

**APPENDIX**

**to the**

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

**2022-2023 academic year**

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

Date of most recent adoption by dean	June 30, 2022
Date of most recent consent by school council	June 17, 2022
Date of most recent consent by degree committee	June 30, 2022

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.

Overview of all the study units in the propaedeutic phase

semester	periode	code	naam	aantal studiepunten
1	1	e-WTB-1PRJa	Project 1a: windmolen	5
1	1+2	e-WTB-1CRS1a	Course 1a: mechanisch ontwerpen	5
1	1	e-WTB-1CRS2a	Course 2a: mechanische berekeningen	5
1	2	e-WTB-1PRJb	Project 1b: windmolen	5
1	2	e-WTB-1CRS1b	Course 1b: mechanisch ontwerpen	5
1	2	e-WTB-1CRS2b	Course 2b: mechanische berekeningen	5
2	3	e-WTB-2PRJa/n	Project 2a: Energetisch ontwerpen	5
2	3	e-WTB-2CRS1a	Course 1a: Energetisch ontwerpen	5
2	3	e-WTB-2CRS2a	Course 2a: Energetisch ontwerpen	5
2	4	e-WTB-2PRJb/n	Project 2b: Energetisch ontwerpen	5
2	4	e-WTB-2CRS1b	Course 1b: Energetisch ontwerpen	5
2	4	e-WTB-2CRS2b	Course 2b: Energetisch ontwerpen	5

Overview of all the study units in the propaedeutic phase

semester	periode	code	naam	aantal studiepunten
3	1+2	e-WTB-3PRJ	Project: Mechanisch ontwerpen	15
3	1+2	e-WTB-3CRS	Course: Mechanisch ontwerpen	15
4	3+4	e-WTB-4PRJ	Project 4: Design of Energy Systems	15
4	3+4	e-WTB-4CRS	Course 4: Energy- & Controlsystems	15
5		e-WTB-5STAGE	Stage	30
6	3+4	e-WTB-6CS	S6 CS	5
6	3+4	e-WTB-6PLG/n1	S6 PLG	25
7		Minor naar keuze. Werktuigbouwkunde verzorgt drie minoren, te weten:		
		M_W-M-MB-VT	Minor Machinebouw (voltijd)	30
		M_W-M-SPFT	Minor Semiconductor Packaging (voltijd)	30
8		e-WTB-8AFST	Afstuderen S8	30

## 9.1 Units of study and the propaedeutic phase

Werktuigbouwkunde - tabel 1 - e-WTB-1CRS1a

<b>General information</b>	
Changes compared to previous academic year	No changes.
Long Dutch name of unit of study (OSIRIS)	Course 1a: mechanisch ontwerpen
Long English name of unit of study (OSIRIS)	Course 1a: Mechanical Engineering
Short Dutch name of unit of study (OSIRIS)	WTB S1 Mechanisch ontwerpen 1a
Short English name of unit of study (OSIRIS)	WTB S1 Mechanical Engineering 1a
Alluris unit of study Dutch name	Course 1a: mechanisch ontwerpen
Alluris unit of study English name	Course 1a: Mechanical Engineering
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-1CRS1a
Term	P1 S1
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	5
Study load in hours	140
Contact hours	Geprogrammeerde contacttijd 42 uur.
Unit of study entry requirements	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, materials science and production technologies.
Exit qualifications	C2 Design (1) C3 Realisation (1)
Cohesion	The other two units of study in term 1 are related to this unit to a greater or lesser degree. (See also curriculum diagram).
Mandatory participation	Nee (No)
Activities and/or instructional formats	Classroom lessons.
Required literature / description of 'learning material'	<ul style="list-style-type: none"> <li>• Simmons, C. H. Manual of Engineering Drawing.</li> <li>• Micheal Ashby e.a.: Materials: Engineering, Science, Processing and Design</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>• Granta Edupack, Granta Design</li> <li>• Solid Works</li> </ul> See study resource list for a full description.
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<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Computer Aided Design 1 - Werktuigbouwkundig Ontwerpen 1</b>
English name (modular) exam (OSIRIS)	Computer Aided Design 1 - Mechanical Engineering Design 1
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Computer Aided Design 1 - Werktuigbouwkundig Ontwerpen 1
English name (modular) exam (Alluris)	Computer Aided Design 1 - Mechanical Engineering Design 1
Alluris Code (modular) exam	CAD1-WON1-V
Assessment dimensions or learning outcomes	The student can draw a mechanical design in a computer aided design program (CAD) and select appropriate materials and processes.
Assessment criteria	The student: <ul style="list-style-type: none"> <li>• can use the sketch function and associated tools to extrude and revolve shapes and make adjustments to these.</li> <li>• can make a technical drawing with the projections of a part.</li> <li>• can determine the right cross-section and special views of a component and place them on a technical drawing.</li> <li>• has knowledge of and insight into the basic principles of designing a technical drawing: scale, paper size, views and cross-section.</li> <li>• has knowledge of and insight into choices regarding dimensioning, primary dimensions, F dimensions (functional dimensions), incremental dimensions, parallel dimensions.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2
Number of examiners	2
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 registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.

Discussion and review	See Part 2 - 8.9.1 and 8.9.2.
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<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Materiaalkunde 1 - Productietechnieken 1</b>
English name (modular) exam (OSIRIS)	Materials Science 1 – Production Technologies 1
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Materiaalkunde 1 - Productietechnieken 1
English name (modular) exam (Alluris)	Materials Science 1 – Production Technologies 1
Alluris Code (modular) exam	MAT1-PTEC1-V
Assessment dimensions or learning outcomes	The student can draw a mechanical design in a computer aided design (CAD) program and select appropriate materials and processes.
Assessment criteria	<p>The student:</p> <ul style="list-style-type: none"> <li>• understands the role of material selection in the design process.</li> <li>• has a global overview of materials and production processes.</li> <li>• knows the definitions and units of and the relationship between the basic concepts.</li> <li>• can apply the basic concepts (of material science and production technology) in simple situations.</li> <li>• can draw and interpret a tensile curve.</li> <li>• understands atom and molecule structures in relation to material properties.</li> <li>• knows the basic functionalities of Granta EduPack.</li> <li>• has knowledge of and insight into the history, design and characteristics of production technologies.</li> <li>• has knowledge of and insight into the archotyping, remodelling, separating and machining metalworking techniques.</li> <li>• can make application choices.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2
Number of examiners	2
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 word list translating English word into the native language of the student (only translations, not definitions).</li> <li>• PTEC1: formula list (will be provided).</li> </ul>
Method of registering for exam or modular exam opportunities	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period

registration period Up to 31 January 2023 (via Alluris)	or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

Werktuigbouwkunde - tabel 2 - e-WTB-1CRS1b

<b>General information</b>	
Changes compared to previous academic year	Not applicable.
Long Dutch name of unit of study (OSIRIS)	Course 1b: mechanisch ontwerpen
Long English name of unit of study (OSIRIS)	Course 1b: Mechanical Engineering
Short Dutch name of unit of study (OSIRIS)	WTB S1 Mechanisch Ontwerpen
Short English name of unit of study (OSIRIS)	WTB S1 Mechanical Engineering
Alluris unit of study Dutch name	Course 1b: mechanisch ontwerpen
Alluris unit of study English name	Course 1b: Mechanical Engineering
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-1CRS1b
Term	P2 S1
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	5
Study load in hours	140
Contact hours	Geprogrammeerde contacttijd 53 uur.
Unit of study entry requirements	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)
Cohesion	The other two units of study in term 2 are related to this unit to a greater or lesser degree. (See also curriculum diagram).
Mandatory participation	Nee (No)
Activities and/or instructional formats	Classroom lessons and learning team.
Required literature / description of 'learning material'	<ul style="list-style-type: none"> <li>• Micheal Ashby: Materials: Engineering, Science, Processing and Design</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, Granta design</li> <li>• Solid Works</li> </ul> See study resource list for a full description.



Dutch name (modular) exam (OSIRIS)	Computer Aided Design 2
English name (modular) exam (OSIRIS)	Computer Aided Design 2
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Computer Aided Design 2
English name (modular) exam (Alluris)	Computer Aided Design 2
Alluris Code (modular) exam	CAD2-V
Assessment dimensions or learning outcomes	The student <ul style="list-style-type: none"> <li>• can draw a mechanical design and select appropriate materials and processes.</li> <li>• makes progress in their professional development.</li> </ul>
Assessment criteria	The student: <ul style="list-style-type: none"> <li>• can work with assemblies, both top-down and bottom-up.</li> <li>• can dimension a technical drawing.</li> <li>• can create a picture package for a simple product.</li> <li>• can work with special features: mirror, chamfer, fillet, rib, loft and pattern.</li> <li>• 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>• 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>• can draw up a complete and correct BOM (partslist) on a welding assembly drawing in accordance with the combination principle.</li> </ul>
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3
Number of examiners	2
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 registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for	Registration for the modular exam through OSIRIS. The

exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Leerteam 1</b>
English name (modular) exam (OSIRIS)	Learning Team 1
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Leerteam 1
English name (modular) exam (Alluris)	Learning Team 1
Alluris Code (modular) exam	LT1-V
Assessment dimensions or learning outcomes	Student shows how he has developed personally, content related and professionally and he controls how to give effect to his own learning process.
Assessment criteria	The student: <ul style="list-style-type: none"> <li>• can evaluate S1 and reflect on himself.</li> <li>• can name several points for personal development for S2 on the basis of feedback received in S1 and (self) reflection on this.</li> <li>• can convert points for development into (personal) learning objectives.</li> </ul>
Exam and modular exam format(s)	PF (Portfolio) Individual assessment Written
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P2 P3
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Not applicable.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Materiaalkunde 2 - Productietechnieken 2</b>
English name (modular) exam (OSIRIS)	Materials Science 2 - Production Technologies 2
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Materiaalkunde 2 - Productietechnieken 2

English name (modular) exam (Alluris)	Materials Science 2 - Production Technologies 2
Alluris Code (modular) exam	MAT2-PTEC2-V
Assessment dimensions or learning outcomes	The student <ul style="list-style-type: none"> <li>• can draw a mechanical design and select appropriate materials and processes.</li> <li>• makes progress in their professional development.</li> </ul>
Assessment criteria	The student <ul style="list-style-type: none"> <li>• knows the most relevant properties of stiffness and strength.</li> <li>• can determine and validate the specified properties based on experimental results.</li> <li>• can formulate the (fixed and variable) requirements for a design set with regard to the materials that will be selected.</li> <li>• can determine which properties need to be optimised and in which direction this optimisation should be made.</li> <li>• can reach a reasoned selection of a group of suitable materials by using a material database.</li> <li>• has knowledge of and insight into injection moulding processes.</li> <li>• can design for injection moulding processes.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3
Number of examiners	2
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 registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Werktuigbouwkundig Ontwerpen 2</b>
English name (modular) exam (OSIRIS)	Mechanical Engineering Design 2
OSIRIS Code (modular) exam	-
Dutch name (modular) exam	Werktuigbouwkundig Ontwerpen 2

(Alluris)	
English name (modular) exam (Alluris)	Mechanical Engineering Design 2
Alluris Code (modular) exam	WON2-V
Assessment dimensions or learning outcomes	The student can draw a mechanical design and select appropriate materials and processes. The student makes progress in his professional development
Assessment criteria	<p>The student:</p> <ul style="list-style-type: none"> <li>- has knowledge of and insight into concepts: nominal size, size deviation, largest limit size, smallest limit size, dimensional tolerance and clearance.</li> <li>- can calculate tolerances and fits.</li> <li>- has knowledge of and insight into the concept of surface roughness, Ra.</li> <li>- has knowledge of and insight into the meaning of ISO roughness symbols.</li> <li>- can select a surface roughness value based on functionality and production method.</li> <li>- can select tolerances based on the required functionality and production method.</li> <li>- 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>- has knowledge of and insight into fit types: loose, transition and fixed (press or interference) fit.</li> <li>- can select fits based on the required functionality and production method.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3
Number of examiners	1
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 registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part Deel 2 - 8.9.1 and 8.9.2.

Werktuigbouwkunde - tabel 3 - e-WTB-1CRS2a

<b>General information</b>	
Changes compared to previous academic year	No changes.
Long Dutch name of unit of study (OSIRIS)	Course 2a: mechanische berekeningen
Long English name of unit of study (OSIRIS)	Course 2a: Mechanical Calculations
Short Dutch name of unit of study (OSIRIS)	WTB S1 Mechanische berekeningen
Short English name of unit of study (OSIRIS)	WTB S1 Mechanical calculations
Alluris unit of study Dutch name	Course 2a: mechanische berekeningen
Alluris unit of study English name	Course 2a: Mechanical Calculations
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-1CRS2a
Term	P1 S1
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	5
Study load in hours	140
Contact hours	Geprogrammeerde contacttijd 53 uur.
Unit of study entry requirements	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)
Cohesion	The other two units of study in term 1 are related to this unit to a greater or lesser degree. (See also curriculum diagram).
Mandatory participation	Nee (No)
Activities and/or instructional formats	Classroom lessons and in learning team.
Required literature / description of 'learning material'	Hibbeler, R. Engineering Mechanics: Statics in SI Units Reader: Exercises Statics Reader WTO2 (based on the for this course relevant chapters of the book of Budynas, Richard, G. Ise Shigley's Mechanical Engineering Design" Roloff Matek Machine-onderdelen, formuleboek Matek. See study resource list for a full description
Required software / required materials	• SoWiSo See study resource list for a full description.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Mechanica 1 -Wiskunde 1</b>
English name (modular) exam (OSIRIS)	Mechanics 1 - Mathematics 1
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Mechanica 1 -Wiskunde 1
English name (modular) exam (Alluris)	Mechanics 1 - Mathematics 1
Alluris Code (modular) exam	MEC1-WIS1-V
Assessment dimensions or learning outcomes	The student <ul style="list-style-type: none"> <li>• can make calculations in a mechanical design.</li> <li>• progresses in his or her professional development.</li> </ul>
Assessment criteria	The student: <ul style="list-style-type: none"> <li>• can design a full model of a structure showing only the external forces and torques.</li> <li>• can replace support points by forces and torques.</li> <li>• can divide a structure into free bodies, and apply loads.</li> <li>• understands the concepts of two and three force elements.</li> <li>• can resolve and compose forces.can prepare equilibrium equations (sum of forces and torques).</li> <li>• can solve equilibrium equations of various equations with multiple unknowns, including trigonometry.</li> <li>• has mastered mathematical skills in algebra, trigonometric functions and geometric trigonometry.</li> <li>• can apply mathematical skills in simple technical calculations.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2
Number of examiners	2
Permitted resources	Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models).
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Werktuigonderdelen 2</b>
English name (modular) exam (OSIRIS)	Mechanical Components 2
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Werktuigonderdelen 2
English name (modular) exam (Alluris)	Mechanical Components 2
Alluris Code (modular) exam	WTO2-V
Assessment dimensions or learning outcomes	The student <ul style="list-style-type: none"> <li>• can make calculations in a mechanical design.</li> <li>• progresses in his or her professional development.</li> </ul>
Assessment criteria	The student: <ul style="list-style-type: none"> <li>• can select different types of mechanical components and dimensioning. These may be bearings, springs, belt and/or chain transmissions and splined connections.</li> <li>• can select tables and graphs and read the data for components.</li> <li>• can draw up a correct structure sketch of the component for visual support in the calculation.</li> <li>• can use flowcharts.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2
Number of examiners	2
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>• Notes on 1 double-sided piece of A4 paper.</li> </ul>
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

Werktuigbouwkunde - tabel 4 - e-WTB-1CRS2b

<b>General information</b>	
Changes compared to previous academic year	No changes.
Long Dutch name of unit of study (OSIRIS)	Course 2b: mechanische berekeningen
Long English name of unit of study (OSIRIS)	Course 2b: Mechanical Calculations
Short Dutch name of unit of study (OSIRIS)	WTB S1 Mechanische Berekeningen - 2
Short English name of unit of study (OSIRIS)	WTB S1 Mechanical Calculations - 2
Alluris unit of study Dutch name	Course 2b: mechanische berekeningen
Alluris unit of study English name	Course 2b: Mechanical Calculations
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-1CRS2b
Term	P2 S1
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	5
Study load in hours	140
Contact hours	Geprogrammeerde contacttijd 42 uur.
Unit of study entry requirements	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.
Exit qualifications	C2 Design (1)
Cohesion	The other two units of study in term 2 are related to this unit to a greater or lesser degree. (See also curriculum diagram).
Mandatory participation	Nee (No)
Activities and/or instructional formats	Classroom lessons.
Required literature / description of 'learning material'	Hibbeler, R. Engineering Mechanics: Statics in SI Units Hibbeler, R. Mechanics of Materials in SI Units Hibbeler, R. Engineering Mechanics: Dynamics in SI Units Exercises Statics Exercises Dynamics See study resource list for a full description.
Required software / required materials	See study resource list for a full description.
<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Mechanica 2</b>



English name (modular) exam (OSIRIS)	Mechanics 2
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Mechanica 2
English name (modular) exam (Alluris)	Mechanics 2
Alluris Code (modular) exam	MEC2-V
Assessment dimensions or learning outcomes	The student can make calculations in a mechanical design.
Assessment criteria	The student: <ul style="list-style-type: none"> <li>• can draw up a correct free body diagram (FBD) of a design/design parts.</li> <li>• can correctly calculate the internal loads in a design/design parts (pull/pressure, bending and torsion).</li> <li>• can schematically represent the internal loads in a design/design parts in a shear force diagram and on a moment flow line.</li> <li>• can draw up a function procedure for internal loads as a function of a variable location in the design.</li> <li>• can correctly calculate tensions and deformation in a design/design parts (pull/pressure, bending and torsion).</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3
Number of examiners	2
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 (is provided).</li> </ul>
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Mechanica 3</b>
English name (modular) exam (OSIRIS)	Mechanics 3
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Mechanica 3
English name (modular) exam (Alluris)	Mechanics 3

Alluris Code (modular) exam	MEC3-V
Assessment dimensions or learning outcomes	The student can make calculations in a mechanical design.
Assessment criteria	The student: <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>• 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)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3
Number of examiners	2
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 registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Wiskunde 7</b>
English name (modular) exam (OSIRIS)	Mathematics 7
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Wiskunde 7
English name (modular) exam (Alluris)	Mathematics 7
Alluris Code (modular) exam	WIS7-V
Assessment dimensions or learning outcomes	The student can make calculations in a mechanical design.
Assessment criteria	The student performs calculations: <ul style="list-style-type: none"> <li>• with position and force vectors.</li> <li>• dot product</li> </ul>

	<ul style="list-style-type: none"> <li>• cross product</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3
Number of examiners	2
Permitted resources	Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models).
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

Werktuigbouwkunde - tabel 5 - e-WTB-1PRJa

<b>General information</b>	
Changes compared to previous academic year	No changes
Long Dutch name of unit of study (OSIRIS)	Project 1a: windmolen
Long English name of unit of study (OSIRIS)	Project 1a: wind turbine
Short Dutch name of unit of study (OSIRIS)	WTB S1 Project 1a
Short English name of unit of study (OSIRIS)	WTB S1 Project 1a
Alluris unit of study Dutch name	Project 1a: windmolen
Alluris unit of study English name	Project 1a: wind turbine
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-1PRJa
Term	P1 S1
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	5
Study load in hours	140
Contact hours	Geprogrammeerde contacttijd 32 uur.
Unit of study entry requirements	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)
Cohesion	The other two units of study in term 1 are related to this unit to a greater or lesser degree. (See also curriculum diagram).
Mandatory participation	Ja (Yes)
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. Report writing for readers with little time.</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>• Solid Works</li> <li>• Caliper</li> </ul> See study resource list for a full description.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>PRJ1a- Basis Productievaardigheden</b>
English name (modular) exam (OSIRIS)	PRJ1a- Basic Production Skills
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	PRJ1a- Basis Productievaardigheden
English name (modular) exam (Alluris)	PRJ1a- Basic Production Skills
Alluris Code (modular) exam	PRAC3
Assessment dimensions or learning outcomes	The student is able to, under supervision of the teacher, manufacture and assemble a technical product, applying the tools/machines available in the school workshop.
Assessment criteria	The student: <ul style="list-style-type: none"> <li>• prepares the production activities</li> <li>• measures the accuracy of the products/parts</li> <li>• reflects on the measurement and the production steps.</li> </ul>
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2
Number of examiners	2
Permitted resources	Machines/tools at the school workshop
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>PRJ1a Introductie Ontwerpen-V</b>
English name (modular) exam (OSIRIS)	PRJ1a Introduction Design-V
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	PRJ1a Introductie Ontwerpen-V
English name (modular) exam (Alluris)	PRJ1a Introduction Design-V
Alluris Code (modular) exam	PRJ1a-ONTW-V
Assessment dimensions or learning outcomes	The student can carry out a mono-disciplinary project with students from their own degree course.
Assessment criteria	The student: <ul style="list-style-type: none"> <li>• Can, based on given stated requirements, come up with</li> </ul>

	<p>conceptual designs and select one.</p> <ul style="list-style-type: none"> <li>• Can detail the design, based on the selected conceptual design.</li> <li>• Accounts for manufacturability and testability.</li> </ul>
Exam and modular exam format(s)	<p>PD ((Professional)Product) Group assessment Written</p>
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	<p>P1 P2</p>
Number of examiners	2
Permitted resources	Machines/tools at the school workshop
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Professional Skills 1a</b>
English name (modular) exam (OSIRIS)	Professional Skills 1a
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Professional Skills 1a
English name (modular) exam (Alluris)	Professional Skills 1a
Alluris Code (modular) exam	SKILLS1a-V
Assessment dimensions or learning outcomes	The student works together with others on a mono-disciplinary project.
Assessment criteria	<p>The student</p> <ul style="list-style-type: none"> <li>• writes an individual informative text with: the tasks, roles and responsibilities of the chair, minute-taker and participants account of the importance of structured meetings with the BOB and ODAT methods a reflection on his/her own role in project group meetings (written in first person 'I') possible improvements for the meeting.</li> <li>• drafts agenda items in the agenda format provided. Agenda items contain: subject, purpose and time required.</li> <li>• substantiates project decisions once using the minutes format provided. These minutes contain: decisions and their argumentation clearly formulate action points (SMART).</li> </ul>
Exam and modular exam format(s)	<p>PD ((Professional)Product) Individual assessment Written</p>
Weight factor of modular exam	0

Minimum result	Vink (tick)
Exam sittings	P1 P2
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Veilig werken (VCA)</b>
English name (modular) exam (OSIRIS)	Work Safely (VCA)
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Veilig werken (VCA)
English name (modular) exam (Alluris)	Work Safely (VCA)
Alluris Code (modular) exam	VCA1-V
Assessment dimensions or learning outcomes	The student works in a safe manner in the workshop of Mechanical Engineering.
Assessment criteria	The student: <ul style="list-style-type: none"> <li>• Has knowledge of safety regulations at the level of the VCA VOL exam.</li> <li>• Follows safety regulations and uses personal protection equipment.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P1 P2
Number of examiners	1
Permitted resources	None.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Not applicable.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Not applicable.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

Werktuigbouwkunde - tabel 6 - e-WTB-1PRJb

<b>General information</b>	
Changes compared to previous academic year	n.v.t.
Long Dutch name of unit of study (OSIRIS)	Project 1b: windmolen
Long English name of unit of study (OSIRIS)	Project 1b: wind turbine
Short Dutch name of unit of study (OSIRIS)	WTB S1 Project 1b
Short English name of unit of study (OSIRIS)	WTB S1 Project 1b
Alluris unit of study Dutch name	Project 1b: windmolen
Alluris unit of study English name	Project 1b: wind turbine
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-1PRJb
Term	P2 S1
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	5
Study load in hours	140
Contact hours	Geprogrammeerde contacttijd 38 uur.
Unit of study entry requirements	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 driven water pump, 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)
Cohesion	The other two units of study in term 2 are related to this unit to a greater or lesser degree. (See also curriculum diagram).
Mandatory participation	Ja (Yes)
Activities and/or instructional formats	Project and classroom lessons.
Required literature / description of 'learning material'	• Elling, R. Report writing for readers with little time. See study resource list for a full description.
Required software / required materials	• MS Office • Solid Works



	<ul style="list-style-type: none"> <li>• Granta Edupack</li> </ul> See study resource list for a full description.
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<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Project 1b</b>
English name (modular) exam (OSIRIS)	Project 1b
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Project 1b
English name (modular) exam (Alluris)	Project 1b
Alluris Code (modular) exam	PRJ1b-V
Assessment dimensions or learning outcomes	The student works together with others on a mono-disciplinary project.
Assessment criteria	The student: <ul style="list-style-type: none"> <li>• can, based on given stated requirements, come up with conceptual designs and select one and applies the taught design methodology.</li> <li>• can detail the design, based on the selected conceptual design.</li> <li>• accounts for manufacturability and testability.</li> <li>• delivers a design report, indicating a clear red string.</li> </ul>
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Professional Skills 1b</b>
English name (modular) exam (OSIRIS)	Professional Skills 1b
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Professional Skills 1b
English name (modular) exam	Professional Skills 1b

(Alluris)	
Alluris Code (modular) exam	SKILLS1b-V
Assessment dimensions or learning outcomes	The student works together with others on a mono-disciplinary project.
Assessment criteria	<p>The student:</p> <ul style="list-style-type: none"> <li>• prepares the individual project presentation using a planned approach. This is based on audience questions, and structured in: openingbodycloseand links the subject of the presentation to its audience and adapts its content accordingly.</li> <li>• gives an individual presentation:</li> <li>• clearly expresses the point/message of the presentation.</li> <li>• explains why this topic is of interest to the audience of engineers.</li> <li>• starts the presentation with an original opening that grabs the audience's attention.</li> <li>• ends with a strong close.</li> <li>• manages to give a compelling presentation of the content of the topic.</li> <li>• uses appropriate nonverbal communication (tone of voice, eye contact, posture, pace) to support the presentation.</li> </ul>
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written Oral
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P2 P3
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

Werktuigbouwkunde - tabel 7 - e-WTB-2CRS1a

<b>General information</b>	
Changes compared to previous academic year	WIS9 moves from this OWE to e-WTB-2-CRS2b. WIS2-WIS3 moves to this OWE.
Long Dutch name of unit of study (OSIRIS)	Course 1a: Energetisch ontwerpen
Long English name of unit of study (OSIRIS)	Course 1a: Energy System Design
Short Dutch name of unit of study (OSIRIS)	WTB S2 Energetisch ontwerpen 1a
Short English name of unit of study (OSIRIS)	WTB S2 Energy System Design 1a
Alluris unit of study Dutch name	Course 1a: Energetisch ontwerpen
Alluris unit of study English name	Course 1a: Energy System Design
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-2CRS1a
Term	P3 S2
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	5
Study load in hours	140
Contact hours	Geprogrammeerde contacttijd 44 uur.
Unit of study entry requirements	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 engineering, mathematics 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)
Cohesion	The other two units of study in term 3 are related to this unit to a greater or lesser degree. (See also curriculum diagram).
Mandatory participation	Nee (No)
Activities and/or instructional formats	Classroom lessons.
Required literature / description of 'learning material'	Reader 7920 (translated chapters from Dutch book: Van Hoek Elektrotechniek). 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>Dutch name (modular) exam (OSIRIS)</b>	<b>Elektrotechniek 1</b>
English name (modular) exam (OSIRIS)	Electrical and Electronic Engineering 1
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Elektrotechniek 1
English name (modular) exam (Alluris)	Electrical and Electronic Engineering 1
Alluris Code (modular) exam	ELT1-V
Assessment dimensions or learning outcomes	The student has basic knowledge of electrical engineering concepts such as voltage, current, resistance, induction and $\cos(\phi)$ and of devices such as electric motors, transformers and rectifiers and can apply them in practical problems.
Assessment criteria	<ul style="list-style-type: none"> <li>• The student has knowledge of the basic terms used in electrical engineering.</li> <li>• The student is aware of how batteries, fuel cells, solar cells and generators work.</li> <li>• The student can carry out calculations with regard to simple electrical circuits.</li> <li>• The student has knowledge of magnetism and induction.</li> <li>• The student can carry out calculations with regard to transformers, coils and capacitors.</li> <li>• The student understands how motors operate and can carry out simple calculations.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P3 P4
Number of examiners	2
Permitted resources	One A4 double-sided written or typed. NOT permitted are sample exams and calculations of exercises.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Thermodynamica 1</b>
English name (modular) exam (OSIRIS)	Thermodynamics 1
OSIRIS Code (modular) exam	-

Dutch name (modular) exam (Alluris)	Thermodynamica 1
English name (modular) exam (Alluris)	Thermodynamics 1
Alluris Code (modular) exam	TDY1-V
Assessment dimensions or learning outcomes	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.
Assessment criteria	<ul style="list-style-type: none"> <li>• The student has knowledge of energy concepts such as heating value, power, energy, capacity and efficiency.</li> <li>• The student can work with quantities and units from the SI system and use adaptations from other systems.</li> <li>• The student can draw up and calculate a (physical) model.</li> <li>• The student is familiar with the gas law and can use it to perform calculations including with partial pressure and partial volume and gas mixtures.</li> <li>• The student can apply the First Law to a closed system.</li> <li>• The student can apply differentiation and integration in energy calculations.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P3 P4
Number of examiners	2
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 registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Wiskunde 2 en 3</b>
English name (modular) exam (OSIRIS)	Mathematics 2 and 3
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Wiskunde 2 en 3

English name (modular) exam (Alluris)	Mathematics 2 and 3
Alluris Code (modular) exam	WIS2-WIS3-V
Assessment dimensions or learning outcomes	The student is proficient in differentiation and integration calculus and can apply this in a technical context.
Assessment criteria	<p>The student:</p> <ul style="list-style-type: none"> <li>• Is familiar with the derived functions from the standard functions.</li> <li>• Has mastered conventions in formula language and notation.</li> <li>• Has mastered differentiation by using differentiation rules (sum, different, multiple, product, quotient and chain rule).</li> <li>• Can apply differential calculations in mathematical and technical contexts.</li> <li>• 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>• Is familiar with primitives of standard functions.</li> <li>• Can geometrically estimate a particular integral;</li> <li>• Can determine the primitive of simple functions by applying the sum, difference, multiple and substitution rules and partial fraction decompositions;</li> <li>• Can apply and calculate definite and indefinite integrals in mathematical and technical contexts.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P4
Number of examiners	2
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 registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

Werktuigbouwkunde - tabel 8 - e-WTB-2CRS1b

<b>General information</b>	
Changes compared to previous academic year	Not applicable.
Long Dutch name of unit of study (OSIRIS)	Course 1b: Energetisch ontwerpen
Long English name of unit of study (OSIRIS)	Course 1b: Energy System Design
Short Dutch name of unit of study (OSIRIS)	WTB S2 Energetisch ontwerpen 1b
Short English name of unit of study (OSIRIS)	WTB S2 Energy System Design 1b
Alluris unit of study Dutch name	Course 1b: Energetisch ontwerpen
Alluris unit of study English name	Course 1b: Energy System Design
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-2CRS1b
Term	P4 S2
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	5
Study load in hours	140
Contact hours	Geprogrammeerde contacttijd 42 uur.
Unit of study entry requirements	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 CAD and control systems 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)
Cohesion	The other two units of study in term 4 are related to this unit to a greater or lesser degree. (See also curriculum diagram.)
Mandatory participation	Nee (No)
Activities and/or instructional formats	Classroom lessons.
Required literature / description of 'learning material'	<ul style="list-style-type: none"> <li>• Simmons, C. H., Manual of Engineering Drawing</li> <li>• Reader Introduction to automation and logical circuits</li> </ul> See study resource list for a full description.
Required software / required materials	<ul style="list-style-type: none"> <li>• CoDeSys</li> <li>• SolidWorks</li> </ul> See study resource list for a full discription.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Computer Aided Design 3</b>
English name (modular) exam (OSIRIS)	Computer Aided Design 3
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Computer Aided Design 3
English name (modular) exam (Alluris)	Computer Aided Design 3
Alluris Code (modular) exam	CAD3-V
Assessment dimensions or learning outcomes	<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>
Assessment criteria	<p>The student:</p> <ul style="list-style-type: none"> <li>• Can use all the functions of the sheet metal tab and use them to manufacture a more complex sheet steel component.</li> <li>• Can dimension a component for production.</li> <li>• Can dimension for production: functional, incremental and parallel dimensions.</li> <li>• Can work with the Hole Wizard and add annotations for the screw threads.</li> <li>• Has knowledge of and insight into dimensional tolerances and their representation on technical drawings.</li> <li>• Has knowledge of and insight into geometrical tolerances and the ISO fit system and their representation in technical drawing.</li> <li>• 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)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam



from 1 February 2023 (via OSIRIS)	period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Logische Circuits</b>
English name (modular) exam (OSIRIS)	Logical Circuits
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Logische Circuits
English name (modular) exam (Alluris)	Logical Circuits
Alluris Code (modular) exam	LOGCIR-V
Assessment dimensions or learning outcomes	The student has basic knowledge of automation, logic algebra and binary number systems and can formulate and simplify control formulas.
Assessment criteria	<ul style="list-style-type: none"> <li>• The student has knowledge of Boolean algebra.</li> <li>• The student has knowledge of memory elements.</li> <li>• The student can apply the binary number system.</li> <li>• The student has knowledge of simple pneumatic, hydraulic and electrical control.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>PLC 1</b>
English name (modular) exam (OSIRIS)	PLC 1
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	PLC 1
English name (modular) exam (Alluris)	PLC 1
Alluris Code (modular) exam	PLC1-V
Assessment dimensions or learning	The student knows how a PLC works, can write and load a

outcomes	PLC program and test how it works.
Assessment criteria	<ul style="list-style-type: none"> <li>• The student is familiar with languages of application, construction and programming for PLCs.</li> <li>• The student can write a PLC program and implement it in a practical set-up.</li> </ul>
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Practicum 9</b>
English name (modular) exam (OSIRIS)	Practical 9
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Practicum 9
English name (modular) exam (Alluris)	Practical 9
Alluris Code (modular) exam	PRAC9-V
Assessment dimensions or learning outcomes	The student can perform measurements and report them and draw conclusions herewith.
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 calculations and/or graphs are included and are substantiated correctly.</li> </ul>

	<ul style="list-style-type: none"> <li>• The student describes the applied technologies concisely and in their own words.</li> <li>• The 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)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

Werktuigbouwkunde - tabel 9 - e-WTB-2CRS2a

<b>General information</b>	
Changes compared to previous academic year	No changes.
Long Dutch name of unit of study (OSIRIS)	Course 2a: Energetisch ontwerpen
Long English name of unit of study (OSIRIS)	Course 2a: Energy System Design
Short Dutch name of unit of study (OSIRIS)	WTB S2 Energetisch ontwerpen 2a
Short English name of unit of study (OSIRIS)	WTB S2 Energy System Design 2a
Alluris unit of study Dutch name	Course 2a: Energetisch ontwerpen
Alluris unit of study English name	Course 2a: Energy System Design
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-2CRS2a
Term	P3 S2
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	5
Study load in hours	140
Contact hours	Geprogrammeerde contacttijd 37,5 uur.
Unit of study entry requirements	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 in energy systems for mechanical engineering, materials science, research skills 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)
Cohesion	The other two units of study in term 3 are related to this unit to a greater or lesser degree. (See also curriculum diagram.)
Mandatory participation	Nee (No)
Activities and/or instructional formats	Classroom lessons.
Required literature / description of 'learning material'	Ashby, Materials Baarda, Research. This is it! 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.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Energiesystemen 1</b>
English name (modular) exam (OSIRIS)	Energy Systems 1
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Energiesystemen 1
English name (modular) exam (Alluris)	Energy Systems 1
Alluris Code (modular) exam	ES1-V
Assessment dimensions or learning outcomes	The student has basic knowledge of the functioning and dimensioning formulas of wind turbines, solar thermal collectors, energy storage and photovoltaic solar panels. 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.
Assessment criteria	The student has knowledge of and can perform calculations in the areas of: <ul style="list-style-type: none"> <li>• Energy and power Identify the power and energy demand.</li> <li>• Dimensioning energy storage Sunlight, solar thermal Sunlight, pv (electric) Wind, wind turbines and make block diagrams of these and apply calculations on efficiencies.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P3 P4
Number of examiners	2
Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82 all models or Texas Instruments TI-30 all models.</li> <li>• Formula list will be provided.</li> </ul>
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Materiaalkunde 3</b>
English name (modular) exam	Materials Science 3

(OSIRIS)	
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Materiaalkunde 3
English name (modular) exam (Alluris)	Materials Science 3
Alluris Code (modular) exam	MAT3-V
Assessment dimensions or learning outcomes	The student has the knowledge to communicate with specialists about a wide range of material properties.
Assessment criteria	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).
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P3 P4
Number of examiners	2
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 list will be provided.</li> </ul>
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

Werktuigbouwkunde - tabel 10 - e-WTB-2CRS2b

<b>General information</b>	
Changes compared to previous academic year	WIS2-WIS3 moves from this OWE to e-WTB-2CRS1a. WIS9 moves to this OWE.
Long Dutch name of unit of study (OSIRIS)	Course 2b: Energetisch ontwerpen
Long English name of unit of study (OSIRIS)	Course 2b: Energy System Design
Short Dutch name of unit of study (OSIRIS)	WTB S2 Energetisch ontwerpen 2b
Short English name of unit of study (OSIRIS)	WTB S2 Energy System Design 2b
Alluris unit of study Dutch name	Course 2b: Energetisch ontwerpen
Alluris unit of study English name	Course 2b: Energy System Design
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-2CRS2b
Term	P4 S2
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	5
Study load in hours	140
Contact hours	Geprogrammeerde contacttijd 21 uur.
Unit of study entry requirements	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 in, statistics, 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)
Cohesion	The other two units of study in term 4 are related to this unit to a greater or lesser degree. (See also curriculum diagram.)
Mandatory participation	Nee (No)
Activities and/or instructional formats	Classroom lessons.
Required literature / description of 'learning material'	• Cengel: Fluid Mechanics: Fundamentals and Applications See study resource list for a full description.
Required software / required materials	• SoWiSo See study resource list for a full discription.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Leerteam 2</b>
English name (modular) exam (OSIRIS)	Learning Team 2
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Leerteam 2
English name (modular) exam (Alluris)	Learning Team 2
Alluris Code (modular) exam	LT2-V
Assessment dimensions or learning outcomes	Student shows how he has developed personally, content related and professionally and how he controls to give direction to his own learning process.
Assessment criteria	The student: <ul style="list-style-type: none"> <li>• Can evaluate on S2 and reflect on himself.</li> <li>• Can name several development points for S3 on the basis of feedback received in S2 and (self) reflection on this.</li> <li>• Can convert development points into SMART-formulated learning goals.</li> </ul>
Exam and modular exam format(s)	PF (Portfolio) Individual assessment Written
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Not applicable.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Stromingsleer 1</b>
English name (modular) exam (OSIRIS)	Fluid Mechanics 1
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Stromingsleer 1
English name (modular) exam (Alluris)	Fluid Mechanics 1
Alluris Code (modular) exam	STL1-V
Assessment dimensions or learning outcomes	<ul style="list-style-type: none"> <li>• The student has knowledge of fluid mechanics terms, definitions, symbols and units, the continuity equation, the concept of hydrostatic pressure and Bernoulli's and Archimedes laws and can apply this all to real-life</li> </ul>



	<p>problems.</p> <ul style="list-style-type: none"> <li>• The student can calculate the pressure difference/differential pressure as a result of (viscous) flow resistance.</li> </ul>
Assessment criteria	<p>The student must:</p> <ul style="list-style-type: none"> <li>• Be able to apply SI units;</li> <li>• Have knowledge of continuity equations;</li> <li>• Be able to perform calculations on fluid pressure;</li> <li>• Be able to apply Bernoulli's and Archimedes laws;</li> <li>• Have knowledge of measurement principles of flow velocity (Pitot, Prandtl, static);</li> <li>• Be able to perform calculations with viscosity and flow resistances.</li> </ul>
Exam and modular exam format(s)	<p>ST (Written Exam) Individual assessment Written</p>
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P4
Number of examiners	2
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 registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Wiskunde 9</b>
English name (modular) exam (OSIRIS)	Mathematics 9
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Wiskunde 9
English name (modular) exam (Alluris)	Mathematics 9
Alluris Code (modular) exam	WIS9-V
Assessment dimensions or learning outcomes	The student has basic knowledge of probability calculus and statistics (descriptive statistics and probability distributions).
Assessment criteria	<ul style="list-style-type: none"> <li>• The student can analyse and solve risks problems.</li> <li>• The student can display statistics using central tendency and dispersion measures.</li> <li>• The student can calculate probabilities of normal distribution, binomial distribution and Poisson</li> </ul>

	distribution.
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P3 P4
Number of examiners	2
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 registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

Werktuigbouwkunde - tabel 11 - e-WTB-2PRJa/n

<b>General information</b>	
Changes compared to previous academic year	Unit of study name changed.
Long Dutch name of unit of study (OSIRIS)	Project 2a: Energetisch ontwerpen
Long English name of unit of study (OSIRIS)	Project 2a: Engineering energy systems
Short Dutch name of unit of study (OSIRIS)	WTB S2 Project 2a
Short English name of unit of study (OSIRIS)	WTB S2 Project 2a
Alluris unit of study Dutch name	Project 2a: Energetisch ontwerpen
Alluris unit of study English name	Project 2a: Engineering energy systems
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-2PRJa/n
Term	P3 S2
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	5
Study load in hours	140
Contact hours	Geprogrammeerde contacttijd 24 uur.
Unit of study entry requirements	Not applicable.
<b>Content and organisation</b>	
General description	Project. Students work together with students from their own degree course (mono-disciplinary) on designing and/or building a product or prototype and thereby developing 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)
Cohesion	The other two units of study in term 3 are related to this unit to a greater or lesser degree. (See also curriculum diagram).
Mandatory participation	Nee (No)
Activities and/or instructional formats	Project and classroom lessons.
Required literature / description of 'learning material'	Grit, R. Project Management 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.

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<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Project 2a</b>
English name (modular) exam (OSIRIS)	Project 2a
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Project 2a
English name (modular) exam (Alluris)	Project 2a
Alluris Code (modular) exam	PRJ2a-V
Assessment dimensions or learning outcomes	<ul style="list-style-type: none"> <li>• Students can carry out a group project.</li> <li>• Students possess the basic skills in (written) communication, consultation, reflection and cooperation.</li> <li>• Students can give a structured overview of sources and examine the reliability of sources.</li> </ul>
Assessment criteria	The student is able to carry out a group project and to approach the design process methodically and to realize the product or prototype.
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P3 P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Professional Skills 2a</b>
English name (modular) exam (OSIRIS)	Professional Skills 2a
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Professional Skills 2a
English name (modular) exam (Alluris)	Professional Skills 2a
Alluris Code (modular) exam	SKILLS2a-V
Assessment dimensions or learning	The student can write professional reports for clients,

outcomes	lecturers and fellow students about the approach, preliminary results and final results of projects.
Assessment criteria	The student reports in a professional manner to clients, lecturers and fellow students about the approach, preliminary and final results of projects. The professional report contains: <ul style="list-style-type: none"> <li>• The appropriate components.</li> <li>• Is well-structured.</li> <li>• Is logical and is written correctly.</li> </ul>
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P3 P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

Werktuigbouwkunde - tabel 12 - e-WTB-2PRJb/n

<b>General information</b>	
Changes compared to previous academic year	Unit of study name changed.
Long Dutch name of unit of study (OSIRIS)	Project 2b: Energetisch ontwerpen
Long English name of unit of study (OSIRIS)	Project 2b: Engineering energy systems
Short Dutch name of unit of study (OSIRIS)	WTB S2 Project 2b
Short English name of unit of study (OSIRIS)	WTB S2 Project 2b
Alluris unit of study Dutch name	Project 2b: Energetisch ontwerpen
Alluris unit of study English name	Project 2b: Engineering energy systems
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-2PRJb/n
Term	P4 S2
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	5
Study load in hours	140
Contact hours	Geprogrammeerde contacttijd 30 uur.
Unit of study entry requirements	Not applicable.
<b>Content and organisation</b>	
General description	Project. Students work together with students from their own degree course (mono-disciplinary) on designing and/or building a product or prototype and thereby developing 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)
Cohesion	The other two units of study in term 4 are related to this unit to a greater or lesser degree. (See also curriculum diagram.)
Mandatory participation	Nee (No)
Activities and/or instructional formats	Project and classroom lessons.
Required literature / description of 'learning material'	<ul style="list-style-type: none"> <li>• Grit, R. Project Management</li> <li>• Zeiler, W. Design Handbook</li> <li>• Vaardig communiceren in de techniek (online boek en</li> </ul>

	traintool). 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>Dutch name (modular) exam (OSIRIS)</b>	<b>Project 2b</b>
English name (modular) exam (OSIRIS)	Project 2b
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Project 2b
English name (modular) exam (Alluris)	Project 2b
Alluris Code (modular) exam	PRJ2b-V
Assessment dimensions or learning outcomes	<ul style="list-style-type: none"> <li>• Students can carry out a group project.</li> <li>• Students possess the basic skills in (written) communication, consultation, reflection and cooperation.</li> </ul>
Assessment criteria	The student is able to carry out a group project and to approach the design proces methodically and to realise the product or prototype.
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Professional Skills 2b</b>
English name (modular) exam (OSIRIS)	Professional Skills 2b
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Professional Skills 2b
English name (modular) exam (Alluris)	Professional Skills 2b

Alluris Code (modular) exam	SKILLS2b-V
Assessment dimensions or learning outcomes	<ul style="list-style-type: none"> <li>• Students can carry out a project with students from the same degree course.</li> <li>• Students possess the basic skills in (written) communication, consultation, reflection and cooperation.</li> </ul>
Assessment criteria	<p>The student produces via an efficient professional approach to writing a clear well-structured professional reports (cv and motivation letter) which in terms of content and language is attuned to the reader and meets the requirements of reporting:</p> <ol style="list-style-type: none"> <li>1. CV is up to date and contains the elements personal details, personal profile, education, work experience and hobbies.</li> <li>2. Motivation letter is written correctly, has an appealing opening and close, refers to the CV and is in line with the vacancy.</li> </ol>
Exam and modular exam format(s)	<p>PD ((Professional)Product) Individual assessment Written</p>
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.



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

Werktuigbouwkunde - tabel 13 - e-WTB-3CRS

<b>General information</b>	
Changes compared to previous academic year	Exam PTC34-MAT46-V replaced by PTEC3-V (MAT46 has expired).
Long Dutch name of unit of study (OSIRIS)	Course: Mechanisch ontwerpen
Long English name of unit of study (OSIRIS)	Course: Mechanical Design
Short Dutch name of unit of study (OSIRIS)	WTB S3 Mechanisch ontwerpen
Short English name of unit of study (OSIRIS)	WTB S3 Mechanical Design
Alluris unit of study Dutch name	Course: Mechanisch ontwerpen
Alluris unit of study English name	Course: Mechanical Design
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-3CRS
Term	P1 P2 S3
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	15
Study load in hours	420
Contact hours	Geprogrammeerde contacttijd 116 uur.
Unit of study entry requirements	Not applicable.
<b>Content and organisation</b>	
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)
Cohesion	The other unit of study in semester 3 is more or less related to this unit of study. (See also curriculum diagram.)
Mandatory participation	Nee (No)
Activities and/or instructional formats	Lecture, tutorial.
Required literature / description of 'learning material'	<ul style="list-style-type: none"> <li>• Reader 7957 – Exercises Dynamics (via HAN Webshop)</li> <li>• Industrial Production, the manufacture of mechanical products; Prof. dr. ir. H.J.J. Kals, Ir. C.A. van Luttervelt, Ir. K.A. Moulijn</li> <li>• Roloff/Matek Machineonderdelen / deel formuleboek ; Muhs, C.S.</li> <li>• Materials: Engineering, Science, Processing and Design</li> </ul>

	; Michael Ashby, Hugh Shercliff, David Cebon • Mechanics of Materials in SI Units; Hibbeler, R. • Engineering Mechanics: Dynamics in SI Units, Hibbeler, R. • Kaartenset/ Cardset 'Engineering Methods Pack' • Composite Materials - An introduction; R.P.L. Nijssen (provided for free via #OO)
Required software / required materials	Siemens NX Educational license; provided via teacher. Codesys; provided via teacher

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Mechanica 4 en 5</b>
English name (modular) exam (OSIRIS)	Mechanics 4 and 5
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Mechanica 4 en 5
English name (modular) exam (Alluris)	Mechanics 4 and 5
Alluris Code (modular) exam	MEC4-5-V
Assessment dimensions or learning outcomes	Not applicable.
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)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2
Number of examiners	2
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 registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Mechanica 6</b>
English name (modular) exam (OSIRIS)	Mechanics 6
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Mechanica 6
English name (modular) exam (Alluris)	Mechanics 6
Alluris Code (modular) exam	MEC-6-V
Assessment dimensions or learning outcomes	Not applicable.
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)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2
Number of examiners	2
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 registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Mechanica 7</b>
English name (modular) exam (OSIRIS)	Mechanics 7
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Mechanica 7

English name (modular) exam (Alluris)	Mechanics 7
Alluris Code (modular) exam	MEC7-V
Assessment dimensions or learning outcomes	Not applicable.
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)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3
Number of examiners	2
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 registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Productietechnieken 3</b>
English name (modular) exam (OSIRIS)	Production Techniques 3
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Productietechnieken 3
English name (modular) exam (Alluris)	Production Techniques 3
Alluris Code (modular) exam	PTEC3-V
Assessment dimensions or learning outcomes	Not applicable.
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> </ul>

Exam and modular exam format(s)	ST (Written Exam) None Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2
Number of examiners	2
Permitted resources	Casio fx-82 calculator (all models) or Texas Instruments TI-30 (all models).
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Werktuigonderdelen 3</b>
English name (modular) exam (OSIRIS)	Mechanical Components 3
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Werktuigonderdelen 3
English name (modular) exam (Alluris)	Mechanical Components 3
Alluris Code (modular) exam	WTO3-V
Assessment dimensions or learning outcomes	Not applicable.
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)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3
Number of examiners	2
Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82... or Texas Instruments TI-30...</li> <li>• Notes: 1 sheet A4, double-sided.</li> </ul>
Method of registering for exam or	Registration for the modular exam through Alluris. The

modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

Werktuigbouwkunde - tabel 14 - e-WTB-3PRJ

<b>General information</b>	
Changes compared to previous academic year	<ul style="list-style-type: none"> <li>• Small changes in assessment criteria PRJ3-V.</li> <li>• PLC2-3-V replaced by PRAC-PLC2-V (namechange only).</li> </ul>
Long Dutch name of unit of study (OSIRIS)	Project: Mechanisch ontwerpen
Long English name of unit of study (OSIRIS)	Project: Mechanical Design
Short Dutch name of unit of study (OSIRIS)	WTB S3 Project
Short English name of unit of study (OSIRIS)	WTB S3 Project
Alluris unit of study Dutch name	Project: Mechanisch ontwerpen
Alluris unit of study English name	Project: Mechanical Design
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-3PRJ
Term	P1 P2 S3
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	15
Study load in hours	420
Contact hours	Geprogrammeerde contacttijd 84 uur.
Unit of study entry requirements	<p>Knowledge and skills from the electrical and electronic engineering field are necessary to effectively handle a complex electro-technical problem. So students wishing to enter semester 6 must have:</p> <ul style="list-style-type: none"> <li>- gained sufficient knowledge and skills in the propaedeutic and main phases of Electrical and Electronic Engineering;</li> <li>- successfully completed 3CRS and 4CRS</li> <li>- successfully completed 3PRJ and 4PRJ</li> </ul> <p>Or</p> <ul style="list-style-type: none"> <li>- acquired comparable knowledge and skills in another way.</li> </ul>
<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	C3 Realisation (1) C5 Management (1) C6 Consultation (1) C7 Research (1) C1 Analysis (1)

	C2 Design (2) C8 Professionalisation (2)
Cohesion	The other unit of study in semester 3 is more or less related to this unit of study. (See also curriculum diagram.)
Mandatory participation	Nee (No)
Activities and/or instructional formats	Tutorial, practical, project work.
Required literature / description of 'learning material'	Not applicable.
Required software / required materials	Not applicable.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Practicum PLC2</b>
English name (modular) exam (OSIRIS)	Practicum PLC2
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Practicum PLC2
English name (modular) exam (Alluris)	Practicum PLC2
Alluris Code (modular) exam	PRAC-PLC2-V
Assessment dimensions or learning outcomes	Not applicable.
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)	PA (Participation) Individual assessment Oral
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P2 P3
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).



<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Project 3</b>
English name (modular) exam (OSIRIS)	Project 3
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Project 3
English name (modular) exam (Alluris)	Project 3
Alluris Code (modular) exam	PRJ3-V
Assessment dimensions or learning outcomes	Not applicable.
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 schedule.</li> <li>• The student writes project documentation that meet 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 can clarify the design in a 3D model, drawings or a motion analysis. They can use a CAD package for this.</li> <li>• The student can convincingly present the project results and uses relevant resources in their presentation.</li> <li>• The student writes reports for Laws and Regulations and Analysis</li> </ul>
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Group assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam

from 1 February 2023 (via OSIRIS)	period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Professional Skills 3</b>
English name (modular) exam (OSIRIS)	Professional Skills 3
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Professional Skills 3
English name (modular) exam (Alluris)	Professional Skills 3
Alluris Code (modular) exam	SKILLS3-V
Assessment dimensions or learning outcomes	Not applicable.
Assessment criteria	<p>The student:</p> <ul style="list-style-type: none"> <li>• Uses an efficient writing plan to write a clearly structured text (e.g. an action plan, memo and/or summary) that is attuned to the reader in terms of both content and language.</li> <li>• Gives a structured individual presentation about a critical choice in the project and underpins that choice with convincing arguments.</li> <li>• Thinks critically about the project and about own performance (type 2 thinking).</li> <li>• Answers critical questions clearly.</li> <li>• Produces level 2 project activities in meeting, presentation, collaboration and reflection.</li> <li>• Reflects on own learning goals.</li> </ul>
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written Oral
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P2 P3
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

Werktuigbouwkunde - tabel 15 - e-WTB-4CRS

<b>General information</b>	
Changes compared to previous academic year	Exam LAB1-2-3-V replaced by PRAC-LAB-V (equal).
Long Dutch name of unit of study (OSIRIS)	Course 4: Energy- & Controlsystems
Long English name of unit of study (OSIRIS)	Course 4: Energy & Control Systems
Short Dutch name of unit of study (OSIRIS)	WTB S4 Energy & Control Systems
Short English name of unit of study (OSIRIS)	WTB S4 Energy & Control Systems
Alluris unit of study Dutch name	Course 4: Energy- & Controlsystems
Alluris unit of study English name	Course 4: Energy & Control Systems
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-4CRS
Term	P3 P4 S4
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	15
Study load in hours	420
Contact hours	Geprogrammeerde contacttijd 121 uur.
Unit of study entry requirements	Not applicable.
<b>Content and organisation</b>	
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)
Cohesion	The other unit of study in semester 4 is more or less related to this unit of study. (See also curriculum diagram).
Mandatory participation	Nee (No)
Activities and/or instructional formats	Classroom lessons and practicum
Required literature / description of 'learning material'	To buy HAN Webshop: Reader 7941 HAN Webshop: Reader 7918 Provided for free via #OnderwijsOnline: Reader 7512 - Combustion engines Reader 7198 - Heat transfer All other documents

Required software / required materials	Matlab/Simulink; educational license, beschikbaar gesteld via docent. Labview; educational license, beschikbaar gesteld via docent.
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<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Energiewerktuigen</b>
English name (modular) exam (OSIRIS)	Energy Conversion Devices
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Energiewerktuigen
English name (modular) exam (Alluris)	Energy Conversion Devices
Alluris Code (modular) exam	EWK-V
Assessment dimensions or learning outcomes	Not applicable.
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 logp-h-diagram in calculations.</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)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P3 P4
Number of examiners	2
Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82... or Texas Instruments TI-30...</li> <li>• 1 A4, double-sided.</li> </ul>
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam</b>	<b>Leerteam 4</b>
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<b>(OSIRIS)</b>	
English name (modular) exam (OSIRIS)	Learning Team 4
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Leerteam 4
English name (modular) exam (Alluris)	Learning Team 4
Alluris Code (modular) exam	LT4-V
Assessment dimensions or learning outcomes	Student shows how he has developed on a personal, content related and professional level, reasons the choices he made and future choices and indicates the direction of development
Assessment criteria	The student: <ul style="list-style-type: none"> <li>• Can evaluate S3 and S4 and reflect on himself can name several development areas for S5, based on feedback received in S3 and S4 and (self) reflection.</li> <li>• Can convert points for development into SMART-formulated learning objectives and elaborate these in a PDP.</li> <li>• Knows how to substantiate choices for projects, internship and minor.</li> <li>• Illustrates the direction of further development for the next semesters.</li> </ul>
Exam and modular exam format(s)	PF (Portfolio) Individual assessment Written
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Practicum Labview</b>
English name (modular) exam (OSIRIS)	Practicum Labview
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Practicum Labview
English name (modular) exam	Practicum Labview

(Alluris)	
Alluris Code (modular) exam	PRAC-LAB-V
Assessment dimensions or learning outcomes	Not applicable.
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)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Regeltechniek</b>
English name (modular) exam (OSIRIS)	Control Systems Engineering
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Regeltechniek
English name (modular) exam (Alluris)	Control Systems Engineering
Alluris Code (modular) exam	REG-V
Assessment dimensions or learning outcomes	Not applicable.
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</li> </ul>

	<p>can derive the process behaviour from these plots.</p> <ul style="list-style-type: none"> <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)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P4
Number of examiners	2
Permitted resources	Calculator: Casio fx-82MS or Texas Instruments TI-30Xa. A formula sheet brought along by the student may be supplemented with notes.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Stromingsleer 2</b>
English name (modular) exam (OSIRIS)	Fluid Mechanics 2
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Stromingsleer 2
English name (modular) exam (Alluris)	Fluid Mechanics 2
Alluris Code (modular) exam	STL2-V
Assessment dimensions or learning outcomes	Not applicable.

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 can use the Mollier diagram to make calculations in relation to air handling.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P4
Number of examiners	2
Permitted resources	<ul style="list-style-type: none"> <li>• Calculator: Casio fx-82... or Texas Instruments TI-30...</li> <li>• Formulasheet provided at exam.</li> <li>• 1 A4-sheet double-sided with notes.</li> </ul>
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Thermodynamica 2</b>
English name (modular) exam (OSIRIS)	Thermodynamics 2
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Thermodynamica 2
English name (modular) exam (Alluris)	Thermodynamics 2
Alluris Code (modular) exam	TDY2-V
Assessment dimensions or learning outcomes	Understands and masters the application of the First Law of Thermodynamics in closed and open systems and in thermodynamic cycles.
Assessment criteria	<ul style="list-style-type: none"> <li>• The student can perform calculations with insight with state variables and process quantities on polytropics in closed systems, where necessary using the 1st Law.</li> <li>• The student can perform calculations with insight with efficiency, work and quantity of heat in closed thermodynamic cycles, where necessary using the 1st Law.</li> <li>• The student can perform calculations with insight with state variables, technical work, quantity of heat, kinetic and potential energy in open systems, where necessary using the 1st Law.</li> </ul>



Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P3 P4
Number of examiners	2
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> </ul>
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Wiskunde 4 &amp; 5</b>
English name (modular) exam (OSIRIS)	Mathematics 4 & 5
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Wiskunde 4 & 5
English name (modular) exam (Alluris)	Mathematics 4 & 5
Alluris Code (modular) exam	WIS4-5-V
Assessment dimensions or learning outcomes	Not applicable.
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)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P3 P4
Number of examiners	2
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>• Formula sheet enclosed with the exam.</li> </ul>
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

Werktuigbouwkunde - tabel 16 - e-WTB-4PRJ

<b>General information</b>	
Changes compared to previous academic year	No changes.
Long Dutch name of unit of study (OSIRIS)	Project 4: Design of Energy Systems
Long English name of unit of study (OSIRIS)	Project 4: Design of Energy Systems
Short Dutch name of unit of study (OSIRIS)	WTB S4 Project 4
Short English name of unit of study (OSIRIS)	WTB S4 Project 4
Alluris unit of study Dutch name	Project 4: Design of Energy Systems
Alluris unit of study English name	Project 4: Design of Energy Systems
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-4PRJ
Term	P3 P4 S4
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	15
Study load in hours	420
Contact hours	Geprogrammeerde contacttijd 60 uur.
Unit of study entry requirements	<p>Knowledge and skills from the electrical and electronic engineering field are necessary to effectively handle a complex electro-technical problem. So students wishing to enter semester 6 must have:</p> <ul style="list-style-type: none"> <li>- gained sufficient knowledge and skills in the propaedeutic and main phases of Electrical and Electronic Engineering;</li> <li>- successfully completed 3CRS and 4CRS</li> <li>- successfully completed 3PRJ and 4PRJ</li> </ul> <p>Or</p> <ul style="list-style-type: none"> <li>- acquired comparable knowledge and skills in another way.</li> </ul>
<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	<p>C3 Realisation (1) C5 Management (1) C1 Analysis (2)</p>

	C2 Design (2) C6 Consultation (2) C7 Research (2) C8 Professionalisation (2)
Cohesion	The other unit of study in semester 4 is more or less related to this unit of study. (See also curriculum diagram.)
Mandatory participation	Nee (No)
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>Dutch name (modular) exam (OSIRIS)</b>	<b>Project 4</b>
English name (modular) exam (OSIRIS)	Project 4
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Project 4
English name (modular) exam (Alluris)	Project 4
Alluris Code (modular) exam	PRJ4-V
Assessment dimensions or learning outcomes	Not applicable.
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 translates the results into relevant requirements, which in turn are used to substantiate the design choices.</li> <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: <ol style="list-style-type: none"> <li>1. Cradle-2-cradle.</li> <li>2. CO2-footprint.</li> <li>3. Life-cycle analysis.</li> <li>4. Effects of material choice on environment.</li> </ol> </li> </ul>
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment

	Group assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Professional Skills 4</b>
English name (modular) exam (OSIRIS)	Professional Skills 4
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Professional Skills 4
English name (modular) exam (Alluris)	Professional Skills 4
Alluris Code (modular) exam	SKILLS4-V
Assessment dimensions or learning outcomes	Not applicable.
Assessment criteria	<p>The student:</p> <ul style="list-style-type: none"> <li>• Knows the 4 forms of assertive behaviour.</li> <li>• Connects the theory to their own experiences/behaviour and distils learning points.</li> <li>• Is aware of the importance of good leadership and specific personal leadership.</li> <li>• Knows his own communication style and its influence on others.</li> <li>• Has an eye for the effectiveness of his own co-operation behaviour and adjusts his difficult behaviour if necessary.</li> <li>• Knows his/her own conflict management style.</li> <li>• Chooses an effective conflict style on the basis of a conflict analysis.</li> <li>• Produces level 2 project activities in meeting, presentation, collaboration and reflection.</li> <li>• Reflects on own learning goals.</li> </ul>
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	0
Minimum result	Vink (tick)

Exam sittings	P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

Werktuigbouwkunde - tabel 17 - e-WTB-5STAGE

<b>General information</b>	
Changes compared to previous academic year	No changes.
Long Dutch name of unit of study (OSIRIS)	Verdiepende Stage S5
Long English name of unit of study (OSIRIS)	In-depth Internship S5
Short Dutch name of unit of study (OSIRIS)	WTB S5 Stage
Short English name of unit of study (OSIRIS)	WTB S5 Internship
Alluris unit of study Dutch name	Stage
Alluris unit of study English name	Internship
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-5STAGE
Term	S5
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	30
Study load in hours	840
Contact hours	Geprogrammeerde contacttijd 12 uur.
Unit of study entry requirements	<p>This semester builds on the knowledge and skills from the propaedeutic phase of Mechanical Engineering and semester 3. So students wishing to do the specialisation internship S5 must:</p> <ul style="list-style-type: none"> <li>- have met the study progress requirement for the propaedeutic phase;</li> <li>- possess general skills that enable them to carry out an optimisation task in the work field;</li> <li>- demonstrate a professional attitude towards clients;</li> <li>- have completed the Profile Portfolio (signed off with a "p" in SIS by the end of semester S4);</li> <li>- Or:</li> <li>- demonstrate in some other way that they have sufficient knowledge of the above-mentioned disciplines and the required attitude.</li> </ul> <p>If there is any doubt, the learning team coach will be consulted.</p> <p>Other:</p> <ul style="list-style-type: none"> <li>- 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.</li> <li>- Internships that start at different times always need approval from the internship coordinator; the deadlines then shift pro rata.</li> <li>- A successfully completed MBO (secondary professional education) internship provides no exemption from this specialisation internship.</li> </ul>

<b>Content and organisation</b>	
General description	Specialisation in the field of mechanical engineering. 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 introduced to the professional tasks you will encounter in the work field, and you build your profile based on these. You work on larger assignments/projects, which serve as a prelude to graduation project (level 3). You may work with other students during your internship, but you carry out an individual assignment.
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)
Cohesion	See also curriculum diagram.
Mandatory participation	Nee (No)
Activities and/or instructional formats	Project on location with the internship organisation, presentation days and lectures.
Required literature / description of 'learning material'	<ul style="list-style-type: none"> <li>• Project management, R. Grit, ISBN 9789001575625 (5th New edition juli 2021 )</li> <li>• Report Writing for Readers with Little Time, ISBN 9789001812591</li> </ul> Information on OnderwijsOnline under content ENG 22-23 S5 – Stage / Internship.
Required software / required materials	Not applicable.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Verslag ethiek</b>
English name (modular) exam (OSIRIS)	Ethics report
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Verslag ethiek
English name (modular) exam (Alluris)	Ethics report
Alluris Code (modular) exam	ETH5-V
Assessment dimensions or learning outcomes	Ethics Report: <ul style="list-style-type: none"> <li>• The student applies ethical knowledge in a mechanical context (Ethics Report).</li> </ul>
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> </ul>



	<ul style="list-style-type: none"> <li>• They define possible action and argue that action taken should be morally responsible.</li> </ul>
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2
Number of examiners	1
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Product Data Management</b>
English name (modular) exam (OSIRIS)	Product Data Management
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Product Data Management
English name (modular) exam (Alluris)	Product Data Management
Alluris Code (modular) exam	PDM5-V
Assessment dimensions or learning outcomes	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>
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)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P1

	P2
Number of examiners	1
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Stage Rapportage</b>
English name (modular) exam (OSIRIS)	Internship Report
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Stage Rapportage
English name (modular) exam (Alluris)	Internship Report
Alluris Code (modular) exam	RAP5-V
Assessment dimensions or learning outcomes	<p>Internship report:</p> <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>
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 internship 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 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> <li>• The student asks for feedback from the company supervisor both halfway through the internship and at the end via the form available for this purpose.</li> </ul>

	<ul style="list-style-type: none"> <li>• The student demonstrates reflective ability (e.g. on the above feedback!)</li> </ul>
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	4
Minimum result	5,5
Exam sittings	P2 P4
Number of examiners	1
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Submission of professional product at the end of the internship period for the relevant assignment in the digital learning environment.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See Part 2 - 8.9.1 and 8.9.2.

Werktuigbouwkunde - tabel 18 - e-WTB-6CS

<b>General information</b>	
Changes compared to previous academic year	None
Long Dutch name of unit of study (OSIRIS)	S6 CS
Long English name of unit of study (OSIRIS)	S6 CS
Short Dutch name of unit of study (OSIRIS)	WTB S6 CS
Short English name of unit of study (OSIRIS)	WTB S6 CS
Alluris unit of study Dutch name	S6 CS
Alluris unit of study English name	S6 CS
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-6CS
Term	S6
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	5
Study load in hours	140
Contact hours	Geprogrammeerde contacttijd 40 uur
Unit of study entry requirements	<p>This module builds on e-WTB-3PRJ, e-WTB-4PRJ and the S5 internship, in which the student developed the necessary knowledge and skills to be able to solve an integral technical problem in the work field.</p> <p>So the student who wishes to take this module must have completed a substantial number of subjects from semesters 3 through 5, which demonstrate sufficient content fundamentals.</p> <p>If there is any doubt, the learning team coach will be consulted and the feasibility of the study programme and solid foundation of the student's professional knowledge will be considered.</p> <p>The technical content knowledge required for this purpose is substantiated by completion of a substantial number of subjects, which demonstrates sufficient content fundamentals. Participation will be determined in consultation with the learning team coach, during which the feasibility of the study programme and the solid foundation of the student's professional knowledge will be considered.</p>
<b>Content and organisation</b>	
General description	Capita Selecta in Mechanical Engineering: knowledge areas selected are Integrated Design and Modeling & Simulation. Various workshops are offered for this.
Exit qualifications	C1 Analysis (2) C2 Design (2) C7 Research (2)

	C8 Professionalisation (2)
Cohesion	-
Mandatory participation	Neer (No)
Activities and/or instructional formats	Workshops & assignments
Required literature / description of 'learning material'	-
Required software / required materials	-

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Integrated Design</b>
English name (modular) exam (OSIRIS)	Integrated Design
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Integrated Design
English name (modular) exam (Alluris)	Integrated Design
Alluris Code (modular) exam	ID-V
Assessment dimensions or learning outcomes	The student has knowledge of Integrated Design and is able to perform an analysis that is appropriate for this.
Assessment criteria	The student can master subjects such as the following and apply them meaningfully: <ul style="list-style-type: none"> <li>• Product Architecture Mapping (PAM).</li> <li>• Lean</li> <li>• Circular Product Design.</li> </ul>
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P4
Number of examiners	1
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Modeleren</b>
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English name (modular) exam (OSIRIS)	Modelling
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Modeleren
English name (modular) exam (Alluris)	Modelling
Alluris Code (modular) exam	MOD-V
Assessment dimensions or learning outcomes	Student is able to draw up a model, apply it and draw conclusions from it.
Assessment criteria	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. (think of FEM, MatLab, motion analysis, plant simulation).
Exam and modular exam format(s)	PD ((Professional)Product) Individual assessment Written
Weight factor of modular exam	2
Minimum result	5,5
Exam sittings	P4
Number of examiners	1
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

Werktuigbouwkunde - tabel 19 - e-WTB-6PLG/n1

<b>General information</b>	
Changes compared to previous academic year	Description of entry conditions adjusted.
Long Dutch name of unit of study (OSIRIS)	S6 PLG
Long English name of unit of study (OSIRIS)	S6 PLC
Short Dutch name of unit of study (OSIRIS)	WTB S6 PLG
Short English name of unit of study (OSIRIS)	WTB S6 PLC
Alluris unit of study Dutch name	S6 PLG
Alluris unit of study English name	S6 PLC
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-6PLG/n1
Term	S6
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	25
Study load in hours	700
Contact hours	Geprogrammeerde contacttijd 200 uur. Totaal geprogrammeerde onderwijstijd 700 uur.
Unit of study entry requirements	This module builds on e-WTB-3PRJ, e-WTB-4PRJ and the S5 internship, in which the student developed the necessary knowledge and skills to be able to solve an integral technical problem in the work field. So students wishing to take this module must have: completed a substantial number of subjects from semesters 3 through 6, which demonstrate sufficient content fundamentals. If there is any doubt, the learning team coach will be consulted and the feasibility of the study programme and solid foundation of the student's professional knowledge will be considered.
<b>Content and organisation</b>	
General description	S6 prepares students to work as young professionals with new technologies within a professional practice. This is done by focusing on projects where new technological developments and research come together. In this way students are prepared for their future as professionals and this allows students to explore the possibilities that new technologies offer. State of the art projects: <ul style="list-style-type: none"> <li>• Come from the professional field</li> <li>• Explore the possibilities of new technology</li> <li>• Are multidisciplinary in nature</li> </ul> Teaching method The projects take place in a real working environment this means:

	<ul style="list-style-type: none"> <li>• Students act independently as junior Engineers</li> <li>• The teacher supervising the team acts as the senior engineer, guiding rather than teaching</li> <li>• Students learn how to expand their knowledge and skills in their area of expertise, beyond what they have been taught regarding the Body of Knowledge and Skills (BoKS) during the 1st and 2nd year.</li> </ul> <p>Supporting workshops and coaching is available for e.g. Mechanical Engineering, Agile working and Team performance. The formal language in this semester will be English.</p>
Exit qualifications	<p>C1 Analysis (2)  C2 Design (3)  C3 Realisation (2)  C4 Control (2)  C5 Management (2)  C6 Consultation (2)  C7 Research (2)  C8 Professionalisation (3)</p>
Cohesion	None
Mandatory participation	None (No)
Activities and/or instructional formats	None
Required literature / description of 'learning material'	None
Required software / required materials	None

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>PLG</b>
English name (modular) exam (OSIRIS)	PLC
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	PLG
English name (modular) exam (Alluris)	PLC
Alluris Code (modular) exam	PRJ6-V
Assessment dimensions or learning outcomes	<p>What  Delivers engineering product as can be expected of a junior Engineer</p> <p>How (method)  Acts as a junior Engineer, capable of choosing an appropriate research- or design methodology, building their own network of experts and choosing relevant information resources, resulting in a contribution to the end result of a complex project.</p> <p>- Problem identification on either:</p> <ol style="list-style-type: none"> <li>1. research objective, main &amp; subquestions</li> <li>2. design objective, required outputs</li> </ol>



	<p>How (professional skills)</p> <p>Shows investigative attitude towards project, client and result in a complex, uncertain working environment.</p> <ul style="list-style-type: none"> <li>- towards assignment, client and results.</li> <li>- Sympathize &amp; asking the right questions.</li> <li>- Acting pro-active and responsible.</li> <li>- Reflecting on progress and results.</li> <li>- Dealing with uncertainties.</li> </ul> <p>Shows effective collaboration with teammembers, senior Engineers, experts, clients and other stakeholders.</p> <ul style="list-style-type: none"> <li>- Working with teammembers, senior engineer, experts and client</li> <li>- Effective cooperation with the different disciplines in the project</li> <li>- Asking for and giving support to teammembers</li> <li>- Giving feedback</li> </ul> <p>Shows professional communication of own and team results to the outside world</p> <ul style="list-style-type: none"> <li>- Creating your own profesional network</li> <li>- Professional conversation with team members, stakeholders and network</li> <li>- (Re)presenting projectgroup and results to the outside world (presentations, symposia, blogs, vlogs, etc.)</li> <li>- Symposium participation</li> </ul> <p>Applies in a conscious matter a method of project management and planning which results in a tricable and flexible projectplanning leading to involvement of all relevant stakeholders.</p> <p>Self Development:</p> <p>Acquiring and developing knowledge within the professional learning community (PLC)</p> <p>Developing yourself personally and within the field of expertise</p> <p>Incorporating feedback</p>
Assessment criteria	None
Exam and modular exam format(s)	PF (Portfolio) PR (Presentation) PD ((Professional)Product) Individual assessment Group assessment Written Oral
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities	You do not need to formally register for (professional) products. For resits, contact the examiner.

registration period Up to 31 January 2023 (via Alluris)	
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	None

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Vrij Project</b>
English name (modular) exam (OSIRIS)	Flexible Project
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Vrij Project
English name (modular) exam (Alluris)	Flexible Project
Alluris Code (modular) exam	VP-V
Assessment dimensions or learning outcomes	<ul style="list-style-type: none"> <li>• Project.</li> <li>• Attitude and development.</li> <li>• Project skills.</li> <li>• Design process &amp; product creation.</li> <li>• Expert sessions.</li> <li>• The student knows how to ask the right questions, can collect and interpret information in the field of Integrated Design, Modelling and Mechanical Engineering.</li> <li>• The student can apply knowledge in the field of Integrated Design, Modelling and Mechanical Engineering 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>
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)	PD ((Professional)Product) Individual assessment Oral
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P4
Number of examiners	1

Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	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.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

Werktuigbouwkunde - tabel 20 - e-WTB-8AFST

<b>General information</b>	
Changes compared to previous academic year	No changes.
Long Dutch name of unit of study (OSIRIS)	Afstuderen S8
Long English name of unit of study (OSIRIS)	Graduation Project S8
Short Dutch name of unit of study (OSIRIS)	WTB S8 Afstuderen
Short English name of unit of study (OSIRIS)	WTB S8 Graduation Project
Alluris unit of study Dutch name	Afstuderen S8
Alluris unit of study English name	Graduation Project S8
OSIRIS unit of study code	None
Alluris unit of study code	e-WTB-8AFST
Term	S8
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	30
Study load in hours	840
Contact hours	Geprogrammeerde contacttijd 12 uur.
Unit of study entry requirements	In the graduation assignment, the student combines all the knowledge they acquired during the major. So for admission to the graduation assignment, students must: - have completed all components of the major or be able to complete them within the foreseeable future. - have completed the Profile Portfolio (signed off with a "p" in SIS at the start of semester S8); The minor need not yet have been followed/ completed. The student can start the graduation assignment if any incomplete units of study or minor can still be reasonably completed during the graduation assignment. If there is any doubt, the graduation coordinator and learning team coach will be consulted.
<b>Content and organisation</b>	
General description	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. 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 of a starting practitioner at university of applied sciences level.
Exit qualifications	C1 Analysis (3) C2 Design (3) C3 Realisation (2)

	C4 Control (3) C5 Management (2) C6 Consultation (2) C7 Research (2) C8 Professionalisation (3)
Cohesion	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.
Mandatory participation	Neer (No)
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'	Writing skills, Elling: Report writing for Readers with Little Time Engineering methods pack (cards) Graduation guide current edition on "ENG - S8 Afstuderen / Graduation Internship" (Onderwijs Online).
Required software / required materials	Not applicable.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Profilingsportfolio Afstuderen</b>
English name (modular) exam (OSIRIS)	Profile Portfolio Graduation
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Profilingsportfolio Afstuderen
English name (modular) exam (Alluris)	Profile Portfolio Graduation
Alluris Code (modular) exam	PPF8-V
Assessment dimensions or learning outcomes	<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> </ul>
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</li> </ul>

	<p>future and motivate their choice of graduation internship (professional task, "cold versus hot ME", sector, type + size of company, international, etc.).</p> <ul style="list-style-type: none"> <li>• Makes a personal SWOT analysis, gives a good picture of their own knowledge and skills with respect to personal development in the professional field (professional development report within the PPF).</li> <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)	PF (Portfolio) Individual assessment Written
Weight factor of modular exam	0
Minimum result	Vink (tick)
Exam sittings	P2 P4
Number of examiners	1
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	In consultation with LT coach. Submit to HAND-in under the relevant assignment.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Toets Afstuderen</b>
English name (modular) exam (OSIRIS)	Graduation Project Assessment
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Toets Afstuderen
English name (modular) exam (Alluris)	Graduation Project Assessment
Alluris Code (modular) exam	WTB-AFST
Assessment dimensions or learning outcomes	<ul style="list-style-type: none"> <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.</li> <li>• They also reflect on the outcomes and execution of the plan and on the predefined learning objectives (ME</li> </ul>

	GRADUATION ASSIGNMENT).
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> <li>• The student demonstrates a professional manner of working and reflective skills.</li> <li>• The assessment form can also be found in the digital learning environment.</li> </ul>
Exam and modular exam format(s)	PF (Portfolio) GS (Conversation, Criterion based interview, Graduation Exam) Individual assessment Written Oral
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2 P3 P4
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	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. The Engineering Business Relations and Placement Office organises and plans the sessions if no cancellations are made. Submit final report online in HAND-in.
Registering and deregistering for exam / modular exam opportunities	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam

from 1 February 2023 (via OSIRIS)	period or the resit period.
Discussion and review	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. If the graduation internship is not given a sufficiently positive assessment, the resit will generally take place in the next round.



### 9.3 Minors of the degree course

Werktuigbouwkunde - tabel 21 - M\_W-M-MB-VT

<b>General information</b>	
Changes compared to previous academic year	No changes.
Long Dutch name of unit of study (OSIRIS)	Minor Machinebouw (voltijd)
Long English name of unit of study (OSIRIS)	Minor Mechanical Engineering (full time)
Short Dutch name of unit of study (OSIRIS)	WTB S7 Minor Machinebouw
Short English name of unit of study (OSIRIS)	WTB S7 Minor Machine Engineering
Alluris unit of study Dutch name	Minor Machinebouw (voltijd) (Minorcode M_W-M-MB-VT)
Alluris unit of study English name	Minor Mechanical Engineering (full time)
OSIRIS unit of study code	None
Alluris unit of study code	M_W-M-MB-VT
Term	S7
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	30
Study load in hours	840
Contact hours	Geprogrammeerde contacttijd 300 uur.
Unit of study entry requirements	<p>The Machine Construction minor builds further on knowledge and skills from certain subject areas and from general skills acquired in the main phase (2nd and 3rd years).</p> <p>So for admission to the Machine Construction minor, students must have:</p> <ul style="list-style-type: none"> <li>- prior knowledge of dynamics (kinematics), strength of materials, materials science, 3D-CAD drawing and propulsion technology.</li> <li>- possess the skills to perform project-based work and communicate.</li> <li>- possess the required level of this prior knowledge from the main phase (2nd and 3rd years).</li> <li>- experience with real-life case studies and external clients.</li> </ul>
<b>Content and organisation</b>	
General description	<p>From client request to machine. This is the central theme of the mechanical engineering minor. In the mechanical engineering minor, the student works in groups on real-life assignments. He designs (or redesigns) based on a list of requirements and methodically a technically complex machine. He is aware of the machine's life cycle.</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</p>

	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.
Exit qualifications	C1 Analysis (1) C2 Design (1) C5 Management (1) C7 Research (1) C8 Professionalisation (1)
Cohesion	Semester 3 and Semester 5 (see also curriculum overview).
Mandatory participation	Nee (No)
Activities and/or instructional formats	Lectures, guest lectures, real-life assignment/project.
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>Dutch name (modular) exam (OSIRIS)</b>	<b>BP Plan van Aanpak</b>
English name (modular) exam (OSIRIS)	PP Action Plan
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	BP Plan van Aanpak
English name (modular) exam (Alluris)	PP Action Plan
Alluris Code (modular) exam	BP PvA
Assessment dimensions or learning outcomes	<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</li> </ul>

	<p>machine and equipment construction and applies it to a case study.</p> <ul style="list-style-type: none"> <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>
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)	<p>PD ((Professional)Product) Group assessment Written</p>
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	<p>P1 P2 P3 P4</p>
Number of examiners	1
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>BP Project-rapportage en Presentatie</b>
English name (modular) exam (OSIRIS)	BP Project-rapportage en Presentatie
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	BP Project-rapportage en Presentatie
English name (modular) exam (Alluris)	PP Project Reports and Presentation
Alluris Code (modular) exam	BP RAP
Assessment dimensions or learning outcomes	Both individual (exams and performance assessment) and per group (project)

	<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>
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> <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)	PR (Presentation) PD ((Professional)Product) Group assessment Written Oral
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3 P4
Number of examiners	1

Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>KT Aandrijftechniek Minor</b>
English name (modular) exam (OSIRIS)	KT Drive Engineering Minor
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	KT Aandrijftechniek Minor
English name (modular) exam (Alluris)	KT Drive Engineering Minor
Alluris Code (modular) exam	KT ADT-M
Assessment dimensions or learning outcomes	In the field of hydraulics you learn to design a simple hydraulic drive. In addition to electric and pneumatic drives, hydraulic drives still have an important place in mechanical engineering and agricultural technology. Where large forces have to be generated and / or a large power density is necessary, hydraulic drives are used.
Assessment criteria	Has knowledge of and insight into hydraulic systems.
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3
Number of examiners	1
Permitted resources	None
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>KT Dynamica Minor</b>
English name (modular) exam	KT Dynamics Minor

(OSIRIS)	
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	KT Dynamica Minor
English name (modular) exam (Alluris)	KT Dynamics Minor
Alluris Code (modular) exam	KT DYN-M
Assessment dimensions or learning outcomes	<ul style="list-style-type: none"> <li>• Determination of movements due to a dynamic or non-dynamic load.</li> <li>• Kinematics (theory of movement) in the flat plane of a rigid body.</li> <li>• The analysis of translational and rotational motion will be discussed.</li> <li>• Important topics include momentary center of rotation and relative speeds and accelerations.</li> </ul>
Assessment criteria	Has knowledge of and insight into dynamic systems aimed at kinematic analyzes (relative speeds and accelerations).
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2
Number of examiners	1
Permitted resources	Formula sheets All types of calculators
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>KT Sterkteleer Minor</b>
English name (modular) exam (OSIRIS)	KT Mechanics Minor
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	KT Sterkteleer Minor
English name (modular) exam (Alluris)	KT Mechanics Minor
Alluris Code (modular) exam	KT STE-M
Assessment dimensions or learning outcomes	<ul style="list-style-type: none"> <li>• Stresses due to combined loads are discussed in more detail.</li> <li>• It is explained how stress components that are defined</li> </ul>

	<p>with respect to a certain coordinate system can be transformed into components belonging to another coordinate system.</p> <ul style="list-style-type: none"> <li>• After establishing the transformation equations, the maximum normal and shear stress components in a point of the structure can be calculated and the orientation of the element on which they act.</li> <li>• In addition to stress transformation, strain transformation is also discussed and the method of arriving at the stress state from measured strain.</li> <li>• Finally, various failure theories and dynamic strength calculations are discussed.</li> </ul>
Assessment criteria	Has knowledge of and insight into strength and stiffness theory (including principal stresses, maximum shear, failure hypothesis).
Exam and modular exam format(s)	ST (Written Exam) Individual assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2
Number of examiners	1
Permitted resources	Formula sheets All types of calculators
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>KT Werktuigonderdelen Minor</b>
English name (modular) exam (OSIRIS)	KT Machine Parts Minor
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	KT Werktuigonderdelen Minor
English name (modular) exam (Alluris)	KT Machine Parts Minor
Alluris Code (modular) exam	KT WTO-M
Assessment dimensions or learning outcomes	"The student has knowledge of and insight into mechanical systems aimed at calculating and dimensioning machine parts". In a mechanical design often parts have to be connected together. This can be done, for example, by means of bolt

	<p>or welded joints. You will learn to calculate these connections in the lectures on tool components. In the period that these lessons are given, you will learn to dimension a number of tool parts using manuals. To this end, the necessary theory is taught in the lessons. At home you will have to master the working method and insight by making practice assignments. The following topics are covered in this cycle:</p> <ul style="list-style-type: none"> <li>• Welding calculations</li> <li>• Feathers</li> <li>• Linear guides</li> </ul>
Assessment criteria	<p>Learning outcomes split-up at exam level:</p> <ul style="list-style-type: none"> <li>• LUKS3.2a: the student (individually) applies theory to a predefined case in the field of welded joints for statically loaded steel structures. He performs multiple (checking or dimensioning) calculations and can look up and read relevant information from prescribed information sources.</li> <li>• LUKS3.2b: the student (individually) applies theory to a predefined case in the field of welding connections for mechanical engineering under dynamic load. He performs multiple (checking or dimensioning) calculations and can look up and read relevant information from prescribed information sources.</li> <li>• LUKS3.2c: the student (individually) applies theory to a predefined case for feathers. He performs multiple (checking or dimensioning) calculations and can look up and read relevant information from prescribed information sources.</li> <li>• LUKS3.2d: the student (individually) applies theory to a predefined case for an elastic system under dynamic load. He performs multiple (checking or dimensioning) calculations and can look up and read relevant information from prescribed information sources.</li> <li>• LUKS3.2e: the student (individually) applies theory to a predefined case for linear conduction. He performs multiple (checking or dimensioning) calculations and can look up and read relevant information from prescribed information sources.</li> <li>• LUKS3.2f: the student (individually) applies theory to a predefined case for a linear drive system under high dynamic load. He performs multiple (checking or dimensioning) calculations and can look up and read relevant information from prescribed information source.</li> </ul>
Exam and modular exam format(s)	<p>ST (Written Exam) Individual assessment Written</p>
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3
Number of examiners	1



Permitted resources	None
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>P Conceptkeuze (design review)</b>
English name (modular) exam (OSIRIS)	P Draft Choice (design review)
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	P Conceptkeuze (design review)
English name (modular) exam (Alluris)	P Draft Choice (design review)
Alluris Code (modular) exam	P DESIGN
Assessment dimensions or learning outcomes	<ul style="list-style-type: none"> <li>• Both individual (exams and performance assessment) and per group (project).</li> <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>
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</li> </ul>

	<p>defined for each subfunction.</p> <ul style="list-style-type: none"> <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)	PD ((Professional)Product) Group assessment Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2 P3 P4
Number of examiners	1
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	You do not need to formally register for (professional) products. For resits, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>PF+G Performance Assessment</b>
English name (modular) exam (OSIRIS)	PF+G Performance Assessment
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	PF+G Performance Assessment
English name (modular) exam (Alluris)	PF+G Performance Assessment
Alluris Code (modular) exam	PF+G PA
Assessment dimensions or learning outcomes	<ul style="list-style-type: none"> <li>• Both individual (exams and performance assessment) and per group (project).</li> <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</li> </ul>

	<p>engineering of the solution.</p> <ul style="list-style-type: none"> <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>
Assessment criteria	<p>Constructs for stiffness: 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>Makes FEM and/or manual calculations: 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>Constructs based on degrees of freedom: 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> <li>• Takes thermal effects into account.</li> </ul>
Exam and modular exam format(s)	<p>PF (Portfolio) Individual assessment Written</p>
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	<p>P1 P2 P3 P4</p>
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities	Not applicable.

registration period Up to 31 January 2023 (via Alluris)	
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	Discussion and review held in consultation with the examiner(s).

Werktuigbouwkunde - tabel 22 - W-M-SPFT

<b>General information</b>	
Changes compared to previous academic year	New exam Industry Orientation Test
Long Dutch name of unit of study (OSIRIS)	Minor Semiconductor Packaging (voltijd)
Long English name of unit of study (OSIRIS)	Minor Semiconductor Packaging (full time)
Short Dutch name of unit of study (OSIRIS)	WTB S7 Minor Semiconductor Packaging
Short English name of unit of study (OSIRIS)	WTB S7 Minor Semiconductor Packaging
Alluris unit of study Dutch name	Minor Semiconductor Packaging (voltijd)
Alluris unit of study English name	Minor Semiconductor Packaging (full time)
OSIRIS unit of study code	None
Alluris unit of study code	W-M-SPFT
Term	P1 P2 S7
Registering for educational components	For all education offered after 31 January 2023, students need to register for the educational components they wish to follow. See Part 3 'OSIRIS Regulations for Education, Exams and Modular Exams' for more information.
Credits	30
Study load in hours	840
Contact hours	175 onderwijscontacturen.
Unit of study entry requirements	The Semiconductor Packaging minor assumes that you have some experience with and affinity for the semiconductor industry. So students wishing to take this minor must have: - demonstrable affinity with the semiconductor industry; - completed the internship - sufficient proficiency (level 2) in English. If there is any doubt, the module coordinator will be consulted.
<b>Content and organisation</b>	
General description	This English-taught minor focuses on the design and manufacture of advanced semi-conductor packaging and assembly techniques and has the following components: <ul style="list-style-type: none"> <li>• Introduction to Semi-conductor Front-End &amp; Packaging;</li> <li>• Advanced Packaging, Applications &amp; Markets;</li> <li>• Basic Simulation, Prototyping &amp; Testing;</li> <li>• Design Quality, Reliability &amp; Economic Sustainability.</li> </ul> These topics are complemented by practicals and two specialisation themes from a choice of six: <ul style="list-style-type: none"> <li>• Multi-Constraint Simulation;</li> <li>• Advanced Materials; Quality Control &amp; Reliability;</li> <li>• Industrialization &amp; Equipment;</li> <li>• Testing;</li> <li>• Data Analysis.</li> </ul> The minor will be concluded with a multidisciplinary

	<p>project.</p> <p>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	<p>C1 Analysis (3)</p> <p>C2 Design (2)</p> <p>C3 Realisation (2)</p> <p>C4 Control (2)</p> <p>C5 Management (2)</p> <p>C6 Consultation (2)</p> <p>C7 Research (3)</p> <p>C8 Professionalisation (2)</p>
Cohesion	<p>See curriculum diagram at the beginning of chapter 9.</p> <p>Minor for 4th year students of different technical disciplines. This minor is part of the Bachelor in Mechanical Engineering.</p>
Mandatory participation	Nee (No)
Activities and/or instructional formats	<p>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.</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.)</p> <p>Course material, documents, articles and references will be provided during the minor.</p>
Required software / required materials	Not applicable.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Semiconductor Packaging Industry Orientation test</b>
English name (modular) exam (OSIRIS)	Semiconductor Packaging Industry Orientation test
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Semiconductor Packaging Industry Orientation test
English name (modular) exam (Alluris)	Semiconductor Packaging Industry Orientation test
Alluris Code (modular) exam	SCP-IOT
Assessment dimensions or learning outcomes	Please note that this partial exam is in English.
Assessment criteria	The student shows that he/she has assimilated the basic concepts, ideas and steps in semiconductor manufacturing, assembly and packaging, as well as the main characteristics

	of applications, global markets and of the participating industrial parties. Moreover, he/she exhibits a positive working attitude, shows initiative and makes use of the offered opportunities for further individual development.
Exam and modular exam format(s)	None Individual assessment Written Oral
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2
Number of examiners	1
Permitted resources	not applicable
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	No formal registration is required for this modular exam. For the resit, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See 8.9.1 en 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Semiconductor Packaging Project Presentation</b>
English name (modular) exam (OSIRIS)	Semiconductor Packaging Project Presentation
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Semiconductor Packaging Project Presentation
English name (modular) exam (Alluris)	Semiconductor Packaging Project Presentation
Alluris Code (modular) exam	SCP-PR
Assessment dimensions or learning outcomes	Please note that this partial exam is in English.
Assessment criteria	<ul style="list-style-type: none"> <li>• The student creates and evaluates their technical progress during the minor and shows their improvement.</li> <li>• They show a positive work attitude, show initiative and make use of the development opportunities offered.</li> <li>• The student communicates clearly and effectively, both verbally and non-verbally, and can work well with fellow students and professionals.</li> <li>• They show they can plan, work according to plan , and adapt where and when necessary.</li> <li>• The student is able to give and receive constructive criticism, and to adapt their behaviour accordingly.</li> <li>• They show they are able to give a presentation with a logical structure, correct structure and valid arguments.</li> <li>• The student clearly indicates what their individual</li> </ul>

	contribution has been in the team and clearly shows they have mastered the in-depth theoretical topics.
Exam and modular exam format(s)	PF (Portfolio) PR (Presentation) GS (Conversation, Criterion based interview, Graduation Exam) Individual assessment Written Oral
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P2 P3
Number of examiners	2
Permitted resources	Not applicable.
Method of registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	No formal registration is required for this modular exam. For the resit, contact the examiner.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
Discussion and review	See 8.9.1 and 8.9.2.

<b>Dutch name (modular) exam (OSIRIS)</b>	<b>Semiconductor Packaging Theory Exam</b>
English name (modular) exam (OSIRIS)	Semiconductor Packaging Theory Exam
OSIRIS Code (modular) exam	-
Dutch name (modular) exam (Alluris)	Semiconductor Packaging Theory Exam
English name (modular) exam (Alluris)	Semiconductor Packaging Theory Exam
Alluris Code (modular) exam	SCP-TT
Assessment dimensions or learning outcomes	Please note that this partial exam is in English.
Assessment criteria	<ul style="list-style-type: none"> <li>• The student demonstrates they have mastered the theory sufficiently.</li> <li>• 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.</li> <li>• The student can perform complex calculations on semiconductor packaging and is able to describe a test setup and test design.</li> </ul>
Exam and modular exam format(s)	ST (Written Exam) Individual assessment



	Written
Weight factor of modular exam	1
Minimum result	5,5
Exam sittings	P1 P2
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 registering for exam or modular exam opportunities registration period Up to 31 January 2023 (via Alluris)	Registration for the modular exam through Alluris. The registration term is several weeks prior to the exam period or the resit period.
Registering and deregistering for exam / modular exam opportunities from 1 February 2023 (via OSIRIS)	Registration for the modular exam through OSIRIS. The registration period is several weeks prior to the exam period or the resit period.
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.