>	<b>Semiconductor Packaging Project Presentation</b>
English name exam/modular exam	Semiconductor Packaging Project Presentation
Code of exam or modular exam	SCP-PR
Assessment criteria	The student creates and evaluates their technical progress during the minor and shows their improvement. They show a positive work attitude, show initiative and make use of the development opportunities offered. The student communicates clearly and effectively, both

	verbally and non-verbally, and can work well with fellow students and professionals. They show they can plan, work according to plan , and adapt where and when necessary. The student is able to give and receive constructive criticism, and to adapt their behaviour accordingly. They show they are able to give a presentation with a logical structure, correct structure and valid arguments. The student clearly indicates what their individual contribution has been in the team and clearly shows they have mastered the in-depth theoretical topics.
Exam and modular exam format	Group presentation with criterium-based interview and feedback processing Individual assessment Oral exam
Weighting factor for modular exams	1
Minimum result	5.5
Exam opportunities	term 4 term 4
Number of examiners	A (1) HAN examiner with a (1) consulting semi-conductor packaging expert
Permitted resources	N/a
Method of registration for exam or modular exam/registration period	No formal registration is required for this modular exam. For the resit, contact the examiner.
Discussion and review	See 8.9.1 and 8.9.2.

#### 9.4 Graduation specialisations

Not applicable.

#### 9.5 Honours, talent and bridging programmes

##### 9.5.1 Honours programmes

Not applicable.

##### 9.5.2 Talent programmes

Not applicable.

##### 9.5.3 Bridging programmes

See Part 2 Section 5.4

#### 9.6 Part-time and/or work-study degree format

##### 9.6.1 Part-time degree format

Not applicable.

##### 9.6.2 Work-study degree format

Not applicable.

#### 9.7 Tracks with special feature

##### 9.7.1 Fast track

Not applicable.

##### 9.7.2 Abridged track

Not applicable.

##### 9.7.3 Abridged track from associate to bachelor degree

Not applicable.

##### 9.7.4 Track for elite athletes

Not applicable.

##### 9.7.5 D-stream

Not applicable.

##### 9.7.6 Combined track

Not applicable.

##### 9.7.7 Other track with special feature

Not applicable.

