HAN_UNIVERSITY OF APPLIED SCIENCES

Degree Statute and Education and Examination Regulation of the Master's Degree Course Engineering Systems 23-24

School of Engineering and Automotive
Academic year 2023-2024

Vastgesteld per 12 mei 2023
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PART 1 General part

Adoption

This degree statute was adopted by the dean on 12-05-2023, after consent was received from the degree committee on 12-05-2023 and consent from school council on 12-05-2023.

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1 About the degree statute

This degree statute has been formulated according to the model degree statute for master programmes of HAN University of applied Sciences. The courses described in this degree statute consist of units of study.

"Unit of study is a legal term. This degree statute will use the term “course” from this point onward.

The Higher Education and Research Act stipulates in article 7.59 that an institution such as HAN University of Applied Sciences (hereafter HAN) is obliged to adopt and publish a student charter. The Student Charter consists of two parts: the institution-specific part (which we call the 'Student Charter') and the degree-specific part (which we call the 'Degree Statute').

The degree statute consists of three parts:

- Part 1: General part.
- Part 2: The Education and Examination Regulations, which outline the education, final assessment, exams and modular exams for your degree programme.
- Part 3: Other regulations.

Part 1 is purely informative. No rights can be derived from it. Rights and obligations can be derived from the other parts; these are legally applicable regulations.

1.1 Which degree programme(s) does this degree statute apply to?

This is the Degree Statute for the following HAN degree programme(s):

Degree programme	Degree format	CROHO number	Degree after graduation
Engineering Systems	Full time	49136	Master of Science
Engineering Systems	Part time	49136	Master of Science

This degree statute contains information on the structure, organisation and execution of the degree programme, education, student facilities, counselling and study coaching, the education and examination regulations and the other degree-specific regulations that describe student rights and responsibilities. When this document subsequently refers to 'the degree programme', we mean the above degree programme(s).

1.2 How do you read this degree statute?

We use regular UK spelling rules.
When we use 'you', we mainly mean you as an internal or external student enrolled in this degree programme at HAN. But we also mean others, such as prospective students.

1.3 How long is the degree statute valid for?

A new degree statute is written for each HAN degree programme every academic year. The degree statute for a certain academic year applies to everyone enrolled in the degree programme for that academic year. It does not matter which phase of your degree programme you are in, whether you are an internal or external student, or when you started. You can find the digital version of the degree statute here: Full time and part time:

https://www.hanuniversity.com/en/programs/master/engineering-systems/fulltime.

This degree statute applies to the 2023-2024 academic year: from 1 September 2023 to 31 August 2024. For students starting their degree programme on 1 February 2024, two different degree statutes apply consecutively during their first 'year': the current one and that of the next academic year.

Did you enrol in the degree programme in a previous academic year? And is the degree programme working with a renewed curriculum or modifications in the education and examination regulations? You can read how this is organised in Part 2, chapter 8 (Transition regulations).

1.4 How does the degree statute come about?

The degree statute for the degree programme is adopted by the dean each year. It is based on the model degree statute: a model that applies for the entire HAN.

The school council exercises the participation rights on the degree statute, but only in so far as the HAN participation council has not already exercised these rights through the model degree statute and in so far as these rights have not been conferred to the degree committee. How this works exactly is set out in the Participation Council Regulations and the Regulations of the Degree Committee.

Advice is requested in advance from the degree programmes board of examiners.

The relevant HAN organisational bodies strive to publish the new degree statute each year before 1 July.

1.5 Consistency of degree statute, student charter and enrolment regulations

The Degree Statute is part of the Student Charter. The Student Charter applies to the entire HAN. The Student Charter lists all the rights and obligations of students and HAN.
The Student Charter can be found here: Student Charter | HAN University of Applied Sciences.

You can find the rules for application, admission, educational requirements, selection and enrolment in the Enrolment regulations. The degree statute only contains a number of specific additions to this. These additions may not contradict the rules from the enrolment regulations.
The enrolment regulations can be found
at: https://www.hanuniversity.com/en/programs/master/engineering-systems/fulltime/admission-finances .

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2 Education at HAN

Your degree programme is part of the HAN educational offerings. HAN has an overarching mission and vision on higher education. Your degree programme embodies this vision in its own way. HAN's mission and vision are described in the HAN Institutional Plan. You can find this plan on www.han.nl .

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3 Information about your degree programme

3.1 Mission and vision of your degree programme

he Master's Degree course Engineering Systems is a programme of Applied Sciences. This means that knowledge and techniques from fundamental research are applied in an industrial environment, where complex processes require advanced systems. The Applied Sciences take definite shape in the minor projects and the final master thesis: the Major Project.

We educate people (fulltime or part time) to be engineers who are capable of solving complex, practice-related problems themselves. Engineering Systems describes all aspects that are necessary to design, to develop, to improve, to use and to maintain a technical system. Engineering Systems encompasses all stages and all aspects of the life cycle; so not only the technical content, but also the working methods, including the business processes: the focus is on systems thinking.

This approach is in keeping with the aim of the professional master: the professional practice provides the frame of reference for the development of the curriculum. After completing the master's degree program, you are considered, as a highly qualified technical professional, to be able to make a contribution to the development of your profession and your organization, across the boundaries of his own discipline.

The focus of the Master's Degree course is the modelling of smart, dynamic systems, which are systems that perceive and respond to the world around them. Because of this focus, the program has two modules that all students work through: Systems Modelling and Applied Control.

Our views on target groups and the realization of education are part of our presentation: our views on cooperative learning are important for the realization of our education. We offer education for mixed groups, which means students who proceed straight from a bachelor to a master program (both international students and students from HAN bachelors) and part-timers. They all bring their own contribution and learn from each other.

The area of expertise of the Engineering Systems Engineer does not stop at the border. On the contrary: the programs are taught completely in English to accommodate the international context in which the program functions. Society is changing at an increasingly faster rate. This is also true for professions and labor organizations. Professionals are facing issues of increasing complexity. All these issues require a multidisciplinary and cross-sectorial approach.

3.2 Content of your degree programme

This section gives a broad description of your degree programme. You can find the rules and details in Part 2, the education and examination regulations, and in the regulations in Part 3.

3.2.1 Scope

The scope of the degree programme is represented in courses and study load. One credit is equal to 28 hours of study (this is an average indication). This is also stipulated as such in the Higher Education and Research Act. Your master degree programme has a study load of 90 credits.

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3.2.2 Degree content

This section gives a broad description of your degree programme. You can find the rules and details in part 2, the Education and Examination Regulations. In the appendix to chapter 6 the description of the study units can be found.

Part of the degree statute are the following documents:

- Manual Major Project. (An explanation of the graduation project)
- Practical guide (for example for an overview of the exams)
- Assessment Why and How

The Degree Statute, Assessment why and how, the Practical Guide and the Manual to the major project can be found on Onderwijs Online General Information.

The professional master's programme Engineering Systems is offered as a full-time program and a part-time programme. The degree course covers 90 EC.

- 60 EC for the teaching phase, 30 of which are elective and 30 credits of the program are offered to all students jointly, and
- 30 EC for the major project.

The full-time programme takes approximately 18 months, including the major project, based on a weekly study load of 40 hours and a break during the summer.

The part-time study takes approximately three years, based on a weekly study load of 20 hours, including the major project. The programme is divided in modules of 15 EC.

Degree programme overview

An overview of the modules and the descriptions of the study units can be found in the appendix belonging to part 2 chapter 6. We offer you the following modules:

- **Compulsory:** Compulsory are the modules Systems Modelling and Applied Control.
- **Two elective modules:** They are grouped by tracks. It is however possible to choose 2 modules from different tracks.

Tracks	Modules
Automotive Systems	Advanced Vehicle Dynamics Hydrogen Technology Innovations in Powertrains Intelligent Mobility
Cyber-Physical Systems	Advanced Vehicle Dynamics Big Data & Small Data Embedded Control
Sustainable Energy	Hydrogen Technology Sustainable Energy Systems (mandatory for SE) Smart Power Supply

Compulsory: Major Project / graduation project

The major project will demonstrate that the student is able to work at master level in the professional working field. Detailed information about the major project can be found in the manual (#OO, major project).

3.3 Organisation of your degree programme

The curriculum is constructed of elements with focus on theory, application and skills, in relationship to the end-qualifications as defined in the next chapter. The teaching units are organized around a theme (an overview of the modules can be found in part 2, chapter 6).

In every module the student is offered

- a theoretical background,
- Capita Selecta and a
- minor project.

With most of these activities including literature survey, oral presentations and reporting, the student will obtain guidelines in presentation and reporting skills, and will receive comments on these communication achievements for a majority of his/her presentation and reporting results.

Design of these activities as well as the assessments (why and how can be found in Assessment Why and How) will be such that you will develop skills to formulate a problem, to solve that in a step-by-step iterative approach and to draw conclusions, which are of value to and in communication with the (non-specialist) problem owner(s). You will also practice skills to analyze the problem at an abstract level and break it up into elements to understand their relationships and organization (system analysis) and to interpret the individual element performance in terms of the total engineering system performance (synthesis). Non-technical skills will be addressed as well, including working in teams (multidisciplinary, with a global international focus), self-management of the learning process, and research

skills.

Each semester consists of two terms. A term lasts between 9 and 10 weeks. The units of study are a combination of lectures, assignments, exercises, etc. for one specific topic. The scores for all parts of a programme should be satisfactory (all pass).

3.4 How we educate and supervise

The purpose of the program is to educate you so that you can operate at Master level.

The intended learning outcomes of the master's degree course are based on the professional profiles and/or professional qualifications drawn up by (or in collaboration with) the relevant professional field. We expect students to develop an increasing degree of independence and self-management in shaping their learning pathway.

HAN is committed to offering support with studying and with making choices about your program at HAN. Study coaching is therefore an important part of our education. The study coaches help you to develop the level of self-management you need to complete your studies. They are also first point of contact in special situations, for example if your studies are not going as planned or if you have a disability or chronic illness. They can help you look for ways to improve your progress.

Exams and final assessments may only be administered by examiners designated by the degree course. The quality of exams and final assessments is monitored by the board of examiners and by external experts.

How do we implement this in practice?

The curriculum is constructed of elements with focus on theory, application and skills, in relationship to the end-qualifications as defined in the preceding chapter. The teaching units are organized around a theme: the earlier mentioned modules.

All modules are scheduled on one day. Systems Modelling for example on Monday, Applied Control on Wednesday. The schedule of the modules can be found in The practical guide. For the sake of clarity: not only the lessons but also the written exams are scheduled on the same day.

Education, supervision and examinations can be offered online or physically at HAN. The choice depends on the character of the teaching unit.

3.5 Internships and/or workplace

Master graduation projects (the major project) are motivated by real-life problems, supplied by engineering companies or institutes. In most cases, the major project is carried out at the company or the research group (the so called problem owner).

The main educational goal of doing a major project is that the student demonstrates that he/she can act and function at master level. In some detail, within the context of the major project, students will at least demonstrate their capabilities on the final qualifications of the master program.

To make it more transparent, we split ‘acting and functioning at Master level’ up into three connected goals. These goals are:

- The solution of a practical problem for the benefit of the client.
- Development of new knowledge and applications for the technical domain.
- Further development of the student’s professional master competences, so called Final qualifications in the Degree Statute, represented and described in a major project report or an article that the student is able to amplify on and to defend.

More detailed information can be found in de module description (part 2) and the Instruction Manual Major Project.

3.6 How the professional field is involved

In a world that is steadily becoming more complex and more dynamic, professional Master programs fulfil a need for renewal in the qualification structure of higher education. Key aspects of these programs are multi-disciplinarity, flexibility and innovation. Professional Masters offer solutions to the tension between training people to meet the current demands of the labor market and training them for professions that, as yet, do not exist and the exact nature of which is hard to predict.

The Master belongs to the specialization master programmes, which means that the programme provides students with a more in-depth understanding of their field and increases the level of professional practice. Intake varies from experienced professionals to Bachelor graduates. The English-language Master has a strong focus on international professional practice.

Associated large industries and specialized companies acknowledge the need for Systems Engineers at Master’s level. This is reflected in the support of a number of companies. The HAN research and competence groups work with students for projects in the industry. The professional research and teaching staff support students in the broad field of engineering.

The HAN Research Centres do important work in the field of research and educational innovation. They maintain a

growing network with other educational institutions, the business community, local authorities and non-profit organizations in the region. With their research, professors respond to issues encountered by these organizations in practice. They involve (Masters) students, lecturers and doctoral candidates in this process. Each research Centre has its own knowledge network, consisting of a group of experts from both education and the professional field. This assures that a continuous process of coordination with professional practice can take place.

3.7 Research groups and research centres

The following research centres and professors are involved in the programme:

HAN Automotive Research	Lector: Dr. P.A. Veenhuizen and Lector: Dr. ir. Frans Tillema
HAN Balanced Energy Systems Group	Lector: Dr. P.A. Veenhuizen vacancy

The Research Groups are contributing to and controlling the quality of the Master program by supplying considerable human input of lecturers and presence in

- the Program Board
- the Master Advisory Counsel
- the Board of examiners
- Program Committee
- Teaching in courses / units of study
- by coaching major project students
- by pre-assessing the reports of the major projects

To monitor the quality of the program, HAN attaches great importance to the opinions of experts from the professional field for which the program trains its students. The Professional Advisory Committee is composed of representatives from the professional field and field of work. These experts assemble several times a year in the meetings of the Professional Advisory Committee.

3.8 Other

Quality asurance of the degree course:

The aim of our quality assurance is to work continuously on improving and guaranteeing quality. The degree programs regularly (twice per module) surveys the opinions of students on all kinds of matters relating to education in its broadest sense. This first relates to the education that students participated in during certain periods, but also to matters such as the study materials, scheduling of contact hours and study tasks.

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4 Exit qualifications and professional requirements

4.1 The professional field

In a world that is steadily becoming more complex and more dynamic, professional Master programs fulfil a need for renewal in the qualification structure of higher education. Key aspects of these programs are multidisciplinarity, flexibility and innovation. Professional Masters offer solutions to the tension between training people to meet the current demands of the labor market and training them for professions that, as yet, do not exist and the exact nature of which is hard to predict.

The Master belongs to the specialization master programmes, which means that the programme provides students with a more in-depth understanding of their field and increases the level of professional practice. Intake varies from experienced professionals to Bachelor graduates. The English-language Master has a strong focus on international professional practice.

Associated large industries and specialized companies acknowledge the need for Systems Engineers at Master's level. This is reflected in the support of a number of companies.

4.2 Professional requirements

We educate people to be engineers who are capable of solving complex, practice-related problems themselves. In this context teamwork is at the centre of the Minor Projects of all modules.

Engineering Systems describes all aspects that are necessary to design, to develop, to improve, to use and to maintain a technical system. Engineering Systems encompasses all stages and all aspects of the life cycle; so not only the technical content, but also the working methods, including the business processes: the focus is on systems thinking.

4.3 Exit qualifications

Exit qualifications:

This section describes your exit qualifications at the end of the degree programme. These exit qualifications are formally set in the education and examination regulations and correspond with the professional requirements described in section 4.2.

When you graduate, you conform to the exit qualifications of the degree programme. In other words, you have certain (required) knowledge, understanding, skills and (if relevant) attitude, for the profession you have been educated for. The exit qualifications for your degree programme are outlined below.

Nr.	Exit qualification	Description
1	Analyzing and defining problems	To be able to critically analyze the engineering problem through active communication with the problem owner, to translate this to a problem formulation, feasible solution approaches and scientifically valid conclusions and recommendations, to be communicated again to the problem owner.

Nr.	Exit qualification	Description
2	Design	To be able to systematically translate the engineering problem to a model at an abstract level, (i.e. reducing it to its essentials in terms of model and problem requirements) and to validate results against the real life situation and problem formulation.
3	Testing	To be able to systematically translate the engineering problem to a concrete level, and to validate results against the real life situation and problem formulation.
4	Managing Work Processes	To be able to put engineering activities within the perspective of engineering company processes, including quality control principles. To be able to incorporate the economical (cost) and societal (safety, sustainability) consequences in the design or development process.
5	Conducting research	To be able to apply specialized scientific knowledge and skills in the field of systems engineering.
6	Communication and collaboration	To be able to work on a problem within a multidisciplinary context in an industrial environment. To be able to work on a problem in an international engineering context in an industrial environment
7	Professional development	To be able, through self-reflection, to improve one's own professional acting

The level of the exit qualifications is geared to the Dublin Descriptors.

As a result, our degree programmes are guaranteed to be at the correct national and international level. The degree certificates meet all legal requirements and are therefore comparable with and equal to similar degree certificates from other universities of applied sciences in the Netherlands and abroad.

Qualifications (Dublin descriptors) that signify completion of the second cycle (master level) are awarded to students who:

- have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with Bachelor's level, and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research context;
- can apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study;
- have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgements;
- can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously;
- have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous.

We have furthermore geared the level of the final qualifications to the Dublin descriptors. These are internationally accepted criteria for Masters level:

DUBLIN DESCRIPTOR	QUALIFICATION
Knowledge and understanding Provides a basis or opportunity for originality in developing or applying ideas often in a research context.	*Analyzing and defining problems:* To be able to critically analyze the engineering problem through active communication with the problem owner, to translate this to a problem formulation, feasible solution approaches and scientifically valid conclusions and recommendations, to be communicated again to the problem owner. *Conducting research:* To be able to apply specialized scientific knowledge and skills in the field of systems engineering.
Applying knowledge and understanding Through problem solving abilities applied in new or unfamiliar environments within broader (or multidisciplinary) context.	*Design:* To be able to systematically translate the engineering problem to a model at an abstract level, (i.e. reducing it to its essentials in terms of model and problem requirements) and to validate results against the real life situation and problem formulation. Testing: To be able to systematically translate the engineering problem to a concrete level, and to validate results against the real life situation and problem formulation. *Managing work processes:* To be able to put engineering activities within the perspective of engineering company processes, including quality control principles. To be able to incorporate the economical (cost) and societal (safety, sustainability) consequences in the design or development process.
Making judgements Demonstrates the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete data.	*Conducting research:* To be able to apply specialized scientific knowledge and skills in the field of systems engineering. *Analyzing and defining problems:* To be able to critically analyze the engineering problem through active communication with the problem owner, to translate this to a problem formulation, feasible solution approaches and scientifically valid conclusions and recommendations, to be communicated again to the problem owner. *Design:* To be able to systematically translate the engineering problem to a model at an abstract level, (i.e. reducing it to its essentials in terms of model and problem requirements) and to validate results against the real life situation and problem formulation. *Managing work processes:* To be able to put engineering activities within the perspective of engineering company processes, including quality control principles. To be able to incorporate the economical (cost) and societal (safety, sustainability) consequences in the design or development process.

Communication Of their conclusions and underpinning knowledge and rationale (restricted scope) to specialist and non-specialist audiences (monologue).	*Analyzing and defining problems:* To be able to critically analyze the engineering problem through active communication with the problem owner, to translate this to a problem formulation, feasible solution approaches and scientifically valid conclusions and recommendations, to be communicated again to the problem owner. *Communication and collaboration:* To be able to work on a problem within a multidisciplinary context in an industrial environment. To be able to work on a problem in an international engineering context in an industrial environment.
Learning skills Study in a manner that may be largely self-directed or autonomous.	*Learning skills:* To be able, through self-reflection, to improve one's own professional acting

5 Academic calendar

This chapter outlines the lecture days, lecture times and the holidays and lecture-free weeks.

5.1 Lecture days and lecture times

The HAN timetable is published on HAN Insite.

A detailed timetable can be found in the Practical Guide.

Lecture times:

A handy tool for viewing your timetable each week can be found on HAN Insite .

https://www1.han.nl/insite/en/students/timetables-lecture-times-academic-calendar/

Period **01** 09:00 – 09:45	Start Mathematics 0
Period **02** 09:45 – 10:30	
Period **03** 10:45 – 11:30	
Period **04** 11:30 – 12:15	
Period **05** 12:15 – 13:00	
Period **06** 13:00 – 13:45	**Start lessons** part time students/ fulltime students
Period **07** 13:45 – 14:30	
Period **08** 14:30 – 15:15	
Period **09** 15:30 – 16:15	
Period **10** 16:15 – 17:00	
Period **11** 17:00 – 17:45	Pause
Period **12** 17:45 – 18:30	Start guest lectures
Period **13** 18:30 – 19:15	
Period **14** 19:15 – 20:00	
Period **15** 20:00 – 20:45	
Period **16** 20:45 – 21:30	

5.2 Holidays and lecture-free weeks

The calendar for this academic year can be found on HAN Insite. It gives the lecture weeks and holidays.

6 HAN organisation

This chapter gives information about the organisation of HAN. Here you also find information on participation, quality assurance and the facilities you as a student can use.

6.1 Schools

At HAN, the degree programmes are divided over 14 schools.

Your degree programme belongs to the School of Engineering and Automotive..

6.2 Management and organisation of the school

On HAN Insite you can find information about the set-up, organisation and staff of your degree programme, and about the school they belong to.

6.2.1 Board of examiners and examiners

The members of the board of examiners can be found on: https://onderwijsonline.han.nl/information/view/kBylXQy2

You can contact the board of examiners for your degree programme via the board of examiners secretarial office The central e-mail address of the Board of examiners of the Academy Engineering and Automotive is: examencommissie.AEA@HAN.nl. The AEA Board of examiners is subdivided into the Engineering Chamber, Automotive Chamber and Master Chamber. For specific matters concerning these respective chambers, these can be reported directly via the e-mail addresses: Examencommisie.engineering@han.nl, Examencommissie.Automotive@han.nl, Examboard.TM@han.nl.

The members of the board of examiners are appointed by the HAN Executive Board.

The tasks and responsibilities of our board of examiners can be found in the Regulations of the Board of Examiners. These include additional rules regarding final assessment and examination in so far as these are within the powers of the board of examiners. See also the Regulations of the Board of Examiners in Part 3 of this degree statute.

The board of examiners decides, amongst other things, whether you meet the conditions set out in the education and examination regulations.

The board of examiners appoints examiners for each exam and modular exams. One or more appointed examiners administer that exam or modular exam and determine the result.

Other duties and powers of the board of examiners include:

- Assuring exam quality.
- Granting exemptions.
- Handling requests for an extra opportunity for an exam or a modular exam.
- Handling requests for modified exam or modular exam formats.
- Handling complaints.

You can find all the further rules on exams, modular exams and the final assessment that apply to you in the education and examination regulations (see Part 2). For rules on how these are organised, please refer to the Exam Regulations (see Part 3).

6.2.2 Participation and consultation

Below is a short overview of the HAN committees and councils. They discuss and also influence the policies and decisions made at HAN.

Degree committee

There is a degree committee for each degree programme or group of programmes. A degree committee consists of an equal number of staff members and students. The degree committee advises the course department about promoting and guaranteeing the quality of the degree programme. Each year it also evaluates the degree programme's compliance with the education and examination regulations. The degree committee also has a right of consent and advisory rights. Through this committee, you can contribute ideas and make decisions about the education and organisation of your degree programme.
Would you like to become a member of the degree committee? You can request more information from educationoffice.tm@han.nl. The degree committee has its own regulations (see Part 3).

School council

Each school has its own school council. This council has the right to discuss all matters concerning the school and to ask the dean about these matters. The council also has the right to be consulted on school policies. The school council gives you the opportunity to contribute ideas and decide on school policies.
Would you like to know more about the school council? Contact the school council secretarial office: academieraad.aea@han.nl

Participation council

The participation council allows staff and students to participate at HAN level. This council has a right of consent on certain aspects of policy, on the main features of the institution budget, the general applicable part of the education and examination regulations and more. The participation council has an equal number of students and staff. The participation council deals with general HAN policy.
Would you like to join the participation council? You can ask for more information from the secretarial office for the participation council: secretariaat.mr@han.nl. Would you like to learn more about the participation council? Go to https://www1.han.nl/insite/mr/home_opl.xml.

6.3 Student facilities

As a student, you can rely on good coaching and guidance during your academic career. Within your degree programme, you and your study coach look at what coaching you need, your study progress and your career development. We look at your talents, ambitions and support needs.
In addition to the coaching offered within your degree programme, you can use the services offered by HAN Student Support Centre. This is a team of experts who work together on one goal: your growth as a student.

On www.han.nl, under the 'Studying' tab, you will find all information about the facilities that are offered in- and out-of-school. The right of students to the various facilities is regulated in section 3.1 of the Student Charter. The various contact details are included in chapter 5 of that statute. The Student Charter can be found at:
https://hanuniversity.com/en/study-and-living/studying-at-han/rights-and-responsibiliti/index.xml

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PART 2 Education and Examination Regulations

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1 About the education and examination regulations

These education and examination regulations are included in the degree statute that applies to your degree programme. The education and examination regulations are adopted each academic year.
The education and examination regulations cover the education, exams, modular exams and final assessment for your degree programme and your rights and obligations.

1.1 Terms and definitions

The terms and definitions used in these education and examination regulations are given below.

The Dutch term is given between brackets.

Academic year (*Studiejaar*)	The period starting on 1 September and ending on 31 August of the following calendar year.
Assessment criteria (*Beoordelingscriteria*)	Clearly defined and unambiguous standards that can be used to give a motivated assessment of whether and to what extent a student meets the required level of knowledge, understanding and skills and (if relevant) attitude assessed in an exam or modular exam.
Assessment dimensions (*Beoordelingsdimensies*)	Assessment dimensions give a global description of the aspects on which a student's performance and/or the resulting products should be assessed. These descriptions need to be global because the assessment dimensions should apply to any type of student performance that demonstrates their qualification.
BRIN number (*BRIN-nummer*)	The Basisregistratie Instellingen (BRIN) is a database for educational institutions that is published by the Dutch Ministry of Education, Culture and Science. It contains all schools and related institutions. Each educational institution is identified in the database with a number. The BRIN number for HAN is 25KB.
Course *(Cursus)*	The term “Course” refers to a unit of study or a unit of learning outcomes and is used for all types of education and corresponding educational concepts.
Credit *(Studiepunt)*	Official term: Education Credit (EC). The study load of a course is measured in credits. For degree programmes that consist of courses one credit equals a normative study load of 28 hours of study. For degree programmes that consist of units of learning outcomes a credit expresses the comparative study load of a course compared to the study load of the degree programme…...
CROHO (*CROHO*)	CROHO is the central register for degree programmes in higher education.

Degree committee (*Opleidingscommissie*)	The statutory public participation body as referred to in article 10.3c of the Higher Education and Research Act, which is responsible for eg. guaranteeing the quality of the degree programmes listed in Part 2, chapter 1.
Degree format (*Inrichtingsvorm*)	The manner in which a degree programme is organised: full-time, part-time or work-study.
Deregister (*Uittekenen*)	When a student is registered for certain educational components, exams or modular exams, that student must deregister if they decide they no longer wish to participate. OSIRIS uses the term ‘disenrol’ for deregistering.
D-stream (*D-Stroom*)	This is a customised study programme that has the same exit qualifications, assessment dimensions and assessment criteria for courses as the regular stream (A-stream). It allows a student to following their own study track in continuous consultation with examiners, lecturers and classmates.
Educational arsenal *(Onderwijsarsenaal)*	The educational and coaching activities offered to students by a unit of learning outcomes programme with the aim of supporting the student in gaining the course exams and exam modules.
Elective course (*Keuze-cursus*)	A course that can be chosen from two or more courses. Once selected, a course becomes part of the student's study programme and final assessment. The exams and modular exams for the non-mandatory courses that the student did not select do not need to be taken for the degree certificate.
Exam (*Tentamen*)	A test of the student's knowledge, understanding, skills and (if relevant) attitude in conjunction with each other. Also, the assessment of the results of that test. The exam is the concluding component of a course .
Exam opportunity (*Tentamengelegenheid*)	An opportunity offered in the degree programme to sit for an exam or modular exam.
Exam sitting (*Tentamenmoment*)	The sitting/time at which an exam or modular exam is administered/held.
Examination Appeals Board (*College van Beroep voor de examens*)	This is the board referred to in article 7.60 of the Higher Education and Research Act. The board deals with appeals submitted by students against decisions made by HAN.
Exams taken independently of the standard programme (*Leerwegonafhankelijk tentamen*)	An exam or modular exam that the student can take without having participated in the educational activities linked to that exam or modular exam.

Exemption (*Vrijstelling*)	A decision made by the board of examiners that a student does not have to take the exam(s) relating to one or more specific courses. This decision is based on the board's opinion that the student already sufficiently masters the required knowledge, understanding, competences and/or skills and (if relevant) attitude.
Exit qualifications (*Eindkwalificaties/Eindtermen*)	Well-defined outcomes regarding the knowledge, understanding and skills and (if relevant) the attitude a student should acquire by the time they complete their degree programme.
External student (*Extraneus*)	A person enrolled at a university of applied sciences or university who can participate in exams, modular exams and final assessments but not in the education or supervision.
Graduation specialisation (*Afstudeerrichting*)	A specialisation within a degree programme as defined in the education and examination regulations.
HAN (*HAN*)	HAN University of Applied Sciences. This abbreviation is used in internal documents to improve the readability of documents.
Head examiner (*Hoofdexaminator*)	Appointed by the board of examiners as the head examiner responsible for the results of examination and assessment in cases where more than one examiner has been appointed for an exam or modular exam.
Higher Education and Research Act (*WHW*)	Higher Education and Research Act (in Dutch: *Wet op het Hoger Onderwijs en Wetenschappelijk Onderzoek*).
Honours programme (*Honoursprogramma*)	A specialisation or differentiation programme for students who are capable of and want to do more than what is offered in the regular study programme. An honours programme has an additional study load of 22.5 credits or more.
Learning outcome (*Leeruitkomst*)	A measurable result of learning outcomes .
Major (*Major*)	The core 210 credits of a bachelor degree programme. During the major a student acquires the qualifications needed to graduate for a university of applied sciences bachelor degree and meet the professional requirements.
Minor (*Minor*)	The part of the post-propaedeutic phase of the bachelor degree programme that is aimed at specialisation or differentiation. The minor has a study load of 30 credits.
Model degree statute *(OER)*	Education and examination regulations.
Module (*Module*)	An internally coherent and to some extent independent part of the part-time and work-study degree programme. A module consists of one or more courses and is aimed at a realistic cluster of qualifications derived from professional practice.

Module certificate (*Modulecertificaat*)	Written statement by the board of examiners that a student has successfully completed a module in the part-time or work-study degree format.
OSIRIS	The HAN study information system.
Premaster (*Premaster*)	Opportunity to resolve deficiencies when failing to meet the admission requirements of master degree programmes
Professional requirements (*Beroepsvereisten*)	Well-defined qualifications regarding the knowledge, understanding and skills and (if relevant) the attitude a student needs to carry out the profession they are studying for.
Professional task (*Beroepstaak*)	A meaningful, complete task as carried out in all its complexity by a professional practitioner in an actual professional setting with all its complexities.
Recognition of Prior Learning (*Erkenning Verworven Competenties, EVC*)	Recognition of prior learning gained outside the degree programme that leads to a Certificate of Prior Learning from the Nationaal Kenniscentrum EVC, the national research centre for the recognition of prior learning. Recognition of prior learning can lead to exemption from exams and modular exams for courses that focus on the competences already gained through the prior learning.
Register (*Intekenen*)	Registering for educational components, exams and modular exams. OSIRIS uses the term ‘Enrol’ for this.
School (*Academie*)	An organisational unit with interconnected degree programmes, research and knowledge services.
Student (*Student*)	A person enrolled as a student in a degree programme at HAN with the aim of participating in education, exams and modular exams.
Study coach (*Studiebegeleider*)	A staff member responsible for the study coaching of one or more students.
Study load *(Studielast)*	The time and effort required for a course.
Study plan *(Studieplan)*	The contract between a student and HAN at courses that consist of units over learning outcomes. Also called the education contract.
Study progress requirement (*Studievoortgangsnorm*)	The standard that the course department sets and that the student must meet in order to receive positive study advice.
Talent programme (*Talentenprogramma*)	A specialisation or differentiation programme for students who are capable of and want to do more than what is offered in the regular study programme. A talent programme has an additional study load of fewer than 22.5 credits.
Track with special feature (*Traject met bijzondere eigenschap*)	A degree track that distinguishes itself from the standard track because of a different duration, intensity, language or format. In all cases, the study load and the qualities in the area of knowledge, understanding and skills that a student has to acquire by the end of the track are the same as those of the degree programme.

Unit of Learning Outcomes *(Eenheid van leeruitkomsten)*	A measurable result of learning outcomes that a student may gain without having participated in the educational activities linked to said learning outcomes, the command of which the student is able to demonstrate independently of regular in-class educational activities. A unit of educational outcomes comes with a final examination that may consist of more than one module of exams. In the model degree statute a unit of learning outcomes is called a course.
Unit of study / study unit (*Onderwijseenheid*)	A basic unit of HAN education that is aimed at achieving clearly defined objectives in terms of knowledge, understanding, skills and (if relevant) attitude. These are assessed in an exam and awarded a certain number of credits.
Workplace learning agreement *(Praktijkleerovereenkomst)*	Agreement between HAN, the student and a company or organisation regarding work-study placement in the part-time or work-study courses as described in article 7.7,

1.2 Which degree programme(s) do these education and examination regulations apply to?

These are the education and examination regulations, as defined in article 7.13 of the Higher Education and Research Act, for the following HAN degree programme(s):

Degree programme	Degree format	CROHO number	Location of the degree programme
Engineering Systems	full time	49136	Arnhem
Engineering Systems	part time	49136	Arnhem

1.3 Which education and examination regulations apply to you?

At HAN, the education and examination regulations are renewed every year. This does not mean everything changes each year. Generally only a small number of changes are made to the educational programme and the organisation.

These education and examination regulations apply to the 2023-2024 academic year, so from September 2023 to 31 August 2024.

This means that during this same period these regulations also apply to students who started their degree programme on 1 February 2023, or who will start their degree programme on 1 February 2024. It also means that students who start their degree programme on 1 February have two different education and examination regulations in their first year.

Amendments made to the education and examination regulations do not apply to events or matters in the past, but only to the new academic year. Special rules may apply when switching from 'earlier' education and examination regulations to new education and examination regulations. These rules can be found in the transition regulations: Part 2, chapter 8.

In exceptional cases the education and examination regulations must be amended during an academic year.

Amendments can only be made during an academic year if this is reasonably necessary and does not disadvantage the students. Transition regulations may also apply in these cases: see Part 2, chapter 8. The overview of adopted amendments is included in Part 2, section 8.5.

In cases not provided for in these education and examination regulations, the dean will decide. If a case is subject to the authority of the board of examiners, a decision will be made by the chair of that board of examiners. Those with an interest in the decision will be informed of that decision within four weeks.

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2 Regulations concerning admission

The rules concerning application, admission, admission requirements, selection and enrolment for all degree programme(s) to which this degree statute applies, can be found in the Enrolment Regulations:https://www.hanuniversity.com/en/programs/master/engineering-systems/fulltime/admission-finances/.

This chapter contains the applicable rules for admission into the degree programme, which by law must be included in the education and examination regulations.

2.1 Maximum number of admissions

Not applicable

2.2 Admission requirements

A requirement for admission to a master degree programme is holding a bachelor degree from a university of applied sciences or university or possessing knowledge, understanding and skills at the level of a bachelor degree from a university of applied sciences or university.

The following specific requirements also apply to this degree course:

Holding a bachelor degree in Automotive, Electrical Engineering of Mechanical Engineering or possessing the knowledge, understanding and skills at the level of this bachelor degree.

Language:

This degree program is offered in English. If you want to successfully complete a degree program offered in English, you need to have sufficient mastery of the language. Detailed information can be found on:

Admission into master Engineering Systems (hanuniversity.com).

CV and motivation

In addition to the general admission requirement a motivation letter and a CV have to be submitted. Detailed information can be found on:

Admission into master Engineering Systems (hanuniversity.com).

Marks:

In addition to the general admission requirement can be admitted with a bachelor in Automotive, Electrical Engineering or Mechanical Engineering and at least a 7 (10 point scale) for physics and mathematics. Detailed information can be found on:

Admission into master Engineering Systems (hanuniversity.com).

2.3 Employment requirements for part time degree programme(s)

In addition to the entry requirements provided above, the part-time degree program is subject to the requirement that you have a job position that will enable you to successfully complete (the major project) the degree program. This job must allow you to perform the work activities as described in the units of study of the module major project.

2.4 Workplace-learning agreement for the work study degree format

Not applicable

2.5 Extra contribution

Not applicable

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3 Description of the degree programme

In this chapter you can read about the format and structure of the degree programme. You can also read about the study load of the different courses and modules offered in the degree programme. This chapter contains a general description. Part 2, chapter 6 describes the exact content of the degreeprogramme.

3.1 Structure and format of the degree programme.

3.1.1 Structure of the degree programme

The degree programme consists of a coherent set of courses.

The study load of a degree programme is represented in credits. The study load of a course is at least one credit. One credit is equal to 28 hours of study (this is an average indication). The study load of this master degree programme is 90 credits.

Each year of study is structured so that the standard study load for a full time degree format is 60 credits.

The standard study load of the part time-degree programme is 30 credits per year of study.

You can follow the degree programme in the following degree formats:

Full-time

Part-time

At location: Arnhem.

The standard scheduled duration of the degree course is 1 1/2 years of study.

The part-time degree format has a standard scheduled duration of 3 years of study.

The structure of the educational programme for this degree programme is provided in Part 2, chapter 6.

3.1.2 Structure of the work-study degree format

Not applicable

3.1.3 Elective courses

There are also a number of times during the degree programme when you can choose from different courses, up to a total of 30 credits. Part 2, chapter 6 stipulates which courses you can choose from.

For all education you need to register for the educational components you wish to follow. See Part 3 ‘OSIRIS Regulations for Education, Exams and Modular Exams’ for more information.

3.1.4 Graduation specialisation

Part 2, chapter 6, describes the graduation specialisations, with the corresponding courses and exams and modular exams. The ‘admission requirements’ for the graduation specialisation are also stipulated here. You can choose one of the following graduation specialisations:

[

Automotive Systems	Master in Engineering Systems, Automotive Systems (hanuniversity.com)

Cyber-fysical Systems	Master of Engineering Systems, Control Systems track (hanuniversity.com) Master of Engineering Systems, Embedded Systems track (hanuniversity.com)
Sustainable Energy	Master of Engineering Systems, Sustainable Energy track (hanuniversity.com)

3.2 Tracks with special features

Not applicable

3.2.1 Combined track

Not applicable

3.2.2 Other track with special feature

Not applicable

3.3 Language in which the courses are offered

The degree programme Engineering Systems is offered in English.

3.4 Extra educational components

As a student you can take one or more extra modules or courses at HAN. If you choose to do this, you will be expanding your study load. You can do this at HAN by:

- taking one or more extra modules,
- taking one or more extra courses.

You do not need approval from the board of examiners to participate in an extra module or one or more extra courses.

Capacity limits may apply for participation in an extra courses or an extra module.

Extra educational components are not part of the degree programme. The results of extra educational components will be listed separately on the degree certificate.

3.5 If the content or structure of your degree programme changes

We regularly change or update components of the degree programme so we can guarantee the quality of the degree programme and the value of your degree (certificate). This means the education and examination regulations for a following academic year may contain amendments to the course programme you will follow.

Changes to the degree programme can have certain consequences. If you have a study delay, for example, you may need to pass a different exam or modular exam than you initially thought. A change may also mean an exam or modular exam is still offered, but you can no longer follow the educational activities for that particular component.

A change cannot mean that courses or exams and modular exams you have already passed no longer count towards the final assessment. The law only allows this in highly exceptional cases.

The transition regulations in Part 2, chapter 8, stipulate, for every change to the degree programme, where needed, what the consequences are for students who are registered for the study programme at the time of said change. .

3.6 Registering for educational activities

In order to take part in education you need to register for educational activities. The ‘OSIRIS Regulations for Education, Exams and Modular Exams’ in Part 3 of this degree statute stipulates what is expected of you regarding registering and deregistering for educational activities. The regulations also contain exceptions for situations where registering for an educational activity is not necessary.

4 Study coaching and study facilities

The learning objective and basic principle at HAN is that you are responsible for your own learning process. We also want you to feel acknowledged during your entire time as a student. You are entitled to good study coaching. Each degree programme offers support for this. If needed, HAN can also offer you academic, psychological and financial support. The HAN Student Support Centre network offers you support for successful study progress.

4.1 What does HAN offer to assist you with your studies?

HAN offers facilities that enable you to do well in your studies. Examples of these are:

1. Facilities for students with a disability;
2. Facilities for pregnant students and students with informal care tasks;
3. Special support for international students;
4. Special support for students from minority groups.

HAN Student Support Centre also offers support for successful study progress. Students who need this can get extra support. You can contact your Study coach or HAN Student Support Centre for more information about the facilities and coaching offered at HAN. See also Part 1, chapter 6

In addition to the general facilities, your degree programme also offers at least the following facilities:

1. Study coaching as described below;
2. Two exam opportunities each academic year.

4.2 How is study coaching organised?

The study coaching starts with the introduction to the Study coach at the start of the academic year. In the first year of study, your personal Study coach will invite you to come and talk with them at least 2 times. Furthermore, study coaching is integrated in the education in the courses.

Furthermore:

- Coaching is mainly integrated in the study program as part of the units of study, for example in the minor projects.
- International students are also assisted by the coordinator of International Affairs with regard to issues not directly related to the program (housing, banking, insurance, etc.).
- During the Major Project phase the student’s supervisor of HAN University has several meetings with the student. The frequency of these meetings depends on the progress of the Major Project. The HAN supervisor is also in contact with the company’s supervisor or HAN Research Group Supervisor to ensure that the necessary requirements will be met.
- Students with a functional disability can ask for more time during exams.

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5 Exams and final assessment

This chapter covers, in general terms, the exams, modular exams and final assessment for your degree programme.

Each course has a related exam**.** An exam can consist of two or more modular exams that have a predetermined weight factor and jointly determine the result for the exam of the course.

5.1 Exams and modular exams

5.2 Exam

The result of an exam for a course is used to determine whether the student has the knowledge, understanding and/or skills and (if relevant) attitude required to successfully complete that course. The assesment dimensions and assessment criteria of the exams and modular exams are set out in Part 2, chapter 6.

5.2.1 Entry requirements

Some courses have qualitative entry requirements for participating in educational activities, exams and modular exams for that course. The entry requirements are provided in the course descriptions in Part 2, chapter 9. You can submit a well-reasoned request to the board of examiners for permission to deviate from these entry requirements.

The following entry requirements may apply to your degree programme:

- You need to have passed one or more other specific exams or modular exams.
- You need to sufficiently master the language in which the course is taught.

5.2.2 Mandatory participation

In some cases you may only do an exam or modular exam if you have participated in the educational activities for the unit of study belonging to that exam or modular exam.

Minor projects cannot be examined without participation.

Part 2, chapter 6 of this degree statute further stipulates which units of study have full or partial mandatory participation. The board of examiners may grant full or partial exemption of mandatory participation. In that case, an equivalent requirement is imposed instead.

5.2.3 Exam format

The format of an exam or modular exam is specified in Part 2, chapter 6, in the description of the course concerned. The board of examiners may deviate from this format in special cases, on request or at their own initiative.

The following exam formats are used:

Format	Description
GESP-F	Meeting on location
GESP-O	Online/digital meeting

KENN-F	Knowledge exam on location/written
KENN-M	Oral knowledge exam
KENN-O	Online/digital knowledge exam
PART-F	Participation on location
PART-O	Online/digital participation
PERF-F	Performance on location/written
PERF-O	Online/digital performance
PORT-F	Portfolio on location/written
PORT-O	Online/digital portfolio
PRES-F	Presentation on location
PRES-O	Online/digital presentation
PROD-F	(professional) Product on location/written
PROD-O	Online/digital (professional) product

It is not possible to use more than one exam format.

Oral examinations are public. The exam commission may, in special cases, deviate from this rule. This decision will be communicated with a motivation to all interested parties.

5.3 The examiner

Each exam and modular exam is designed and assessed by one or more examiners, as decided and appointed by the board of examiners.
The examiner determines the outcome of the exam or modular exam and the result. If more than one examiner is appointed, the head examiner sets the final result.

5.3.1 When have you passed an exam?
The examiner gives the result of an exam as a grade, a word qualification or a pass/fail qualification.
The **grade** of an exam is expressed in one of the following numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.
A **word** qualification can be given in one of the following terms: excellent, good, more than satisfactory, satisfactory, unsatisfactory, poor, very poor.

The conversion chart below must be used:

Word qualification	**Abbreviation word qualification**	**Conversion**
Excellent *(excellent)*	E	10

Good *(goed)*	G	8
More than satisfactory *(ruim voldoende)*	RV	7
Satisfactory *(voldoende)*	V	6
Unsatisfactory *(onvoldoende)*	OV	5
Poor *(ruim onvoldoende)*	RO	4
Very poor *(slecht)*	S	2

You have passed an exam if you receive a grade of 6 or higher, a word qualification of satisfactory or higher or a Pass.

You have failed an exam if you receive a grade of 5 or lower, a word qualification of unsatisfactory or lower or a Fail.

In the course descriptions in Part 2, chapter 6, is described if an exam is graded with a grade, a word qualification or a pass/fail.

In the case of fraud, an F is recorded for the exam result in OSIRIS.

5.3.2 When have you passed a modular exam?
The examiner gives the result of a modular exam as a grade, a word qualification or a pass/fail qualification as described in art. 8.3.1. The same conversion chart applies.
A grade for a modular exam is rounded to a number with 1 decimal place.
Grades with the decimals 1, 2, 3 or 4 are rounded down.
Grades with the decimals 5, 6, 7, 8 or 9 are rounded up.

You pass a modular exam if you earn a grade of 5.5 or higher, a word qualification of satisfactory or higher or a 'pass' qualification.
You fail a modular exam if you earn a grade of 5.4 or lower, a word qualification of unsatisfactory or lower or a 'fail' qualification.

In the course descriptions in Part 2, chapter 6, is described if a modular exam is graded with a grade, a word qualification or a pass/fail.

In the case of fraud, an F is recorded for the modular exam result in OSIRS.

5.3.3 How is the overall grade calculated for an exam with modular exams?
When the overall grade for the exam is calculated, the grades earned for the modular exams are weighted as specified in the course descriptions given in Part 2, chapter 6. In case of word qualifications the conversion chart above applies. The final exam grade is then rounded as follows:

Exam grades with the decimal 1, 2, 3 or 4 are rounded down to whole numbers.
Exam grades with the decimal 5, 6, 7, 8 or 9 are rounded up to whole numbers.

5.3.4 Applicable result

The final grade for an exam or modular exam is the highest grade achieved. You are allowed to resit an exam or modular exam even if you pass it.

The unit of study descriptions in Part 2, chapter 6, stipulate whether compensation regulations for exams and modular exams apply.

5.4 Number of exam opportunities each academic year

You have at least two opportunities each academic year to take an exam or modular exam. Degree programmes may choose to offer an exam or modular exam more than twice in an academic year. The degree programme will then decide how often a student may sit an exam or modular exam. Your degree programme allows you to sit exams and modular exams at least 2 times per academic year.
The descriptions of the courses in Part 2, chapter 6, specify how many exams and modular exams are conducted each academic year and in which term.

In the following exceptional situations, the course description in Part 2, chapter 6, may stipulate that fewer opportunities than mentioned above will be offered each academic year for students to take the exam or modular exam. This may occur in the following situations:

- if the nature of the education and assessment for the course make it impossible to offer the maximum amount of opportunities. Each academic year at least one opportunity must be given to sit an exam or modular exam, or,
- if it is not possible to offer the maximum amount of opportunities due to physical or logistic reasons, for instance the participation of a third party such as an actor or if the time of the exam makes an extra opportunity impossible, and the next opportunity cannot be offered until the following academic year, and
- an alternative has been offered that prevents further study delay.

The student will be informed of this exception when they apply for the course and, if possible, before the start of the academic year.

5.4.1 Registering for exams and modular exams

If you want to sit an exam or modular exam you need to register for this exam or modular exam. Part 2, chapter 6 describes how en when you need to register for an exam or modular exam. In some situations you will be registered automatically. These exceptions are described in the Regulations Education and exams and modular exams OSIRIS in part 3 of this statute. These regulations also contain information about what is expected of you regarding registering and de-registering for exams and modular exams.

5.4.2 Request for extra exam opportunity or different exam format

You can submit a request to the board of examiners for an extra opportunity for an exam or modular exam.
The request must include a good motivation and at least a description of the reason and importance. In the Regulations of the Board of Examiners (see Part 3) gives further details on the procedure are explained.

5.5 Modified exam format

Do you have a disability or chronic illness, or is there another reason that means you cannot participate in the regular format of the exam or modular exam? Then you can ask the board of examiners to conduct the exam or modular exam in a format adjusted to your situation.

The board of examiners will decide, if needed after consultation with you and the examiner, which format can reasonably be used for the exam or modular exam, which facilities will be offered and which different rules will apply.

5.6 When is the result of an exam announced?

It depends on the exam format when the result of an exam or modular exam is announced:

- You will be informed of the result of a written exam or written modular exam within at least 15 working days. This result will be recorded in OSIRIS.
- The result of an oral exam or oral modular exam will be decided directly after the exam and announced within no more than five days. This result will be recorded in OSIRIS.
- You will be notified of the result of a practical exam or practical modular exam immediately after the exam, or if that is not possible, within five working days. This result will be recorded in OSIRIS.

A result entered into OSIRIS may only be changed in the following cases:

- If a demonstrably incorrect result has been entered into OSIRIS.
- In cases of fraud, deceit or impersonation.
- If an examiner has revised their assessment for well-founded reasons.
- If you have lodged an appeal to the Examination Appeals Board or the Higher Education Appeals Tribunal against an assessment, the appeal is judged to be valid and the result has been revised by the examiner.

Has a result changed after being entered into OSIRIS? Then you will be notified.

5.7 Exams: review and discussion rights

You are entitled to receive further explanation about the assessment of your exam or modular exam. This is set out in the HAN rules on discussion and review rights below. Both the discussion and individual review are closely monitored to ensure no fraud takes place.
Discussion and review rights are organised as follows:

5.7.1 Group discussion

Within 10 working days after the results of an exam or modular exam, the examiner organises a group discussion, unless there is clearly no need for this among the students.

5.7.2 Review and discussion of individual work

As an interested party you are entitled to review and discuss your own work with your lecturer and the examiner, unless you could reasonably have already done this during the group discussion. You are allowed to review and discuss everything: the assessed exam or modular exam, the questions, assignments and grading system. Students must have the option to review and discuss their own work within 6 weeks after the result.

5.7.3 Other exam formats

If an exam has been administered in a format that cannot be reviewed or discussed as outlined in the procedure above, the course description in chapter 6 will specify how the review and discussion is organised. The same principles will be guaranteed as in sections 5.8.1 and 5.8.2 above.

5.8 Exams taken independently of the standard programme

All exams and modular exams for this degree programme are offered as exams taken independently of the standard programme. The exam format is described in Part 2, chapter 6. There you will also find the times at which exams and modular exams are planned.

5.9 When and how can you request exemption from an exam or modular exam?

Part 2, chapter 6 describes for each exam and modular exam which knowledge, understanding, skills and attitude you need to demonstrate and how they will be examined and assessed. You can request an exemption from the board of examiners for one or more exams or modular exams if you demonstrate that you already master the knowledge, understanding, skills and attitude associated with the exam or modular exam.

You can demonstrate this with:

- evidence showing you previously passed an exam in higher education;
- an official report showing recognition of prior learning;
- evidence that you gained the required knowledge, the required understanding and/or the required skills elsewhere.

The learning outcomes assessment criteria of the exams and modular exams as specified in Part 2, chapter 6, form the guidelines for the board of examiners to grant the exemption.

Instead of a grade, a word qualification or the 'pass' qualification, you receive the qualification of 'exemption' for an exam or modular exam.

The procedure for granting exemptions can be found in the Regulations of the Board of Examiners (Part 3).

The board of examiners may designate certain previously passed exams and modular exams and/or any previously earned credits and degree certificates as entitling students to exemption from one or more exams or modular exams.
The designated exams, credits and certificates are outlined in an appendix to the Regulations of the Board of Examiners. The board of examiners may also consider these as grounds for exemptions from one or more exams or modular exams for courses that are part of abridged tracks.

5.10 The final assessment

You pass the final assessment of the master degree programme if you have passed all of the exams related to that final assessment.
This will differ if the board of examiners has specified that an extra assessment is needed of your knowledge, understanding and skills. In that case, you will also need to pass that extra assessment (exam). Only then will you pass the final assessment.

5.10.1 Cum laude

If you pass all the exams that count towards the final assessment with a grade of 8 or higher, you will pass that assessment ‘cum laude’. The grades that count here are the overall exam grades for each course; separate grades for the modular exams are not taken into account.
Exams that have a word qualification will be converted using the table in 5.3.1.

Exams that are part of an increase of your study load, as described in Part 2, chapter 3, are not taken into

consideration when determining the 'cum laude' distinction.
You may earn no more than 30 credits in exemptions or 'pass' qualifications in the degree programme.

5.10.2 With merit
If you pass all the exams that count towards the final assessment with a grade of 7 or higher, you will pass that assessment ‘with merit’. The grades that count here are the overall exam grades for each course; separate grades for the modular exams are not taken into account.
Exams that have a word qualification will be converted using the table in 5.3.1.

Exams that are part of an increase of your study load, as described in Part 2, chapter 3, are not taken into consideration when determining the 'with merit' distinction.
You may earn no more than 30 credits in exemptions or 'pass' qualifications in the degree programme.

5.11 Overview of results, supporting documents, and declarations

5.11.1 How to request a - certified - overview of your study results
You can make a printout of your exam results as recorded in OSIRIS. If you want to use this overview as an official document outside HAN, you can submit a request to the Student Affairs Enquiry Desk, via ASK@han.nl for a certified overview of study results. This certification does not guarantee that the relevant authorities will also consider the document official.

5.11.2 Exam documentation
You will receive a digital document from the examiner for each exam or modular exam you take. It gives the name and code of the exam or modular exam, the course and your result. The examiner is required to provide you with this documentation.
Keep these documents in a safe place.

5.11.3 Statement
Are you dropping out of the degree programme and not entitled to a master degree certificate? If you have passed more than one exam, you can ask the board of examiners for a statement listing the exams you passed, for which degree programme, how many credits you earned for those exams and, if applicable, the programme for which the statement is being issued.

5.11.4 Module certificate
Not applicable

5.12 Degree certificate, degree and diploma supplement

5.12.1 Master degree certificate and diploma supplement
In the month when you expect to have passed all the exams for the degree programme, you can apply for your certificate through OSIRIS. Only after you apply, does the board of examiners check whether you have indeed passed all exams for the degree programme, whether you are enrolled in the degree programme, and whether you have met all your financial obligations towards HAN.
Following this, the board of examiners will award the degree certificate and the accompanying diploma supplement in English. The official date of graduation is the day the board of examiners determines that you have earned all the

required credits.

5.12.2 Degree and degree title
Once the board of examiners has confirmed you have passed the final bachelor assessment, the HAN Executive Board will award you the degree for your degree programme. This degree comes with an official abbreviation you can place after your surname in the Netherlands and abroad.

Degree programme	Degree and degree title	Official abbrevation
Engineering Systems	Master in Science	MSc.

This degree title is also stated on the certificate.

5.12.3 Postponement of the degree certificate
You are allowed to postpone the request for your master degree certificate. The board of examiners will determine the duration of the postponement, taking into account the reasons for the delay. You must request the degree certificate within the timeframe specified. If you do not do so, the board will issue the degree certificate after this timeframe, unless you have requested an extension to the timeframe on time. You can postpone graduation for a maximum of two years.

5.13 Appeal

You can lodge an appeal with the HAN Examination Appeals Board against a decision concerning education, exams, modular exams and final assessments within 6 weeks based on the education and examination regulations.

For more information about which decisions you can appeal and how, go to HAN Insite Complaints and Disputes Office:
https://www1.han.nl/insite/en/students/contact/complaints-disputes-unacceptable-behavior/examination-appeals-board/

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6 Description of the educational programme

This chapter describes your degree programme in the form of a curriculum overview and description of the courses.

If extra programmes, tracks in a language other than English or tracks with a special feature are offered, these are also described.
This chapter also specifies whether the degree programme offers modules and/or elective courses.

Name of degree programme: Engineering Systems		
CROHO number: 49136		
Degree format	Full-time	Part-time
Language	English	English

Below is a schematic overview that gives you an overall impression of the degree programme. It also gives the courses and modules in the degree programme.

6.1 Courses

See Appendix to chapter 6 description of the educational programme.

6.2 Graduation specialisations

See Appendix to chapter 6 description of the educational programme.

6.3 Other

Not applicable

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7 Evaluation of the degree programme

7.1 Evaluation structure

A quality framework has been adopted for all HAN degree. This is in line with the accreditation framework of the Accreditation Organisation of the Netherlands and Flanders (NVAO) and the education policy formulated by HAN. This framework stipulates, among other things, that regular evaluations must be held among students, graduates, the professional field and staff.

Assessments are also held by HAN to support the evaluations at the level of the degree programme.

Each year all HAN degree programmes participate in the National Student Survey (NSE) in which students indicate how satisfied they are with different aspects of their degree programme.

Every year an alumni survey is held via the HBO-monitor. This evaluates for each degree programme how alumni look back on their degree programme and how well it was geared to the labour market in their experience.

HAN students who leave a degree programme without a degree certificate are contacted to enquire about their reason for leaving. Also, study progress and drop-outs are monitored for each degree programme.

Every six years an accreditation is held by the NVAO, with external reviews beforehand by a committee of experts. Halfway through the accreditation cycle, an audit is conducted by an internal committee complemented by an external expert in the relevant field. The aim is to monitor and test the progress of improvement measures relating to the last external assessment of the degree programme. This internal audit results in a report with improvement recommendations for those responsible for the content of the degree programme, the degree committee and the dean.

The audit is conducted according to HAN guidelines and it includes quality assurance with regards to administrative and educational law and good implementation of the education and examination regulations.

7.2 Evaluation by the degree programme

The The head of the school of Engineering and Automotive is responsible for the structure and the quality of the degree programme.

Each year the dean adopts an annual quality assurance report on the degree programme. This document, along with the internal audit report or review report, forms the basis for dialogue about the quality of the degree programme. This report concerns the improvement activities that were agreed on for the reported year, how they were executed and what results they delivered.

Based on the analysis of evaluation data for the reported year, a description follows of the improvement activities to be implemented in the current year. The evaluation data come about through evaluations of courses, annual evaluations and curriculum evaluations by lecturers, students, alumni and the professional field. Also through evaluation studies conducted centrally by HAN.

The head of the school of Engineering and Automotive and/or the degree committee, curriculum committee and the board of examiners are involved in this cycle at degree programme level by means of a brief response to this. Their responses are included in the appendixes to the annual report.

7.3 Role of the degree committee

The tasks, role and responsibilities of the degree committee in the evaluation are set out in the Regulations of the Degree Committee (see Part 3). The degree committee can also take the initiative to conduct specific evaluations.

7.4 Degree-specific quality assurance

The aim of our quality assurance is to work continuously on improving and guaranteeing quality. The programme regularly (twice per module) surveys the opinions of the students on all kind of matters relating to education. This first relates to the education that students participated in during certain periods, but also to matters such as the study materials, scheduling of contact hours and study tasks.

8 Transition regulations

8.1 Effective date for amendments

An amendment to the education and examination regulations can only become effective as of 1 September in the following academic year. Exceptions to this rule are clerical error, force majeure, fulfilment of legal regulations or when the amendment is in your favour.

This chapter sets out the rules for respecting acquired rights and legitimate expectations.

8.2 Validity certificate

A successful master degree certificate is inviolable, except in the case of proven fraud in the process of earning this.

8.3 Obtained credits and study results

The result of an exam and its corresponding credits remain valid until the board of examiners has made a substantiated decision that the examined material is so outdated that it can no longer be used in the profession and the term of validity has expired as of a date stipulated by the board of examiners.

Results obtained for modular exams remain valid and may – if they still fit in the new programme – lead to exemptions for modular exams. A modular exam can, if possible, be added to another course to replace a different modular exam that had the same learning outcomes or learning goals.

8.4 Participation in education, but not in exam or exam not passed

A student who has participated in the educational activities for a course in the academic year prior to the programme change, but who has not completed an exam or modular exam or has not passed an exam or modular exam, is entitled to repeat the educational activities at least during the academic year in which the change takes effect, and is entitled to at least two opportunities to take the (modular) exams.

8.5 Degree-specific transition regulations

Master of Engineering Systems track Automotive Systems / MAE

Background: The MAE Framework document allows exemptions for students, formulated in the following way (quote):

> *There are possibilities that a candidate has previously completed programs on one or more of the topics of the introductory program, such as those having successfully followed the first year post-graduate program in Automotive Engineering in Prague (Czech Technical University in Prague, CVUT). In that case, the student may be granted exemptions from carrying out one or more of the modules, being part of the introductory phase of the master. The candidate is never granted an exemption for (part of the) modules of the specialization program or the final project.*

This document discusses the Automotive track first semester program and the first year program of the European Master of Automotive Engineering (MAE) and concludes that a successful first year of the MAE is awarded by exemptions for the modules mentioned on the next page. The exemptions will be granted after completion of 34 credits at HAN:

The MES AS program and the MAE first year program: The MES AS program (64 credits) covers the following topics:

MAS-1. Module Advanced Vehicle Dynamics (15 EC)

MAS-2. Innovations in Power Trains (joint project AVD) (5 EC)

MAS-3. Module Applied Control (15 EC)

MAS-4. Module Systems Modelling (4 EC)

MAS-5. Major Project (30 EC)

with the number of credits (EC) between brackets.

The MAE first year program covers the following topics:

EMAE-1. Internal Combustion Engines (5)

EMAE-2. Mechanical and Hydraulic Transmissions 1 (4)

EMAE-3. Micro-Electronics in Vehicles (2)

EMAE-4. Multibody Modelling for Vehicle Systems (5)

EMAE-5. Technology for Automotive Production (4)

EMAE-6. Design against Fatigue (2)

EMAE-7. Management, Economics and Finance (2)

EMAE-8. Computation of Fluid Dynamics (4)

EMAE-9. Foreign Language – I (3)

EMAE-10. Internal Combustion Engines (2)

EMAE-11. Mechanical and Hydraulic Transmissions 2 (2)

EMAE-12. Project and 3D CAD (3)

EMAE-13. Vehicle Dynamics I & II (6)

EMAE-14. Vibration of Vehicles (5)

EMAE-15. Design of Tools and Plastic Parts (3)

EMAE-16. Vehicle Concept., Structure, Aggregates and Safety (3)

EMAE-17. Quality (3)

EMAE-18. Foreign Language – II (3)

In addition to lecturing, the following teaching and study methods are applied:

- Practical work (laboratory, practical training) is included in EMAE-2, EMAE-3, EMAE-11
- Specific modelling activities and exercises are included in EMAE- 4, EMAE-6, EMAE-7, EMAE-13, EMAE-14.
- Individual assignments and project presentations are included in EMAE-5, EMAE-12.
- Take-home assignment for almost all topics

Comparison between MES AS and MAE first year: In this section, the MAE first year program will be considered in comparison with the MAS program.

- The contents of MAS-2 is covered (term 1) by the various MAE courses.
- The contents of MAS-2 is partly covered (term 2) by the various MAE courses.
- The contents of MAS-4 (term 1) is covered by the various MAE courses.
- The contents of MAS-4 (term 2) is partly covered by the various MAE courses.
- The in-take requirements for MAS and MAE related to Mathematics and Mechanics are identical. The theory as described in the self-assessment is treated again in MAS-1 to validate this level again. The first year program covers a sufficient amount of mathematics to ensure that the student will have acquired the output level of MAS-4.
- MAS-Minor Projects are not included in MAE. Instead, MAE-students carry out practical (team-) work (EMAE-2, EMAE-3, EMAE-11) and individual assignments (EMAE-5, EMAE-12), practicing the minor assessment aspects of Annex 5. As mentioned before, the MAS puts more emphasis on the communication part, but that is corrected in MAS-semester 1 (Applied Control and Advanced Vehicle Dynamics) for these students.

-

Conclusion: the students, having successfully finished the first year of MAE, are considered partly to master knowledge and skills according to the MES AS first semester output level, and they are granted exemptions for the following units of study after completion of 34 credits at HAN:

· Module Systems Modelling (AP, IM, EBM, MP)

· Module Innovations in Powertrains (IPT T, IPT CS)

8.6 Adopted amendments to this degree statute

Not applicable

[Describe the amendments here].

In this section you will find a description of the adopted amendments on [date of adopted amendment(s)] as referred to in Part 1, under ‘Adoption’:

[Describe the amendments here].

In this section you will find a description of the adopted amendments on [date of adopted amendment(s)] as referred to in Part 1, under ‘Adoption’:

[Describe the amendments here].

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PART 3 Other regulations

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1 Exam regulations

These regulations set out:

1. The rules of conduct for students in exam and modular exam sessions, insofar as these are not laid down in the Student Charter, the Education and Examination Regulations or related regulations.
2. The rules of conduct for students in review sessions and discussions of exams and modular exams, insofar as these are not laid down in the Student Charter, the Education and Examination Regulations or related regulations.

1 Code of conduct for students during exam sessions

The facilities provided by HAN for students with respect to exams and modular exams are laid down in the Student Charter and Education and Examination Regulations or related regulations. HAN also has a general code of conduct for students. In addition to general provisions, this code of conduct contains provisions governing the conduct of students at exam venues. These exam regulations contain additional provisions regarding student behaviour during written and digital exams in particular.

Behaviour
The student:

1. must follow the instructions given by the supervisor and treat the supervisor with respect;
2. must behave in such a way that they do not disturb other students at any time during the exam or when entering or leaving the exam venue. The student must be silent before, during and after the exam when in and near the room where the exam is being held;
3. must contact the supervisor as soon as possible if anything is unclear before and/or during the exam.

Identification and admission
The student:

1. must report to the supervisor at the exam room 15 minutes before the start of the exam;
2. will only be admitted to the HAN exam if they can identify themselves with a valid student card or a valid proof of identity. This includes:
   - a passport;
   - a European identity document;
   - a Dutch driving licence;
   - a European driving licence;
   - a Dutch residence permit.
3. may only use an identity document to identify themselves if they are sitting for a national exam;
4. must place their valid student card or proof of identity at the top right-hand corner of the desk during the exam so the supervisor can check their identity;
5. will have their name checked off the attendance list by the supervisor to confirm their participation in the exam.

Theft/loss of identification
If the student cannot show identification due to theft or loss, they can participate in the exam using an original police report of the theft and/or official request to the municipal authorities for new identity papers. The supervisor should

contact the coordinator when determining whether to approve. This is then noted on the official report/attendance list.

Extra requirements for computer-based exam

1. When taking a computer-based exam, the student is expected to have actively participated in the mock exam organised by the degree course and to have been informed about the exam application, about the fraud prevention application and about the use of personal data;
2. The laptop the student brings with them for the computer-based exam or modular exam must meet the HAN requirements. These can be found at HAN Insite – Facilities and IT – Applications/Software – Schoolyear (digital exams with fraud prevention);
3. If the student's laptop is not compatible with the exam and fraud prevention software, the student may request a loan laptop from the degree course/school before participating in the exam or modular exam.

Before the start of the exam
The student:

1. may only place items needed to complete an exam on or next to the table;
2. may not – unless expressly stated otherwise – be in possession of any digital data carriers during the exam other than those expressly permitted and necessary for taking the exam or modular exam. This includes equipment with integrated digital data carriers, such as USB flash drives, calculators, special watches, special glasses, special earphones, etc.;
3. may not wear a watch. A clock is provided in all exam venues;
4. may not – unless expressly stated otherwise – use the following resources during the exam: hard-copy or digital versions of dictionaries, law books, textbooks, etc. If these resources are permitted, the hard-copy or digital resources will be made accessible and may be checked by the supervisors;
5. must put their coat, scarf, hat, bags, cases, mobile phone(s), smartphone(s), digital data carrier(s) and any equipment with integrated digital data carrier(s) in the place specified by the supervisor;
6. must turn off mobile phones, smartphones, etc. before putting them away;
7. must write their name, student number, class/group and other details requested by the supervisor on all written exam documents at the start of the exam. The student must also write these details on any note paper they use;
8. will not have direct access to the exam venue after the actual start of the exam. Students who do not make it to the exam venue on time are allowed to enter the exam venue when 30 minutes of the exam have passed and are allowed to sit the exam for the remainder of the exam time. The supervisor makes a note of which students are late. Students must strictly observe any instructions given by the supervisors regarding where they are allowed to sit and they may not disturb students who have already started the exam;
9. may log into the exam application prior to a computer-based exam, identify themselves via SURF-connext or Microsoft Azure, and wait at the cover sheet for the exam or modular exam until the supervisor signals that students may start the exam or modular exam.

During the exam
The student:

1. may not take toilet breaks during exam sessions of 120 minutes or less. During exams that last longer than 120 minutes, students may take a toilet break after 120 minutes if accompanied by a supervisor. Exceptions are possible for all exams in cases of physical discomfort, provided the supervisor is notified no later than 15 minutes before the start of the exam or immediately upon entry when arriving 30 minutes after the start of the

exam;
2. may not leave or submit their work during the first 30 minutes of the actual start of an exam (to prevent disruption to other students and/or irregularities). If there are any students who enter the exam venue 30 minutes after the start, any students who want to leave may only do so after the late students have started their exam;
3. will be given access to additional exam facilities if they are entitled to those facilities according to OSIRIS or a decision to that effect by the board of examiners. These facilities are applicable if the student indicated when registering for the exam that they wanted to use these facilities;
4. may not consume any food during exams that are shorter than 150 minutes; students may consume food during exam sessions of 150 minutes or longer if this does not cause a nuisance to fellow students;
5. may only consume drinks from a resealable bottle/container;
6. must use the writing materials specified on the cover sheet (black or blue pen or lead pencil) to complete the written exam;
7. must ensure that multiple-choice forms are filled in correctly and according to the instructions given by the supervisor;
8. may not copy or scan a written or computer-based exam or parts thereof in any way or take the exam or its contents outside the exam venues in any manner:
9. may not use unauthorised digital resources, facilities or functions.

Resources
The student:

1. may not use resources other than those permitted. The permitted resources will be announced in advance by the department and will be listed on the exam cover sheet;
2. must ensure that resources do not have notes, etc. on them unless the exam cover sheet states that this is permitted;
3. must make sure that the laptop and accompanying mouse and earplugs they bring for computer-based exams meet the requirements set by HAN. These can be found at HAN Insite – Facilities and IT – Applications/Software – Schoolyear (digital exams with fraud prevention).

Suspected irregularity
The student:

1. will be referred to Part 2 of the degree statute (the education and examination regulations), and Part 3, chapter 3, of the degree statute (the regulations of the board of examiners) for provisions concerning irregularities or fraud, penalties for irregularities or fraud, and confiscation of evidence;
2. will be permitted by the supervisor to complete the exam in the event of reasonable suspicion of an irregularity or fraud and will sign to confirm they have seen the ‘Official exam report form’ that has been filled in by the supervisor. This form is appended to these regulations.

Handing in exam documents
The student:

1. must check before handing in the exam script and assignment(s) whether their name, student number, class/group number and any other details requested by the supervisor have been written correctly on all of the exam documents to be submitted;
2. must submit all the exam documents including used and unused note paper to the supervisor and sign the

attendance list for confirmation;
3. must make sure everything is left neat and tidy before leaving the exam venue;
4. must make sure they close down the exam application and blocking software for the computer-based exam.

2 Code of conduct for students during review/discussion sessions of assessed exam work

There is a code of conduct for students. In addition to general provisions, this code of conduct contains provisions governing the conduct of students at exam venues.
Below are additional regulations regarding the review of assessed exam work, hereafter referred to as a 'review session'.

Before the review session: Only students who have taken part in the exam for which the review session is organised may be present in the classroom. A lecturer and a supervisor will be present during the review session.

Behaviour
The student:

1. must follow the instructions given by the supervisor and treat the supervisor with respect;
2. must behave in such a way that they do not disturb other students at any time during the review session or when entering or leaving the room where the review session takes place (hereafter referred to as the 'room');
3. must contact the supervisor a.s.a.p. if anything is unclear during the review session.

Identification and admission
The student:

1. must show the supervisor a valid student card or another valid form of identification:
   - a passport;
   - a European identity document;
   - a Dutch driving licence;
   - a European driving licence;
   - a Dutch residence permit.
   If the student cannot show a student card or a valid form of identification, they will not be allowed to take part in the review session/discussion;
2. In the case of theft or loss of the identity document, the student can apply for a certificate of enrolment at the exams office, which will give them admittance to the room. This certificate will only be issued if the student can show the original police report and/or official request to the municipal authorities for new identity papers;
3. must write their name on the attendance list provided by the supervisor to confirm their participation in the review session/discussion;
4. must place their valid student card or other form of identification at the top right-hand corner of the desk during the review session/discussion so the supervisor can check their identity;
5. will only be admitted to a digital review session if they have a laptop with them that meets the requirements set by HAN. These can be found at HAN Insite – Facilities and IT – Applications/Software – Schoolyear (digital exams with fraud prevention).

Start and resources
The student:

1. must ensure they have a copy of their answer sheet (yellow carbon copy) when reviewing a multiple-choice

exam with OMR answer sheet;
2. must log in to the exam application when reviewing a digital exam or modular exam, and identify themselves via SURF-connext or Microsoft Azure;
3. may only place on the table the permitted resources listed on the review cover sheet or announced by the supervisor at the start of the review session;
4. may not – unless expressly stated otherwise – have any of the following in their possession during the review session: digital data carriers or equipment with an integrated digital data carrier, such as mobile phone, smartphone, USB flash drive, calculator, special watch, special glasses, special earphones, etc.;
5. must put their coat, scarf, hat, bags, cases, mobile phone(s), smartphone(s), digital data carrier(s) and any equipment with integrated digital data carrier(s) in the place specified by the supervisor;
6. must ensure their mobile phone(s), smartphone(s) or other digital data carrier(s) and any equipment with integrated digital data carrier(s) are switched off before putting them away.

During the review session/discussion
The student:

1. may not take a toilet break during the review session;
2. may not eat anything during the review session;
3. may only consume drinks from a resealable bottle/container;
4. may only place one or more of the following permitted documents on the table in the case of written exams:
   a. assessment form
   b.yellow carbon copy (of the multiple-choice exam with OMR answer sheet)
   c. exam script
5. may not make any annotations or amendments to the exam script. If the student does this anyway, this is reported to the board of examiners as an irregularity;
6. may not copy, scan or take with them any model answers or assignments. Neither may students copy their own exam scripts and/or those of other students;
7. may not copy or scan a written or computer-based exam or parts thereof in any way or take the exam or its contents outside the exam venues by any other means;
8. may not use unauthorised digital resources, facilities or functions.

In the case of protest
The student:

1. must carefully complete all requested details on the protest form.

Submitting reviewed (assessed) exam work
The student:

1. must submit all the exam documents received for the review session to the supervisor and sign the attendance list to confirm this;
2. must make sure they close the exam application and blocking software for the computer-based exam;
3. must make sure everything is left neat and tidy before leaving the room.

3 Final provisions

Unforeseen circumstances
In exceptional situations and cases not provided for by these regulations and in which an immediate decision is necessary, the decision will be taken by:

a. the head of the exams office (in so far as this is within the powers of the exams office);
b. the examiner (in so far as this is within their powers);
c. the chair of the board of examiners (in so far as this is within their powers);
d. the supervisor, in consultation with the coordinating supervisor if it is not possible to wait until one of the above authorised people is present.

The interested parties will be informed of the decision as soon as possible.

Complaints and appeals concerning decisions and procedures of the exams office
Complaints and appeals concerning decisions and procedures of the exams office

For more on this, see these HAN regulations:
-'Complaints Regulations';
- 'Regulations for Legal Protection of Decisions Concerning Education'.

4 Appendix Proces-verbaal tentamen Official exam report

Naam surveillant *Name of supervisor:*

……..……..

Code/naam tentamen *Code/name of exam*

……..……..

Tentamendatum en tentamentijdstip *Date and time of exam*

……..……..

Tentamenlokaal *Exam room:*

……..……..

Plaats *Place:*

……..……..

PART 1: UITREIKEN VAN HAN LAPTOPS / *LOAN OF HAN LAPTOPS*

Totaal aantal uitgeleende HAN laptops *Total number of loaned HAN laptops*

……..……..

Naam én studentnummer van de student aan wie de HAN laptop is uitgeleend en de reden van uitleen
Name and student number of the student to who the HAN laptop has been lent and the reason for lending

1. (Naam, studentnummer en reden *name, student number and reason***)**

……..……..

……..……..

2.……

……..……..

3. ……...

……..

4.……

……..……...

5.....

PART 2: MELDING VAN EEN GECONSTATEERDE VERMOEDELIJKE ONREGELMATIGHEID OF FRAUDE / ***NOTIFICATION OF A SUSPECTED IRREGULARITY OR FRAUD***

Naam student *Name of student*

……..……

Studentnummer *Student number*

……..…….....

Beknopt verslag door de surveillant van de geconstateerde vermoedelijke onregelmatigheid of fraude
Brief written report report of the suspected irregularity/fraud by the supervisor

……...

……...

Korte reactie van de student (je bent niet verplicht dit in te vullen, je krijgt nog de kans je verhaal te doen bij de examencommissie):

Brief response by the student (you are not required to fill out this form, you will still have the opportunity to tell your story to the Board of Examiners):

……..……..

……..……..

Handtekening surveillant *Supervisor's signature:*

……..……..

Handtekening 'voor gezien' van student *Student's signature to confirm he/she has read the form*

……..……..

The supervisor intervenes immediately in case of a suspected irregularity or fraud. The supervisor provisionally allows the student to finish the exam, and seizes all documents that they suspect are involved in the suspected irregularity/fraud. The supervisor fills in this form and submits it to the coordinating supervisor along with all accompanying items immediately after the exam. The student in question receives a copy of the completed form. The form is then sent to the board of examiners via the exams office. The board of examiners will contact the student.

De surveillant grijpt in geval van een redelijk vermoeden van een onregelmatigheid of fraude direct in. Hij laat de student onder voorbehoud het tentamen afmaken en neemt alle bescheiden in waarmee de vermoedelijke onregelmatigheid/fraude heeft plaatsgevonden. De surveillant vult dit formulier in en levert dit met alle bescheiden na afloop van het tentamen direct in bij de coördinator-surveillant. De student ontvangt een kopie van het ingevulde formulier. Via het Tentamenbureau gaat het formulier vervolgens naar de examencommissie. De examencommissie neemt contact op met de student.

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2 OSIRIS regulations for education, exams and modular exams

These regulations set out:

1. The rules applying to registering for courses;
2. The rules applying to registering for exams or modular exams;
3. The rules applying in case of technical problems.

Regulations for registering and cancelling registrations for courses, exams and modular exams in OSIRIS

1. Registering for courses
   a. You need to register for courses you plan to participate in. If you do not register, you cannot participate in any courses;
   b. The degree programme may specify that a maximum number of students can participate in a certain course. If applicable, this is stated in Part 2 of the degree statute (the education and examination regulations), in the chapter ‘Description of the education programme’;
   c. The degree programme may decide that registration is not required for certain courses . If applicable, this is specified in the description of the course in Part 2 of this degree statute (the education and examination regulations), in the chapter ‘Description of the education programme’;
   d. You do not have to register for courses you take at the start of your degree programme. However, if registration is required at the start of the degree programme for electives / courses, this is specified in Part 2 of the degree statute (the education and examination regulations), in the chapter ‘Description of the education programme’.

2. Registration periods for courses
   a. Registration for courses is open from 20 to 10 working days before they start. If a different registration period is set for a certain course, this period can be found in the description of that component in Part 2 of the degree statute (the education and examination regulations), in the chapter ‘Description of the education programme’.
   Deviating from this provision is only permitted if it benefits students;
   b. A different registration period may be set for the courses related to minors. This period can be found in the description of the course in Part 2 of the degree statute (the education and examination regulations), in the chapter 'Description of the education programme', for the degree programme offering the minor.
   Deviating from this provision is only permitted if it benefits students.

3. Registering for courses after the deadline
   a. You cannot register after the registration deadline has passed. You can submit a request for late registration via ASK@HAN.nl until 9.00 on the last working day before the course starts;
   b. You will be granted permission if there is no maximum number of students as referred to in article 1 under b and if the format of the course allows for late registration;
   c. If a maximum number of students is specified, you will still be given permission if this maximum has not yet been reached and if the format of the course allows for late registration;
   d. The degree programme may decide late registration is not possible for certain courses. If applicable, this is specified in the description of the course in Part 2 of the degree statute (the education and examination

regulations).

If permission is granted, you will be registered by Study Progress.

4. Cancelling registration for courses
   a. If you do not want to participate in an course for which you have registered, you need to deregister no later than the day before it starts;
   b. When you cancel your registration, the automatic registration for the first exam sitting is cancelled as stipulated below in article 5 under b.

Registering and cancelling registration for exams

5. Registering for exams and modular exams
   a. You need to register for the exams and modular exams you want to take. If you are not registered for an exam or modular exam, you cannot take that exam;
   b. There is one exception to this rule: when you register to participate in an course, you are automatically registered for the first sitting of the exam or modular exam for that component. If you want to participate in a different sitting of the exam or modular exam, you need to cancel your registration (see article 8 below). If you do this, also remember to register for the sitting of the exam or modular exam that you do want to attend.

6. Registration periods for exams and modular exams
   a. Registration for exams and modular exams is open from 20 to 10 working days before the exam date;
   b. If a different period has been set for certain exams and modular exams, this period can be found in the description of that course in Part 2 of the degree statute (the education and examination regulations), in the chapter 'Description of the education programme'.

Deviation from this provision is only permitted if it benefits students.

7. Registering for exams and modular exams after the deadline
   a. You can no longer register after the registration deadline has passed. You can still request late registration 8 until 9.00 one working day before the exam or modular exam sitting via ASK@HAN.nl;
   b. You will not be granted permission for late registration if it is no longer possible to arrange the required facilities, services or support;
   c. A request for late registration will be granted if the request is for the last exam or modular exam for a final assessment or if the exam is being offered for the last time due to a change in the curriculum.

8. Cancelling registration for exams and modular exams
   a. If you decide not to participate in the exam or modular exam, you must cancel your registration prior to the exam or modular exam sitting;
   b. You can cancel registration for an exam or modular exam up to one working day before the exam or modular exam sitting;
   c. If you are registered for an exam or modular exam, but do not participate and have not cancelled your registration, this will count as an exam opportunity used and an ‘NP’ (not participated) will be recorded for the exam or modular exam result in OSIRIS. If there were special circumstances that prevented you from cancelling your registration and/or from participating, you can apply to the board of examiners for an additional exam opportunity if needed. See the section ‘Request for extra exam opportunity or another exam

format' in Part 2 of the degree statute (the education and examination regulations), in the chapter 'Exams and final assessment'.

9. Technical problems

If you encounter problems while registering or cancelling your registration for educational components, exams or modular exams and you are unable to register or cancel your registration, report this by email or in person to ASK@HAN.nl before the registration deadline.

3 Regulations of the Board of Examiners

HAN_UNIVERSITY OF APPLIED SCIENCES

Regulations of the Board of Examiners School of Engineering and Automotive (AEA)

Section 1: General provisions

Article 1.1 Terms and definitions

The terms and definitions applied in these regulations are those set out in Section 1.1 of the Education and Examination Regulations.

Article 1.2 Status and scope of these regulations

1. These regulations contain rules about the duties and powers of the Board of Examiners of the School of Engineering and Automotive and measures they may take in this context, as well as rules about the implementation of those measures.
2. These model regulations are adopted annually as part of the model degree statute by the Executive Board with consent from the participation council.
   The board of examiners may amend paragraphs, articles and sections, provided the amendments do not conflict with the education and examination regulations of the degree programme(s), the HAN Student Charter or the Higher Education and Research Act.
3. These regulations have been adopted by the board of examiners and apply to the courses, exams, modular exams and final assessments for all associate degree, bachelor degree and master degree programme(s) of the School of Engineering and Automotive.

Section 2: Decision-making and mandates, tasks and meetings

Article 2.1 Decision-making and mandates

1. The chair of the board of examiners and members of the board of examiners sign decisions by the board of examiners (under the four eyes principle), unless this duty has been mandated to someone else.
2. The board of examiners can appoint a managing committee for matters concerning day-to-day affairs. This committee is composed of the chair of the board of examiners of the chambers and another member and – insofar as this function is carried out – is supported by the official secretary. The managing committee is authorised to make provisions for current matters based on a general mandate. Should situations arise in which the managing committee cannot reach a decision, the situation is presented to the board of examiners as soon as possible for a decision.
3. The board of examiners can be supported in its activities by an official secretary.
4. The duties mandated by the board of examiners are listed in appendix 1 to this set of regulations. The board of examiners remains fully responsible for any duties and/or powers it mandates to others.
5. The duties mandated by or on behalf of the Executive Board to the board of examiners are listed in an overview that can be found in appendix 2.
6. The board of examiners ensures that it receives regular reports (in writing) regarding the progress of its mandated duties and/or powers.

Article 2.2 Duties and powers of the board of examiners

The board of examiners has the following duties and powers:

1. Ensuring the quality of exams, modular exams and final assessments.
2. Adopting guidelines and instructions in addition to the EER about assessing exams, modular exams and final assessments in an objective, reliable, valid and transparent manner and determining their result.
3. Deciding that the term of validity of exam or modular exam results and the corresponding credits have expired, from a date determined by the board of examiners. This is only done in cases where reasoned arguments can be given showing that the knowledge, understanding and/or skills are so outdated that they are no longer useful for the profession.
4. Deciding on student requests for exemptions. If a decision is later shown to be based on incorrect evidence submitted by the student, the board of examiners is authorised to withdraw the decision.
5. Deciding that certain previously passed exams and modular exams, certificates and other declarations, diplomas and degree certificates entitle a student to exemptions for one or more exams and/or modular exams. An overview of designation decisions for groups of students is included in appendix 3 of these regulations.
6. Determining further rules and regulations regarding possible fraud and/or irregularities on the part of students, prospective students or external students, including any measures to be taken.
7. Adopting policies and rules about how the duties and powers should be performed as described in paragraphs 1, 2, 3, 4 and 5.
8. Ensuring the quality of the organisation of and the procedures for exams and final assessments.
9. When establishing guidelines and instructions as specified in paragraph 2, protocols are used for assessing (final) projects that meet national requirements as far as possible.
10. Appointing examiners and head examiners to administer exams and modular exams and to determine the results of those exams. The board of examiners sets guidelines about appointing and assigning tasks to examiners for each exam format.
11. Terminating the appointment of examiners.
12. Submitting proposals to the Executive Board for termination of a student's enrolment in the event of serious fraud.
13. Advising the Executive Board on the discontinuation of a student's enrolment in a degree programme as a consequence of the student's behaviour in relation to future practice of the profession.
14. Deciding in the event of a suspicion that a student has committed irregularities and/or fraud and, if necessary, taking measures in that regard, in accordance with the regulations of the board of examiners as laid down by the board of examiners.
15. Deciding on a student’s request to take a minor in accordance with the EER.
16. Deciding which HAN minors are approved as minors for the degree certificate of the degree programme(s). The overview of these HAN minors approved by the board of examiners can be found on ....
17. Deciding on a student's request for an extra opportunity to take an exam or modular exam.
18. Only for degree courses composed of units of study: deciding on a student’s request to take an exam or modular exam for a course independently of the standard programme.
19. Not applicable.
20. Not applicable.
21. Deciding on a student's request to take exams and modular exams in a different format from what is stipulated in the education and examination regulations.
22. Deciding on a student request, based on a disability or chronic illness or other condition such as pregnancy, to take exams and modular exams in an adapted format.
23. Deciding on a student's requests for an oral exam to be closed to the public. The board of

examiners may also decide (in principle) to close certain exams and modular exams to the public without the student's request in cases where there are special reasons such as company confidentiality during a graduation meeting.

24. Issuing documentation, module certificates and declarations.
25. Contributing to the examination policy for the degree programme or group of degree programmes.
26. Advising the dean on the education and examination regulations.
27. Issuing a degree certificate as proof that a final assessment has been passed after the Executive Board has declared that the procedural requirements for issuing the certificate have been met.
28. The requirements for receiving a degree are that:
    - the student is enrolled at HAN University of Applied Sciences;
    - the tuition fees have been paid.
29. Deciding about the term of postponement when a student does not request his Degree Certificate after passing all the components of his final exam.
30. Issuing a statement of successfully completed exams, at the request of a student, in cases where the student has successfully completed more than one exam and to whom a degree certificate as referred to in article 7.11 paragraph 2 of the Higher Education and Research Act cannot be issued.
31. Issuing a competence assessment certificate to persons entering the field of teaching from another career background as evidence that they have passed the competence assessment.
32. Only for degree programmes composed of units of study: Deciding on a request for exemption from mandatory participation, with or without imposing an equivalent substitute requirement.

Article 2.3 Meetings of the board of examiners

1. The board of examiners meets at least 4 times a year.
2. The meetings of the board of examiners are scheduled in such a way that they concur with the scheduling cycles of the degree programme(s) and the school.
3. The board of examiners decides by a simple majority of votes.
4. If the votes are equally divided, the chair has the deciding vote.
5. At each meeting, the board of examiners ratifies decisions taken in the intervening period by the managing committee based on its general mandate regarding day-to-day affairs, as well as any other decisions taken on the basis of mandated duties/powers.
6. The official secretary to the board of examiners ensures that a report is drawn up of every meeting. The report is adopted at the next meeting held by the board of examiners. The report includes a list of decisions made during the meeting.
7. The official secretary to the board of examiners ensures that the dean[9] and any other members of the board of examiners receive a copy of the final report as soon as possible.
8. The official secretary to the board of examiners ensures that the final, anonymised reports of the meetings can be viewed digitally by lecturers/students/professors and others from the degree programme(s) concerned.

Article 2.4 Joint meeting of the dean and board(s) of examiners

1. The board of examiners meets with the academic manager/dean four times each academic year.

Section 3: Quality assurance of exams, final assessments and organisation

Article 3.1 Ensuring the quality of exams

1. The board of examiners is responsible for ensuring the quality of exams and modular exams.

2. The board of examiners verifies whether the guidelines and instructions as referred to in article 3.2 are observed in practice and result in high quality exams and modular exams.
3. The board of examiners offers suggestions for improvements where needed.
4. Each year, the board of examiners prepares a monitoring plan / quality control plan to ensure the validity, reliability, feasibility and transparency of examinations.

Article 3.2 Guidelines and instruction for exams

1. Exams and modular exams are administered and graded by examiners and head examiners appointed by the board of examiners.
2. The examiners and head examiners examine and assess the exams and modular exams based on the criteria listed in the education and examination regulations and the guidelines and instructions adopted by the board of examiners.
3. The board of examiners advises on:
   - the construction of exams and modular exams. These can be consulted via the academic test policy plan (toetsbeleidsplan AEA)
   - the administering of exams and modular exams. These can be consulted via the HAN Exam Regulations
   - the assessment and adoption of the result of exams and modular exams. These can be consulted via OSIRIS.

Article 3.3 Ensuring the quality of the final assessment

1. The board of examiners is responsible for ensuring the quality of the final assessments. They adopt and follow a policy for this.
2. The board of examiners regularly inspects whether the entirety of exams test all of the intended exit qualifications.

   The board of examiners determines whether a student has the knowledge, understanding, skills and (if relevant) attitude, as described in the EER, that are required for obtaining a degree. The board of examiners also determines whether to award a student a distinction. The board of examiners uses a graduation protocol for this purpose that can be consulted via the EER.
3. The board of examiners is authorised to administer their own further investigation/exam to reach a careful decision about the matters outlined in the previous paragraph.
4. The board of examiners periodically reviews the level of final graduation projects. The board of examiners may have these reviews conducted by other persons, who then submits a report to the board of examiners.
5. The board of examiners will oppose and counteract any unjustified awarding or withholding of credits by examiners.

   degree. The board of examiners also determines whether to award a student a distinction. The board of examiners uses a graduation protocol for this purpose that can be consulted via the EER.
6. The board of examiners is authorised to administer their own further investigation/exam to reach a careful decision on the provisions of the previous paragraph.
7. The board of examiners periodically reviews the level of final graduation projects. The board of examiners may have these reviews conducted by other persons, who then submit a report to the board of examiners.
8. The board of examiners will oppose and counteract any unjustified awarding or withholding of credits by examiners.

[9] This means: the person who is in charge of the degree programme and who acts as direct discussion partner for the board of examiners. Due to the new HAN2020 reorganisation, we cannot yet indicate in this model which officials these should be exactly. The board of examiners can adjust this in their own regulations.

degree. The board of examiners also determines whether to award a student a distinction. The board of examiners uses a graduation protocol for this purpose that can be consulted via the EER.

9. The board of examiners is authorised to administer their own further investigation/exam to reach a careful decision about the matters outlined in the previous paragraph.
10. The board of examiners periodically reviews the level of final graduation projects. The board of examiners may have these reviews conducted by other persons, who then submits a report to the board of examiners.
11. The board of examiners will oppose and counteract any unjustified awarding or withholding of credits by examiners.

Article 3.4 Ensuring the quality of the organisation and procedures for exams and final assessments

1. The board of examiners is responsible for ensuring the quality of the organisation and procedures regarding exams, modular exams and final assessments.
2. The board of examiners monitors compliance with the guidelines and instructions regarding the administering of exams and modular exams as set out in article 3.2 paragraph 3. The board of examiners meets periodically with the exams office about this and if needed also with the Executive Board.

Article 3.5 External validation of the quality of final assessments

The board of examiners ensures that the quality of the final assessment is validated by external parties by:

- supporting school-wide and HAN-wide examination;
- possibly hiring external supervisors to monitor the quality of the assessment of final graduation projects.

Section 4: Appointment and expertise of examiners

Article 4.1 Appointing examiners and expertise of examiners

1. The board of examiners appoints (external) examiners to construct, administer, assess and determine the result of exams and modular exams.
2. Depending on their role in the examination process, examiners and head examiners are experts in their subject field and possess the necessary knowledge and skills to construct exams and modular exams, set out methods and standards for assessing exams and modular exams, organise exams and modular exams and analyse the results of these based on guidelines and criteria for reliable, valid and transparent examinations and assessments.
3. The board of examiners ensures examiners have sufficient expertise. If necessary, the board of examiners can ask the dean to take the necessary measures to facilitate the professional development of examiners.
4. As a way of ensuring the expertise of examiners and head examiners, the board of examiners has a profile with set criteria they use when appointing examiners.
5. Examiners are appointed for one or more specific degree components (course, exam or modular exam, phase, specialisation) and for a specific period.
6. The board of examiners informs examiners about their appointment and the profile used for their appointment.
7. If necessary, examiners and other parties involved may be heard by the board of examiners and asked to provide the board with specific information and/or advice.

8. If requested, examiners must be able to provide the board of examiners with materials for evaluating the quality of exams, assessment methods and assessment results (such as learning outcomes, test plans, exam matrices, answer keys, assessment schemes, assessment criteria for assignments, the actual exam or modular exam and/or assignments, the exam results and an analysis of these).
9. If an examiner does not or no longer meets the required level of expertise or level of functioning, the board of examiners is authorised to revoke that examiner's appointment.

Section 5: Further rules for decisions regarding individual students

Article 5.1 EER as model document

The EER sets out model provisions regarding exams, modular exams, minors, assessment criteria, exemptions, exams and modular exams taken independently of the standard programme, Dutch proficiency, extended study load, study advice and studying with a disability, chronic illness or other special condition such as a pregnancy.

Article 5.2 Further rules regarding exemptions from exams and modular exams

1. The procedure for requesting and granting exemption(s) is according to HAN policy arranged via OSIRIS and fixed in the OSIRIS click card.
2. Designation decisions which offer the prospect of exemptions for special target groups (e.g. as part of an abridged route), can be found in appendix 3.

Article 5.3 Further rules on studying with a disability, chronic illness or some other special condition such as pregnancy

The procedure for requesting and special provisions is according to HAN policy arranged via OSIRIS and fixed in the OSIRIS click card.

Article 5.4 Further rules regarding flexible minors

The board of examiners receives documentation from the student showing they passed the exams approved by the board of examiners for a flexible minor. This documentation may comprise a certificate, a statement or other documents showing the student passed the approved exam.
The procedure regarding flexible minors is according to HAN policy arranged via OSIRIS and fixed in the OSIRIS click card.

Article 5.5 Further rules on requesting an extra exam opportunity

The procedure regarding flexible minors is according to HAN policy arranged via OSIRIS and fixed in the OSIRIS click card.

Article 5.6 Further rules for requesting a different exam format

A motivated request for a different exam or modular exam format can be requested by the student, in writing. Based on the motivation given by the student, the board of examiners will decide whether to award a different exam format or not. For the purpose of decision-making the board of examiners may consult an examiner.

Article 5.7 Further rules for determining the term of postponement if a Degree Certificate is not requested

After completing 240 (bachelor degree), 120 (associate degree) or 90 (master degree) credits, the student can apply for the diploma within 2 years.

Section 6: Irregularity and fraud in exams and modular exams

Article 6.1 Definition of irregularities and fraud

1. An irregularity is defined as ‘any action or omission by an interested party in which they either intentionally or unintentionally give the wrong impression of their own or one or more other interested parties’ knowledge, understanding, skills and (if relevant) attitude.’
2. Fraud is defined as ‘any action or omission of which the interested party knew or should have known that this action or omission made it partly or wholly impossible to form a correct judgement of their or someone else's knowledge, understanding and (if relevant) attitude. And/or intentionally influencing (components of) the exam or exemption awarding process with the purpose of influencing the results of the exam or modular exam or decision about exemption or with the purpose of obtaining a different result for the exam or modular exam or request for exemption.’
3. The following situations are in any case considered to be an irregularity or fraud:
    a. intentionally or unintentionally submitting work in a portfolio and/or presenting or submitting work as a group's or an individual's own work (such as a thesis, project, assignment or other written piece for submission), while it was wholly or partly copied or created by the student in unauthorised collaboration with one or more other students; This also includes the following rules:
        i. paraphrasing the content of someone else’s texts with insufficient references;
        ii. using or copying someone else’s texts, data or ideas without providing the complete and correct references;
        iii. unclearly indicating in your text, for example without quotation marks or some other formatting, that the text has literally been copied from another author, even if you have provided the right references;
        iv. submitting text you have previously already submitted or that is comparable to what you have previously submitted for assignments of other exams or modular exams;
        v. submitting other types of written pieces acquired from a commercial institute or that have been written by someone else (whether or not for a fee).
        vi. not or barely contributing to a (group) assignment, but placing or having someone else place your name under the (group) work.
    b. allowing questions and/or answers of an exam or modular exam to be disclosed or obtaining knowledge of these during and/or before the exam or modular exam is administered;
    c. aiding or assisting another student in a way that gives an incorrect impression of that other student's knowledge, understanding and/or skills;
    d. seeking and/or receiving aid or assistance from a fellow student or other person in a way that gives an incorrect impression of the student's knowledge, understanding and/or skills;
    e. having access to unauthorised resources during an exam or modular exam;
    f. using permitted resources during an exam or modular exam that contain unauthorised notes and/or additions (e.g. margin notes or notes or additions on separate pieces of paper);
    g. leaving the exam venue and returning to the venue during an exam or modular exam without explicit permission;
    h. leaving the exam venue with the completed exam or modular exam, or part thereof, also in cases when that answer sheet is subsequently handed in to the supervisor or their substitute;
    i. altering completed written exams / modular exams that have already been submitted

to the examiner or assessed by the examiner.

j. taking an exam or modular exam under someone else's name, or having another person do this for you;
k. violating the rules that apply to reviewing and discussing assessed exams;
l. any other matters or incidents which the board of examiners sees as constituting an irregularity.

Article 6.2 Confiscation of evidence

If there is reasonable suspicion of an irregularity or fraud, the board of examiners, examiner and any other person who is present at an exam or modular exam on the Executive Board's behalf are authorised to confiscate materials that may serve as evidence of the irregularity or fraud. After the decision of the board of examiners as referred to in article 6.5 has become final and conclusive, the board will return the confiscated materials to the student.

Article 6.3 Measures taken in the event of fraud and irregularities

1. The board of examiners may impose one or more of the following measures if a student commits an irregularity or fraud in any part of an exam or modular exam:
   a. give a written warning;
   b. give a written reprimand;
   c. invalidate an administered exam or modular exam and the exam result if the board of examiners is unable to guarantee the quality due to the irregularity or fraud. If an exam or modular exam is invalidated, this will lead to an 'F' being recorded for the exam or modular exam result in OSIRIS;
   d. withhold a student's degree certificate (if the irregularity or fraud is not discovered until after the exam or modular exam);
   e. decide the degree certificate can only be awarded after the student resits an exam in a manner, on a date and at a time to be decided by the board of examiners (if the irregularity or fraud was not discovered until after the exam or modular exam);
   f. revoke the degree certificate after it has been issued (if the serious fraud was not discovered until after the certificate was issued to the student).
2. In the event of an irregularity or fraud, the board of examiners may deny a student access to one or more exams or modular exams for a period not exceeding one year;
3. In the event of serious fraud, the board of examiners may recommend that the Executive Board terminate the student's enrolment for the degree programme concerned.
4. If according to the board of examiners an administered exam or modular exam does not meet the quality criteria for examination as the result of an irregularity or fraud committed by someone other than the student, the board of examiners may decide to annul all or part of the exam or modular exam and/or the exam result. Invalidating a past exam or past modular exam leads to the exam result being annulled or not being awarded. Students affected by this are offered the opportunity to redo the exam or modular exam (or part thereof) concerned.

Article 6.4 Hearing the student, the reporter of the irregularity and one or more third parties

1. The board of examiners will notify the student immediately, if possible orally but always in writing, of any reported irregularity or fraud involving that student at an exam or modular exam.
2. The student will be given the opportunity to be heard by the board of examiners before a final decision is made.
3. If the student wishes to be heard, he or she must make this known in writing within 8 working days of the date on which he or she was notified of the opportunity to be heard.

4. The student will be heard no later than 10 working days after receipt of their request.
5. The board of examiners can hear the person who reported the irregularity and any third parties before making a final decision on the irregularity or fraud.
6. Before the hearing takes place, the student is informed of their right not to answer the questions posed by the board of examiners.
7. Any third parties brought along by the student may not be refused. They are permitted to be present as an observer.

Article 6.5 Announcement of decision

1. If the student does not respond in writing within 8 working days of being informed about the possibility to be heard, the board of examiners will presume that the student does not wish to be heard. After expiry of this period, the board of examiners will inform the student in writing of the decision or proposal/recommendation to the Executive Board within 10 working days.
2. If the student, reporter and/or one or more relevant third parties are heard, the board of examiners will inform the student in writing within 10 working days after the hearing of the decision or of a proposal/recommendation to the Executive Board.

Section 7: Degree certificate and diploma supplement

Article 7.1 EER as model document

1. The EER stipulates model provisions with regard to units of learning outcomes / units of study, exams and degree certificates.
2. The board of examiners uses the formats for degree certificates, diploma supplements and other certificates adopted by the Executive Board and when awarding certificates [10]follows the principles and procedures set out in the notes of that decision.
3. After the board of examiners has established that a student has passed the final bachelor assessment, that student can submit a request to receive their degree certificate before the set dates. The board of examiners will grant this request, and the student needs to take into account a processing period of at least 10 working days.

Article 7.2 Translation of degree certificate

For translations, graduates can contact a certified translator at their own expense (see: www.ngtv.nl). All costs for the translation are to be paid for by the student.

Section 8: Annual report of the board of examiners

Article 8.1 Annual report of the board of examiners and dean

1. Each year in November, the board of examiners writes a report on its activities during the previous academic year and sends this to the Executive Board and dean.
2. The board of examiners uses the guidelines for the annual report.
3. If applicable: The relevant school manager11 receives a copy of the annual report.

Section 9: Final provisions

Article 9.1 Unforeseen circumstances

Matters not provided for by these regulations in which an immediate decision is needed will be

decided on by the chair of the board of examiners, provided that doing so falls within the powers of the board of examiners. The chair will communicate their decision to all interested parties as soon as possible.

Article 9.2 Complaints and appeals concerning decisions and procedures of a board of examiners

1. A student can submit an appeal to the Examination Appeals Board against a decision made by the board of examiners or an examiner within 6 weeks after this decision was announced. The procedure is outlined in the 'Regulations for Legal Protection of Decisions Concerning Education' of the HAN Student Charter.
2. Every decision taken by the board of examiners or individual examiner contains a remedy clause. This clause stipulates at least the following:
   a) an appeal must be made within six weeks of the date of the decision;
   b) an appeal can be lodged with the Examination Appeals Board;
   c) the correct and current address details of the Examination Appeals Board.
   d) a reference – for more information – to the 'Regulations for Legal Protection of Decisions Concerning Education' of the HAN Student Charter.
3. If a student wants to file a complaint against an examiner or member of the board of examiners, they can consult the procedure set out in the complaints regulations of the HAN Student Charter.
4. If a complaint or appeal concerns a member of the board of examiners, this member of the board of examiners does not take part in processing the complaint or appeal on behalf of the board of examiners.

Article 9.3 Adoption, effective date and amendments

1. These regulations were adopted by the Board of Examiners of the School of Engineering and Automotive on July 1, 2023 and came into effect on September 1, 2023.
2. These regulations replace the Regulations of theBoard of Examiners of the School of Engineering and Automotive that were adopted on July 1, 2023
3. These regulations will be made available to the students and staff of the degree programme(s) as referred to in article 1.2 paragraph 3 of these regulations by inclusion in the Degree Statute.
4. Amendments to these regulations can be made by the board of examiners in the form of separate decisions. Amendments during the current academic year will be made only if this is necessary for the protection of students' interests.
5. Amendments to these regulations may not have any adverse impact on decisions that were made earlier by the board of examiners and were made based on these regulations.

Arnhem/ Nijmegen Februari 7, 2023

On behalf of the Board of Examiners for the School of Engineering and Automotive, Mr. H. van der Zee, chair.l

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[10] Last adopted version: Executive Board decision 2021/1883. Always check if a more recent version has been adopted.

[11] The idea here is that those who are most closely involved in the degree programme receive a copy of the annual report. If there is a academic manager who is responsible for (the quality of) the degree programme, they should receive that report. Arrange this in a way that suits the organisation of the degree programme/school.

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Appendix 1: Duties mandated by the board of examiners

Overview of duties mandated by the board of examiners (by board of examiners – mandate giver – mandate decision(s) taken)

	Duties mandated by the board of examiners	Mandated body[12], or job title or specific duties of the mandated staff member[13]
1	Dutch language test (Dutch as a second language)	AEA admissions committee

Note:

- The mandate will remain valid unless revoked by the board of examiners and as long as the mandated person remains employed by HAN and performs the duties specified above.
- Unless otherwise explicitly stated, those mandated are not authorised to further mandate their duties.

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[12]For example, committee or office (managing committee, assessment committee, examination task team, exams office).

[13]The official job titles of employees (e.g. dean, lecturer, senior lecturer, educator, trainer, adviser, secretary) can be found on HAN Insite under 'Our staff'. A duty is a specific work activity carried out by an employee – and may or may not be officially assigned to or requested of them (e.g. chair of the board of examiners, official secretary, study coach, team leader, administrative staff m ember or examiner). This column lists the specific duties relevant in the context of the mandate given by the board of examiners.

Appendix 2: Duties mandated to the board of examiners by or on behalf of the Executive Board

Overview of duties mandated to the board of examiners

	Duties mandated to the board of examiners
1	Awarding the degree

Note:

- The mandate will remain valid unless revoked and as long as the mandated party remains employed by HAN and performs the duties specified above.
- Unless otherwise explicitly stated, those mandated are not authorised to further mandate their duties.

Appendix 3: For the right to specific exemption(s) for previously obtained exams and modular exams, degree certificates and other statements, diplomas and certificates

Exemption for professional skills in full-time course programmes

- A student is granted exemption for all learning outcomes of professional skills if he/she has a Dutch HBO or WO bachelor's degree or higher (as of academic year 2014-2015)

- A student will be granted exemption for Basic Prof.Skills 1 and 2 if he/she has a Dutch HBO or WO propaedeutic diploma (from academic year 2014-2015).

- In other cases, no exemption will be granted but the individual student can demonstrate compliance with the learning outcomes by submitting a portfolio to the board of examiners.

Exemption for professional skills part-time course programmes

- A student will be exempt from all learning outcomes of professional skills if he/she has a Dutch HBO or WO bachelor's degree or higher (as from academic year 2014-2015)

- A student is granted exemption for Basic Prof.Skills 1 and 2 if he/she has a Dutch HBO or WO propaedeutic diploma (from academic year 2014-2015).

- A student will be exempted for the learning outcomes that are part of the associate degree if he/she has a Dutch Associate degree.
- Basic Prof.Skills 1 and 2
- EVL-2 Communication of the Professional Skills module

- In other cases, no exemption is granted but the student can demonstrate compliance with the learning outcomes by submitting a portfolio to the board of examiners.

HAN_UNIVERSITY OF APPLIED SCIENCES

Appendix 4: Procedure (alleged) fraud in (modular) exams School of Engineering and Automotive (AEA)

This procedure describes the actions of examiners and the Board of examiners AEA in the most common irregularities and cases of fraud.

A distinction is made between irregularity and fraud. Is there no intent? Then we call it an irregularity. Fraud, on the other hand, is always intentional.

The measures described are proportionate to the seriousness, the burden of proof and the number of times a student has committed fraud.

The starting point in this procedure is that the examiner handles the irregularities himself if possible. The Examination Board, on the other hand, handles cases of fraud.

The role of the examiner(s)

- An examiner suspects that a student or group of students is not showing a fair picture of his or her knowledge, insight or skills. This suspicion may arise from, for example, a report from an invigilator, reports from plagiarism control software.
- The examiner shares his suspicions with a second examiner.
- If both examiners are convinced that something in the partial examination taken was not done correctly, the examiners report it to the student(s) concerned. The examiners do not (yet) enter a mark in the SIS (student information system).
- The examiner(s) then ask the student(s) concerned for an explanation of the alleged irregularity or fraud.

In case of an irregularity

- Do the examiners establish that it is an irregularity? Then the examiners warn the students (unofficially) and/or have them make a supplement and deal with it that way.

In case of fraud

- If the examiners suspect that there is sufficient evidence for fraud, then it becomes a matter for the AEA Examination Board. The examiners then make a report to the AEA Board of Examinors.

The role of the AEA Board of examiners

- After the Board of examiners has received all necessary data including the available evidence from the examiners, the Board of examiners appoints two members to handle the case in the next meeting.
- The official secretary then invites both the student(s) and the examiners for an explanatory interview. Preferably right after each other. The members remind the student(s) of their right to remain silent. They apply hearsay and conduct further investigation if necessary. These interviews take place within 10 working days after receiving the evidence. If necessary, the Board of examiners may consult a HAN lawyer.
- Then both members of the Board of examiners check the history of the student(s) in the file of the Board of examiners, take an intended decision and provisionally record this in a letter to the student(s). The chamber makes the final decision.
- The decision is mailed to the student(s) and examiner(s).
- One of the above two members of the Board of examiners enters an F in the SIS if the chamber decides on Fraud..
- One of the two aforementioned members of the Board of examiners returns the evidence to the entitled person, if the evidence is not digital.
- The official secretary of the Board of Examiners records a scan of the established decision in student archive of the AEA Examination Board on HAN Work.
- The student(s) may lodge an objection against this decision with the Examination Appeals Board (COBEX) of HAN through the Complaints and Disputes Committee within 6 weeks after the date.

4 Regulations of the Degree Committee

4 Regulations of the Degree Committee Master Engineering Systems (MES)

Chapter 1 Introductory provisions

Article 1 Status and definitions

1. These regulations are regulations as defined in the administrative and management regulations of HAN University of Applied Sciences (hereafter: HAN).
2. These regulations apply to the degree committee Master Engineering Systems for the following degree programmes:
   - Master Engineering Systems degree course – full time – English spoken
   - Master Engineering Systems degree course – part time – English spoken

   and the minor(s) given under the responsibility of these degree programmes.
3. The definitions and provisions from the glossary in appendix 1 to the degree statute apply to these regulations.

Chapter 2 Degree committee

Article 2 Establishing degree committee(s)

1. A degree committee will be established for each degree programme or group of degree programmes.
2. If a degree committee is established for two or more degree programmes, that degree committee will be referred to as a joint degree committee. The decision to establish or dissolve a joint degree committee will be taken by the dean, and it will require the consent of the school council of the relevant school. The school council consults the relevant degree committees with regard to the decision whether or not to give its consent.
3. The provisions in these regulations also apply to joint degree committees, unless the nature of the provision precludes application.
4. One or more divisions may be set up within a degree committee if required. A division can be set up as needed according to the degree format, according to a special feature of the degree programme (e.g. English-taught), according to the location of the degree programme or according to any other special aspect of the degree programme[14].
5. The degree committee for the degree programme(s) MES has been established for one degree programme/a group of degree programmes.

Article 3 Joint Assembly

If the degree programmes of a school do not have a joint degree committee, all of the degree committees within that school will convene in a joint session at least two times a year to discuss shared matters. This will include at least those matters specified in article 27 paragraph 4 of these regulations

[14] For the duties and powers of a division, see the description in article 27 paragraph 3 of the regulations.

Article 4 Composition of the degree committee

1. The degree committee consists of 4 members.
2. Half of the members of the degree committee (or division thereof) will be students from the relevant degree programme(s), with the other half of the members of the degree committee (or division thereof) being staff members from the relevant degree programme(s).
3. No individual belonging to the school or course management or employed as an education manager can simultaneously be a member of the degree committee.

Article 5 Appointment term

1. The members of a degree committee, *division(s)* and members of the joint assembly *elected/appointed* from among and by the student body serve for terms of *2 years*. The terms of student members are decided in joint consultation between the dean and the degree committee. The dean will confirm the choice upon adoption of the regulations. The members of a degree committee, division(s) and members of the joint assembly elected/appointed from among and by staff members serve for terms of 4 years.
2. The term begins on 1 September.
3. All members step down simultaneously at the end of their terms.
4. At the end of their terms, members of a degree committee, division(s) and members of the joint assembly may be *re-elected/re-appointed*, on the understanding that members *elected/appointed* from among and by the staff may serve for two consecutive terms and may not be re-elected/re-appointed again after those two terms until they have had a one-term break from serving on the committee. After stepping down, members elected from among and by the student body may be *re-elected/re-appointed* for a maximum of four consecutive academic years.

Article 6 Termination of membership

1. Membership in a degree committee, *division* and the joint assembly will end:
   a. when the term expires, unless the member is *re-elected/re-appointed*;
   b. before the end of the term:
      - in the event of death;
      - in the event the composition of the degree committee no longer meets the requirements specified in these regulations;
      - in the event the staff member is no longer employed at the relevant school or no longer affiliated with the relevant degree programme(s);
      - in the event the student member has quit the degree programme(s).
2. A member of the degree committee may terminate the membership at any time by withdrawing the membership in writing, stating the reason, to the relevant dean.

Article 7 Composition

1 The degree committee will be composed by election/nomination and appointment.

2 A review will be conducted each year to determine whether this method of composition is still appropriate.

If the degree committee has opted for elections in the preceding article, the provisions of chapter 3 will apply. If the degree committee has opted for nomination in the preceding article, the provisions of chapter 4 will apply. A choice for appointment must be reviewed each year to determine whether this method of composition is still appropriate.

Chapter 3 Elections

Not applicable[1]

[1] Articles 8 to 15 belonging to this chapter have been removed. In the remainder of these regulations, the original

Chapter 4 Appointment

Article 16 Appointment

The members of the degree committee are appointed by the school dean.

Article 17 Procedure

1. Before the end of term, the members of the degree committee's student division will submit 2 students from each degree programme (belonging to the group of degree programmes) to the dean for nomination, with due consideration of article 4. The submission will be compiled by the degree committee of the relevant degree programme(s), or on behalf of the team leader Master Engineering Systems.
2. Before the end of term, the members of the degree committee's staff division will submit 2staff members from each degree programme (belonging to the group of degree programmes) to the dean for nomination for the coming term, with due consideration of article 4. The submission will be compiled by the team leader of the relevant degree programme(s).
3. If no joint degree committee has been established for a school's degree programmes, each separate degree committee belonging to the school will choose one staff member and one student from among its members to be delegated to the joint assembly, together with the chair.

Article 18 Interim appointment

1. In the event of an interim vacancy on a degree committee or division, the dean will appoint a replacement member. The appointment procedure specified in article 17 will be followed.
2. The replacement member must be appointed within 4 weeks of the opening of the interim vacancy.
3. The interim replacement member steps down at the same time that the person being replaced would have stepped down.

Chapter 5 Positions and performance

Article 19 Positions

1. The degree committee and division elect one of their members as chair and one as secretary, in addition to electing two members as deputies.
2. A degree committee (or division thereof) will be represented by either the chair or the deputy.

Article 20 Decision-making

1. The degree committee will take decisions by a simple majority of votes. Abstentions will not be counted. Votes may be held only if a majority of the members are present at the meeting.
2. Voting takes place without the presence of management or the discussion partner.
3. The members of the degree committee advise and vote independently and unbound by any instructions.
4. In the event of absence, the absent member may vote by proxy. Proxies must be submitted in writing at the beginning of the meeting. A member may cast only one proxy vote for another member at a time. The proxy will vote independently and unbound by any instructions. Proxies are counted when determining the quorum for the meeting.
5. Anyone who is involved in performing the duties of the committee and who therefore has access to information that is known to be or could be reasonably expected to be of a confidential nature will

numbering has been retained.

be bound to confidentiality.

6. Where applicable, the degree committee will ensure that the viewpoints represented by the minority of the votes cast are also communicated to the dean and/or the academic manager.
7. The degree committee will ensure that its resolutions, recommendations and proposals are available for inspection in a place accessible to the staff members and students of the school or degree programme(s).

Article 21 Meetings

1. The degree committee will meet at least eight times a year and also at any time at least half of the members of the degree committee [or division thereof] request a meeting. Meetings are called by the chair of the degree committee. At the first meeting, a meeting schedule will be compiled in consultation with the dean, and will be posted on the website of the degree programme.
2. The members of the degree committee] will receive a writte n invitation to the meeting no later than five working days before the meeting. The invitation will be accompanied by an agenda.
3. The meeting documents will be sent to the members of the degree committee no later than four working days before the meeting. If the documents are sent later, the members may decide by majority of votes not to address the meeting documents.
4. The degree committee may be advised by an expert at the meeting. The secretary will be informed about the expert at least seven days before the meeting.
5. The degree committee may compose a temporary committee from among its members in order to prepare a topic. This committee will report to the degree committee.

Article 22 Public nature of meetings

1. The meetings of the degree committee will be public unless the degree decides otherwise. The degree committee [or division thereof] will determine whether to hold a closed meeting in preparation for a public meeting. No resolutions may be passed in closed meetings.
2. The degree committee must hold at least two public meetings a year. The dates of the public meetings will be scheduled in consultation with the school dean and in concurrence with the official HAN academic calendar.

Article 23 Reporting procedure

1. The secretary of the degree committee will prepare a report of each meeting.
2. This report must contain at least:
   - the date, time and location of the meeting;
   - the names of the members who are present at and absent from the meeting;
   - the agenda items;
   - the main discussion points;
   - any explanations of votes;
   - the advice;
   - the resolutions concerning advice, any votes taken on this advice and the results of the votes;
3. A draft version of the report will be sent to the members of the degree committee no later than 15 working days after the meeting, after which the report will be confirmed in the subsequent meeting.
4. The reports of the public meetings of the degree committee will be made available in digital format to the staff members and students of the school or relevant degree programme(s).

Article 24 Contact with management

1. The academic manager for the relevant degree programme(s), format/course with special feature will promptly and without request provide the degree committee or division thereof with all information they might reasonably or justly need to fulfil their duties. Upon request, they will promptly provide the degree committee *or* division thereof with all information the committee may reasonably or fairly deem necessary to fulfil its duties.

2. At least twice a year, the degree committee is authorised to invite the academic manager to discuss the intended policy based on the agenda that it has prepared.
3. At the opening of the academic year, the degree committee will prepare a policy plan with its key policy points for the coming academic year. The policy plan is then shared with the academic manager.
4. At the request of the dean, their designated deputy or at the request of the degree committee [or division thereof], the dean or their designated deputy will attend the meetings or parts of the meetings of the degree committee [or division thereof].
5. The dean will be responsible for ensuring the students and staff of the relevant school are sufficiently informed of the existence and performance of the degree committee.
6. The chairs of the individual study programme committees are authorised and mandated by their study programme committee to invite the academy director at least twice a year to a joint meeting in which the proposed policy is discussed on the basis of an agenda drawn up by them.

Article 25 Annual reporting procedure

1. No later than November of each year, the chair of the degree committee will submit a written report to the dean concerning the duties and performance of the degree committee during the previous academic year. The chair will forward the report to the school council for inspection.
2. The report will contain information on at least the following points:
   - the composition of the degree committee;
   - the degree committee's vision on its duties and procedures;
   - the degree committee's policy plan and evaluation of its policy plan;
   - the recommendations and resolutions issued by the degree committee, including requests for consent;
   - the board's reaction to the recommendations and resolutions;
   - conclusions and recommendations.
3. The written report referred to in paragraphs 1 and 2 must at any rate be made available digitally and, if requested, in hard-copy format to the staff and students of the school or the relevant degree programme(s).

Article 26 Contact with school council

The chair of the degree committee will ensure that consultation with the school council (or its chair) is held as needed.

Chapter 6 Duties and powers of the degree committee

Article 27 Duties of the degree committee

1. The degree committee has the duty to advise on the promotion and safeguarding of the quality of the degree programme.
2. The degree committee is also charged with the following duties:
   - annually assessing the operational methods of the education and examination regulations (EER) of the relevant degree programme;
   - advising or issuing proposals to the school council and the school dean on all other matters concerning education in the relevant degree programme(s) when requested or on its own initiative.
3. Not applicable
4. The joint assembly has the following duties:
   - discussing the separate recommendations about the EER made by the degree committees belonging to a school so they can reach a joint resolution in the event the EER is adopted at

school level;
- discussing the separate evaluations of the degree programmes concerning the implementation of the EER to reach a resolution on the implementation of the EER at the school level;
- advising or issuing proposals to the school dean and/or school council on all other matters concerning education in the relevant degree programme(s) at school level when requested or on its own initiative.

5. Consultation of the joint meeting with the academy director:
   - Each individual study programme committee mandates one participant and one deputy participant from the representatives for the joint meeting to discuss with the academy director the decisions and opinions under paragraph 4.

Article 28 Right of consent

1. The degree committee has right of consent concerning the administrative and management regulations in so far as they:
   - specify a manner of composition other than election for the degree committee;
   - concern the annual assessment of the appropriateness of this other method of composition;
2. The degree committee has right of consent concerning the EER of the relevant degree programme
   - the manner in which education is evaluated within the relevant degree programme;
   - the content of the graduation specialisations within a degree programme;
   - the quality of the knowledge, understanding and skills that students should have acquired upon completion of the degree programme;
   - where needed, the organisation of practical exercises;
   - the study load of the degree programme and each of its units of study and units of learning outcomes;
   - if applicable, the selection procedure for students applying for a special track within a degree programme that aims at helping students attain a higher level of knowledge;
   - if applicable, the regulation that stipulates that the study load for a fast track aimed at students with a VWO diploma is 240 instead of 180 credits.

Article 29 Advisory rights

The degree committee has advisory rights concerning the EER of the relevant degree programme in so far as it concerns:

- the content of the degree programme and the final assessments associated with it;
- any further rules on issuing study advice for the propaedeutic phase of the bachelor degree programme or the first year of study of an associate degree and further rules on issuing referrals in the propaedeutic phase/first year of study if a degree programme includes more than a graduation specialisation after the propaedeutic phase/first year of study;
- the number and order of exams, as well as the times at which they can be taken;
- the full-time, part-time or work-study structure of the degree programme;
- where necessary, the order in which, time frame within which and number of times each academic year that students are to be offered the opportunity to take exams and final assessments;
- where necessary, the extension of the validity term of passed exams, subject to the authority of the board of examiners;
- the way in which exams are taken, whether orally, in writing or otherwise, subject to the authority of the board of examiners to decide differently in special cases;
- the manner in which students with disabilities or chronic illnesses are reasonably to be given the opportunity to take the exams;
- the public character of exams that are to be administered orally, subject to the authority of the board of examiners to decide differently in special case;
- the time frame within which the results of an exam are to be posted, and whether and how exeptions may be made to this time frame;
- the manner and term in which individuals who have taken a written exam will be allowed tot review their word after it has been assessed;
- the manner and term in which questions and assignments made or given as part of a written exam may be reviewed as well as the standards according to which the assessment was performed;
- the grounds upon which the board of examiners may grant exemptions for one or more exams

based on previously passed exams or final assessments in higher education or based on knowledge and skills acquired outside the context of higher education;
- where necessary, the requirement to pass certain exams before admission can be granted to take other exams
- where necessary, the requirement to participate in practical exercises for the purposes of admission to taking the relevant exam, subject to the authority of the board of examiners to grant exemptions from this requirement, whether or not that is conditional upon alternative requirements;
- the monitoring of studyprogress and individual study coaching;
- the actual design of the education.

Article 30 Conditions for consent and advice

The dean will ensure that

a advice is requested at such a time that it can actually bear an influence on the decision - making,

b the committee has the opportunity to consult with the dean before the advice is issued,

c the committee is notified in writing as quickly as possible concerning the manner in which the advice will be acted upon.

Article 31 Procedure for consent and advice

1. The degree committee notifies the dean in writing about whether the degree committee has granted consent or what the degree committee's advice is as soon as possible, but no later than 6 weeks after consent or advice has been requested.
2. The degree committee and the dean may agree to extend the term specified in the preceding paragraph, or to shorten it due to the urgency of the decision to be taken or if the decision to be taken is required in order to comply with a legal prescription.
3. If the degree committee has not notified the dean of its advice or decision concerning the requested consent within the term referred to in paragraph 1 of this article, or within the extended or shortened term, the degree committee will be regarded as not having exercised its powers.
4. The degree committee may consult with students and/or staff members from the relevant degree programme prior to deciding on a request for consent or before issuing advice.

Article 32 Deviating from advice

1. If the dean does not wish to follow all or part of the advice given by the degree committee, the dean will notify the degree committee of this, along with the reasons, within four weeks.
2. The dean will ensure that the degree committee has the opportunity to engage in further consultation with him or her before making a definite decision
3. The dean will suspend the execution of his decision for 4 weeks after the day on which the degree committee announced its decision, unless the committee has no objection to the immediate execution of the decision.
4. The dean will notify the degree committee and school council in writing of the definite decision, noting that the decision deviates from the degree committee's advice.

Article 33 Right of initiative

1. If the degree committee makes a proposal to the school council or dean as referred to in article 27 paragraph 2 of these regulations, upon request or at its own initiative, the dean will respond to the proposal within two months of receipt. The degree committee will send the advice and proposals to the participation council or the relevant school council for inspection

Chapter 7 Quality assurance

Article 34

1. At the opening of the academic year, the degree committee and the academic manager make agreements concerning the manner in which quality assurance is performed.

Chapter 8 Involvement in accreditation

Article 35

In the context and for purposes of the accreditation of the degree programme:

- the degree committee provides a recommendation for the self-evaluation of the degree programme upon request by the dean;
- in certain cases the degree committee has advisory rights with regard to the recovery plan.

Chapter 9 Disputes

Article 36 Access to the Disputes Advisory Committee

The disputes committee for participation will inspect disputes between the degree committee or the dean with regard to:

a. the applications of the regulations of the degree committee;
b. disputes arising from articles 27 to 30 of these regulations.

Article 37 Amicable settlement

In the event of a dispute between the degree committee and dean, the Executive Board will investigate the possibility of amicable settlement. If this is not possible, the dean or the degree committee will submit the dispute to the Disputes Advisory Committee

Article 38 Binding judgement of the Disputes Advisory Committee

The disputes committee is authorised to effect an amicable settlement between parties. If they are unable to reach an amicable settlement, the disputes committee will resolve the dispute by issuing a binding judgement after assessing whether:

a. the dean has adhered to the requirements of the law and the internal regulations for degree committees;
b. the dean could have reasonably reached the proposal or decision when considering the interests involved;
c. the dean has acted negligently with regard to the degree committee.

Article 39 Suspended execution of a decision

If the dispute concerns the choice whether or not to follow the advice or part of the advice given by the degree committee, the execution of that decision will be suspended for four weeks, unless the degree committee has no objection to the immediate execution of the decision.

Article 40 Permission in the absence of consent

If the dean has not received consent from the degree committee for an intended decision, the dean may request permission from the disputes committee to make the decision, contrary to the provisions of article 31. The disputes committee will only grant permission if the decision of the degree committee not to provide consent is unreasonable or if compelling organisational, economic or social reasons call for the intended decision of the dean.

Chapter 10 Facilities

Article 41 Facilities for degree committees (and their members)

1. The dean will grant the degree committee the use of facilities that are available and that the committee could reasonably need to fulfil its duties, including at least administrative, financial and legal support.
2. More specifically, the degree committee is entitled to:
   - meeting space;
   - facilities for the reproduction/distribution of meeting documents;
   - secretarial support;
   - catering facilities;
   - …..
3. The school dean will allocate a training budget to the members of the degree committee. The training budget will be determined at the opening of the academic year, in joint consultation between the degree committee and the dean and allows the members of the degree committee to participate in the training and professional development opportunities offered by HAN Academy. The training budget for the degree committee of the MES Degree programme accounts to a minimum of €2000 per academic year.
4. The members of the degree committee who are employed as staff members will have the opportunity to participate in this training during working hours and with retention of salary.
5. The dean will give the degree committees the opportunity to meet during working hours whenever possible.
6. Each student and staff member of the degree committee will be facilitated for all degree committee activities for 20 hours each academic year, with the position of chair receiving additional facilitation of 80 hours each academic year.

Chapter 11 Final provisions

Article 42 Legal protection

The Executive Board, the school dean and the academic manager of the relevant degree programme(s) will ensure that the members of the degree committee, the division and the members of the joint assembly are not disadvantaged in their position and/or interests in relation to the university of applied sciences on account of their membership in the degree committee.

Article 43 Unforeseen circumstances

Matters that are not provided for in these regulations and for which an immediate decision is needed by the degree committee, division or joint assembly will be decided upon by the chair of the degree committee or the chair of the joint assembly. The chair must communicate this decision as soon as possible to the other members of the degree committee (*or division thereof*) or the other members of the joint assembly, and to the dean and the academic manager.

Article 44 Effective date

These regulations were adopted by the school dean on May 12, 2023, after agreement of the school council on May 12, 2023 and will come into effect on 1 September 2023.

HAN_UNIVERSITY OF APPLIED SCIENCES

Appendix to chapter 6 description of the education

HAN_UNIVERSITY OF APPLIED SCIENCES

HAN_UNIVERSITY OF APPLIED SCIENCES

Degree Statute for the Master's Degree Course

Engineering Systems

of HAN University of Applied Sciences academic year 2023 - 2024

Part 2 Education and Examination Regulations (EER)
chapter 6
Course catalogue

HAN_UNIVERSITY OF APPLIED SCIENCES

Content

HAN_UNIVERSITY OF APPLIED SCIENCES

1 Description of the education

1.1. Outline of the curriculum

The professional master's program is offered as a full-time and a part-time degree course and covers 90 EC. 60 credits for the teaching phase, 30 of which are targeted at the study track, and 30 credits of the program are offered to all students jointly and 30 EC for the major project.
The full-time programme takes approximately 18 months, including the major project, based on a weekly study load of 40 hours and a break during the summer. Part-time takes approximately three years, based on a weekly study load of 20 hours, including the major project. The degree course is divided in modules of 15 EC.

The Master's Degree Program Engineering Systems offers 2 compulsory modules:

- Applied Control and
- Systems Modelling

We offer you the following elective modules grouped by tracks:

<table>
<tr><td>Semester 1 (fulltime) /
Year 1 (part-time)
Technical foundation focussed on smart dynamic systems.</td><td>Semester 2 (fulltime) /
Year 2 (part-time)
Specialization (two modules of own choice)</td><td>Semester 3 (fulltime) /
Year 3 (part-time)
Master's thesis</td></tr>
<tr><td>Systems Modelling (15 EC)

modelling of physical systems, including white and black box modelling</td><td rowspan="2">Electives (30 EC)

Track Automotive Systems
Advanced Vehicle Dynamics
Hydrogen Technology
Innovations in Powertrains
Intelligent Mobility

Track Cyber-Physical Systems
Advanced Vehicle Dynamics
Big Data & Small Data
Embedded Control

Track Sustainable Energy
Hydrogen Technology
Smart Power Supply
Sustainable Energy Systems</td><td rowspan="2">Major project (30 EC)
In a company, in line with the chosen specialization</td></tr>
<tr><td>Applied Control (15 EC)

including feedback, digital and optimal control and controller implementation</td></tr>
</table>

1.2. Competences / final qualifications and the Dublin descriptors

The competences (final qualifications) for the Master are defined as follows:

	Final qualification	Description
C1	*Analysing and defining problems*	To be able to critically analyse the engineering problem through active communication with the problem owner, to translate this to a problem formulation, feasible solution approaches and scientifically valid conclusions and recommendations, to be communicated again to the problem owner.
C2	*Design*	To be able to systematically translate the engineering problem to a model at an abstract level, (i.e. reducing it to its essentials in terms of model and problem requirements) and to validate results against the real life situation and problem formulation.
C3	*Testing*	To be able to systematically translate the engineering problem to a concrete level, and to validate results against the real life situation and problem formulation.
C4	*Managing work processes:*	To be able to put engineering activities within the perspective of engineering company processes, including quality control principles. To be able to incorporate the economical (cost) and societal (safety, sustainability) consequences in the design or development process.
C5	*Conducting research*	To have gained specialized scientific knowledge and skills in the field of engineering.
C6	*Communication and collaboration*	To be able to work on a problem within a multidisciplinary context in an industrial environment. To be able to work on a problem in an international engineering context in an industrial environment
C7	*Professional development*	To be able, through self-reflection, to improve one's own professional acting

And the following Dublin descriptors:

	Dublin descriptor	Description
DD1	Knowledge and understanding	Provides a basis or opportunity for originality in developing or applying ideas often in a research context.
DD2	Applying knowledge and understanding	Through problem solving abilities applied in new or unfamiliar environments within broader (or multidisciplinary) context.
DD3	Making judgements	Demonstrates the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete data.
DD4	Communication	Of their conclusions and underpinning knowledge and rationale (restricted scope) to specialist and non-specialist audiences (monologue).
DD5	Learning skills	Study in a manner that may be largely self-directed or autonomous.

The modules (mentioned on page 3) consists of a number of units of study. All these study units relate to the qualifications (page 4) we intend to teach you. The description relates the content of an individual study unit to the qualifications, through the test criteria of the assessment of the study unit. These test criteria are included in the description as the learning outcomes. This relation between the criteria per study unit, the qualifications and the Dublin descriptors are summarized in Assessment why and how. As all modules together cover all qualifications, a completion of the modules with a sufficient mark entitles you to receive the degree Master of Science (MSc.).

1.3. Modules and the units of study

Below you find a schematic overview that gives you an overall impression of the degree program. It also describes the elective units in the degree program.

Units of study: mandatory (60 EC)

M SM	Module Systems Modelling		
Teaching Term	Semester 1		
Overview units of study	Units of Study	EC	study load
	Applied Physics	2.0	56
	Introduction Modelling	2.0	56
	Practice Modelling and Simulation	2.0	56
	Energy Based Modelling	2.0	56
	System Identification	2.0	56
	Systems Modelling Minor Project including Research Skills	5.0	140
		15	420

M AC	Module Applied Control		
Teaching Term	Semester 1 / Semester 2		
Overview units of study	Units of Study	EC	study load
	Feedback Control	4.0	112
	Apply Control Strategy	2.0	56
	Controller Implementation	2.0	56
	Multivariable systems and optimizations	2.0	56
	Applied Control Minor Project	5.0	140
		15	420

M MAJP	Module Major Project		
Teaching Term	Semester 1 / Semester 2		
Overview units of study	Units of Study	EC	study load
	Major Project	30	840
		30	840

Modules and units of study: electives

Track Automotive:

M AVD	Module Advanced Vehicle Dynamics		
Teaching Term	Semester 1 / Semester 2		
Overview units of study	Units of Study /	EC	study load
	Advanced Vehicle Dynamics Theory	7.5	210
	Advance Vehicle Dynamics Capita Selecta	2.5	70
	Advanced Vehicle Dynamics Minor Project	5.0	140
		15	420

M IPT	Module Innovations in Powertrains		
Teaching Term	Semester 1 / Semester 2		
Overview units of study	Units of Study	EC	study load
	Innovations in Powertrains Theory	7.5	210
	Innovations in Powertrains Capita Selecta	2.5	70
	Innovations in Powertrains Minor Project	5.0	140
		15	420

M HT	Module Hydrogen Technology		
Teaching Term	Semester 2		
Overview units of study	Units of Study	EC	study load
	Hydrogen Technology Theory	7.5	210
	Hydrogen Technology Capita Selecta	2.5	70
	Hydrogen Technology Minor Project	5.0	140
		15	420

M IM	Module Intelligent Mobility		
Teaching Term	Semester 2		
Overview units of study	Units of Study	EC	study load
	Intelligent Mobility Theory	7.5	210
	Intelligent Mobility Capita Selecta	2.5	70
	Intelligent Mobility Minor Project	5.0	140
		15	420

Track Cyber-Physical Systems

M AVD	Module Advanced Vehicle Dynamics		
Teaching Term	Semester 1 / Semester 2		
Overview units of study	Units of Study /	EC	study load
	Advanced Vehicle Dynamics Theory	7.5	210
	Advance Vehicle Dynamics Capita Selecta	2.5	70
	Advanced Vehicle Dynamics Minor Project	5.0	140
		15	420

M EC	Module Embedded Control		
Teaching Term	Semester 2		
Overview units of study	Units of Study	EC	study load
	Embedded Control Theory	7.5	210
	Embedded Control Capita Selecta	2.5	70
	Embedded Control Minor Project	5.0	140
		15	420

M BDSD	Module Big Data & Small Data		
Teaching Term	Semester 1 / Semester 2		
Overview units of study	Units of Study	EC	study load
	Big Data & Small Data Theory	7.5	210
	Big Data & Small Data Capita Selecta	2.5	70
	Big Data & Small Data Minor Project	5.0	140
		15	420

Track Sustainable Energy:

M HT	Module Hydrogen Technology		
Teaching Term	Semester 2		
Overview units of study	Units of Study	EC	study load
	Hydrogen Technology Theory	7.5	210
	Hydrogen Technology Capita Selecta	2.5	70
	Hydrogen Technology Minor Project	5.0	140
		15	420

M SPS	Module Smart Power Supplies		
Teaching Term	Semester 2		
Overview units of study	Units of Study	EC	study load
	Energy Management	2.5	70
	Power Control	2.5	70
	Power Quality	2.5	70
	Asset Management	2.5	70
	Smart Power Supplies Minor Project	5.0	140
		15	420

M SES	Module Sustainable Energy Systems		
Teaching Term	Semester 1 / Semester 2		
Overview units of study	Units of Study	EC	study load
	Sustainable Energy Systems Theory	7.5	140
	Sustainable Energy Systems Capita Selecta	2.5	140
	Sustainable Energy Systems Minor Project	5.0	140
		15	420

2 Details of study: general modules

Module code **AEA MES M AC**	**Applied Control**
Degree program	Master Engineering Systems
Target Group	All students, mandatory
Coordinating Lecturer	Richard Kaandorp
Code for OSIRIS	APPLCO60
Professional Task	Design and test a controller
Professional Products	Models
Credits / Study load	15 EC / 420 hours
Relationship with and entry requirements concerning examinations	Simultaneously to the Module Systems Modelling or (for part time students) after taking classes Systems Modelling
General Description	In this module the student will gain knowledge on designing a PID, lag-lead or digital controller. Furthermore, the usefulness of a specific control strategy will be discussed using different papers. This strategy can solve problems that can occur when using the classical control theory. Finally, when having various options for defining a controller, an optimal path would be helpful. This can reduce cost for example and makes it necessary to define an objective function. The theory learned will be implemented in a platform and run on a practical setup. The student learns to design a controller for a practical setup in the following design steps and tasks: • Creating a feedback controller • Analysing an uncontrolled system • Applying an advanced control strategy • Applying a controlled system
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Units of study	Feedback Control (4 EC) Apply Control Strategy (2 EC) Controller Implementation (2 EC) Multivariable systems and optimizations (2 EC) Applied Control Project (5 EC)

Unit of Study (UoS) **AEA MES M AC FC**	**Feedback Control**
General Information	
Long name of unit of study	Feedback Control
Short name of unit of study	Feedback Control
Code for unit of study OSIRIS	FEEDCO04
Teaching Term	P1A, P2A, P3A, P4A (Semester 1/ Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	4 EC / 112 hours
Study hours (contact hours)	38 contact hours + 3 contact hours exam
Entry requirements	It is expected that the student has mastered basic mathematics skills specifically 1st and 2nd order differential equations, matrix calculations and calculations with complex numbers.
Content and organization	
General description	In this course students will learn how to design a PID, lag-lead or digital controller. A variety of processes is used to illustrate the design procedure. The controllers will be presented in functional block diagrams and within the time, Laplace and frequency domain. Specific techniques are used, such as notch filtering, wind-up prevention and Smith predictor. Also, a digital controller will be designed.
Required literature / description of 'learning material'	Nise N.S., Control Systems Engineering, John Wiley & Sons Handouts Specific articles about control structures
Recommended literature	-
Required software	Matlab, Simulink
Cohesion Relationship	Units of study: Applied Control Module: Systems Modelling
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Self-study, Working on assignments and exercises, Modelling with Matlab-Simulink Work Forms: Lectures, review exercises, discussion
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design of controllers
Assessment dimensions / learning outcomes	Dimensions of assessment: - Knowledge and understanding (analysing and defining problems, design of controllers) - Applying knowledge and understanding (design of controllers) - Making judgements (design of controllers) The student can analyse the physical system (first and second order, higher order) and/or a model (linear/ nonlinear, SISO/MIMO). The student can apply techniques such as Pole/zero-plot and step/ramp responses in order to determine the requirements of the controlled system.

	The student can agree on specifications (stability, offset, settling time, overshoot, phase and gain margin) of the controller with the client. The student can apply techniques such as Bode plots (open loop, closed loop) and Nyquist diagrams in order to determine the requirements of the controlled system. The student can model components in the digital control loop and make use of sampling and conversions to agree on specifications of the controller. (M AC FC HTE)		
Assessment criteria	M AC FC WE assessment criteria: The student will be assessed on answering the questions: • clearly and to the point, including sufficient relevant explanation and depth, comparable with the depth of the literature studied • without irrelevant additional information • using correct equations and models for the situation (for example when to use linear or nonlinear models) • using correct units for quantities in equations, graph labels, etc. M AC FC HTE assessment criteria: The student will be assessed on the criteria mentioned on the evaluation form. (next page)		
Information for each exam and modular exam			
Examinations	Exam name	MES AC FC WE written exam	MES AC FC HTE Home taken exam
	Exam code	TOETS-01	TOETS-02
	Registering and deregistering for exam opportunities	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”.	
	Exam format	KENN-F Knowledge exam on location / written	PROD-O Online / digital product
	Exam type	ANS	Hand in
	Exam week	P1A, P3A (week 9)	P2A, P4A (week 9)
	First examiner	Richard Kaandorp	Stefan Sterkenburg
	Permitted resources	Open book exam Computer with Matlab-Simulink	Everything, but all results must be the student’s own work
	Number of examiners	1	1
	Assessment	Mark	mark
	Pass mark	55	
	Minimal result	45	45
	Weight	1	1
	Reassessment	1 (P5A)	1 (P5A)
	Compensation	Yes	
	Review	Week 2.4 and 4.4	Evaluation form week 3.4 and 4.12
Other information			
Required classroom	Regular classroom		

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Feedback Control part 2: Digital Control

Evaluation and Awarding Marks
Name: ……
Student number: ……

	Mark	Motivation	Weight factor
Applying knowledge and understanding **C1 Analysing en defining problems** **C2 Design** The student can apply the basics of discrete signal processing of linear time-invariant systems (z-transform, discrete transfer function, difference equation). The student can derive the frequency behaviour of a discrete (control) system. The student can design a discrete control system using sampling principles, the theorem of Shannon and z-transform. The student can apply Tustin and Euler approximations. The methods and techniques are properly used. The student shows sufficient analytical skills to master the problem at hand.			1
Making judgments **C2 Design** The student can assess the stability and transient response behaviour of discrete systems. The student is able to correctly interpret the quality of the results.			1
Mark total			

Date: Signature examiner:

Unit of Study (UoS) **MES M AC ACS**	**Apply Control Strategies**
General Information	
Long name of unit of study	Apply Control Strategies
Short name of unit of study	Apply Control Strategies
Code for unit of study OSIRIS	APPCOS16
Teaching Term	P1A, P3A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2 EC / 56 hours
Study hours (contact hours)	16 contact hours
Entry requirements	Simultaneously to the Module Systems Modelling or after taking classes Systems Modelling
Content and organization	
General description	In this course students learn how to design specific structures in which there is interaction between control loops. The goal is to improve the transient response behaviour. The control strategy (feedforward, cascade, compensation, override) is used for a limited amount of control goals. The students will work on a few case-studies that are based on scientific papers.
Required literature / description of 'learning material'	Handouts
Recommended literature	Scientific papers
Required software	MATLAB/Simulink
Cohesion Relationship	Units of study: Applied Control Module: Systems Modelling
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Self-study, warm-up tests, case studies Work forms: Lectures, interactive simulation exercises, assignments, reporting
Examinations	
Final Qualifications	C2 Design C5 Conducting Research
Assessment dimensions / learning outcomes	Dimensions of assessment: - Applying knowledge and understanding (design of controllers and testing of controlled systems) - Making judgements (testing controlled systems) The student can apply control strategies such as feedforward, cascade, compensation and override with use of frequency-response and root-locus techniques.

Assessment criteria	M AC ACS HTE assessment criteria: The student will be assessed on the criteria (the questions) mentioned on the evaluation form (next page)	
Information for each exam and modular exam		
Examinations	Exam name	MES AC ACS Home taken exam
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	PROD-O Online digital product
	Exam type	Hand in
	Exam week	P1A, P3A (week 9)
	First examiner	Richard Kaandorp
	Permitted resources	Everything, but all results must be the student’s own work
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1
	Compensation	No
	Review	Evaluation form week 2.4 and 4.4
Other information		
Required classroom	Regular classroom	

Apply Control Strategies

Evaluation and Awarding Marks
Name, first name……
Student number ……

	Mark	Motivation	Weight factor
Applying knowledge and understanding **C1 Analysing and defining problems** **C2 Design** The student can design different control strategies to deal with specific control problems. The student is able to review scientific papers and to apply the suggested control structures (e.g. feedforward, cascade, compensation, override). The student is able to apply Root-locus and frequency-response techniques. The methods and techniques are properly used. The student shows sufficient analytical skills to master the problem at hand.			1
Making judgments **C2 Design** The student can assess the stability and transient response behaviour of control systems. The student is able to correctly interpret the quality of the results.			1
Mark total			

Date: Signature examiner:

Unit of Study (UoS) **MES M AC CI**	**Controller Implementation (Capita Selecta)**
General Information	
Long name of unit of study	Controller Implementation
Short name of unit of study	Controller Implementation
Code for unit of study OSIRIS	CONTIM04
Teaching Term	P1A, P2A, P3A, P4A (Semester 1 / Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2 EC / 56 hours
Study hours (contact hours)	16 contact hours
Entry requirements	Simultaneously to the Module Systems Modelling or after taking classes Systems Modelling
Content and organization	
General description	In this course the implementation and evaluation of a controller on different platforms (SIL, PIL, HIL) or for an application in vehicle dynamics control is set up. It is important to structure the program to keep a good overview. Also, safety should be taken into account. To ensure a reliable program, selecting the appropriate measurement devices and signal conditioning are important. Information about sensors will be provided in this course. The programs Labview and Matlab Simulink can be downloaded from internet. For PLC the Codesys software is provided. After a short introduction, a practical example is worked out and tested.
Required literature / description of 'learning material'	Lecturing material and hand-outs available on Onderwijs Online
Recommended literature	-
Required software	Matlab, Simulink, Simmechanics, Labview, PLC, Hantune
Cohesion Relationship	Units of study: Applied Control Module: Systems Modelling
Compulsory participation	Yes.
Activities and/or instructional formats	Home study, working on practical assignments
Examinations	
Final Qualifications	C3 Testing controlled system
Assessment dimensions / learning outcomes	Dimensions of assessment: - Applying knowledge and understanding (testing of controlled systems) - Making judgements (testing of controlled systems) - Communication (testing) - Learning skills (testing

	The student can implement, test and evaluate a controller on an appropriate specific platform (e.g. SIL, PIL, HIL) for thermodynamic, hydraulic, mechanic processes or an application in vehicle dynamics and can check whether control specifications are met.	
Assessment criteria	M AC CI HTE assessment criteria: The student will be assessed on the criteria mentioned on the evaluation form (next page)	
Information for each exam and modular exam		
Examinations	Exam name	MES AC CI home taken exam
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	PROD-O Online digital product
	Exam type	Hand in
	Exam week	P2A, P4A (week 9)
	First examiner	Karl Wallkum
	Permitted resources	Everything, but all results must be the student’s own work
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1
	Compensation	No
	Review	Evaluation form week 3.4 and 4.12
Other information		
Required classroom	Regular classroom	

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Controller Implementation, Evaluation and Awarding Marks
Name, first name……
Student number …….
Topic……

	Mark	Motivation	Weight factor
Applying knowledge and understanding **C3: Testing** The student is able to identify the fields of application of different platforms using relevant literature. The student can demonstrate and explain how a controller can be implemented in each platform. The student can reflect on specific aspects, such as non-ideal sensors and actuators, signal conditioning, digitizing. The central questions have been answered. The methods and techniques properly used. The student shows sufficient analytical skills to master the problem at hand.			1
Making judgments **C3: Testing** The student is able to compare the different platforms on three key aspects. The student can determine the strengths and weaknesses of every platform. The student id able to correctly interpret and evaluate the quality of the results.			1
Communication **C3: Testing** The student reports in a way that the text is clearly understandable and in grammatically sound language.			1
Learning Skills **C3: Testing** The student displays discernible eagerness to tackle the task. The student shows problem solving skills. The student is self-reliant. The student reflects on the choices.			1
Mark total			

Date : Signature examiner :

Unit of Study (UoS) **MES M AC MSO**	**Multivariable systems and optimization**
General Information	
Long name of unit of study	Multivariable systems and optimization
Short name of unit of study	Multivariable systems and optimization
Code for unit of study OSIRIS	MULSYO02
Teaching Term	P2A, P4A
Registering for educational components	Go to Part 3 “Regulations for Education, exams and modular exams OSIRIS” for more information.
Credits/study load	2 EC / 56 hours
Study hours (contact hours)	16 contact hours and 3 contact hours exam
Entry requirements	It is expected that the student has mastered basic mathematics skills specifically differential equations and matrix calculations.
Content and organization	
General description	This course covers the essential concepts of linear systems and control methodologies based on state-space models with (possibly) multiple inputs and multiple outputs. First, several structural properties are considered, such as input-output stability, internal stability, controllability and observability. Secondly, feedback strategies based on the state and the output are studied, and includes the notions of stabilizability and detectability, as well as the design of state observers and dynamic compensators. In the last part of the course, the theory of linear quadratic regulators (LQR) and the application of cost functions is introduced to optimally tune the feedback controllers. Computations, analysis and control designs will be mainly performed using Matlab's “Control Systems Toolbox” and applied to real-life systems. This course is complementary to the course “Feedback Control”, i.e., state space models versus transfer function based analysis and design. Time-domain versus frequency domain approach. Together with the course “Feedback Control” this course will form the essential basis to enter the world of control systems engineering and beyond.
Required literature / description of ‘learning material’	Nise N.S., Control Systems Engineering, John Wiley & Sons Handouts / Manuals
Recommended literature	-
Required software	Matlab, Simulink
Cohesion Relationship	Units of study: Applied Control Module: Systems Modelling
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Working on practical assignments Work forms: Lectures, interactive simulation exercises, assignments
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design

Assessment dimensions / learning outcomes	Dimensions of assessment: - Knowledge and understanding (analysing control systems) - Applying knowledge and understanding (designing control systems the student is able to • identify whether a system is fully controllable, stabilizable, observable, detectable, and can check internal and input-output stability using state-space models; • design pole-placement controllers and state observers; • specify a cost function and to design an optimal dynamic compensator.	
Assessment criteria	The student will be assessed on answering the questions: • clearly and to the point, including sufficient relevant explanation and depth, comparable with the depth of the literature studied • without irrelevant additional information • using correct equations and models for the situation (for example when to use linear or nonlinear models) • using correct units for quantities in equations, graph labels, etc.	
Information for each exam and modular exam		
Examinations	Exam name	MES AC MSO written exam
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	KENN-F Knowledge exam on location / written
	Exam type	ANS
	Exam week	P2A, P4A (week 9)
	First examiner	Dimitri Jeltsema
	Permitted resources	Open book
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P5A)
	Compensation	No
	Review	Review week 3.4 / 4.12
Other information		
Required classroom	Regular classroom	

Unit of Study (UoS) **AEA MES M AC MP**	**Applied Control Minor Project**
General Information	
Long name of unit of study	Applied Control Minor Project
Short name of unit of study	Applied Control MP
Code for unit of study OSIRIS	APPCOM14
Teaching Term	P1A, P2A, P3A, P4A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	5 EC / 140 hours
Study hours (contact hours)	28 contact hours and 4 hours presentation
Entry requirements	-
Content and organization	
Professional task	Development of a controller
(Professional) products	Controller implementation, documentation/ poster presentation
General description	The Project serves to challenge the students to apply their knowledge and skills on a real-life problem, in correspondence with a subset of the final qualifications. The project covers the following topics: • The problem to be solved requires an understanding and active analysis of distinctive disciplines. • The project will always include the step from a real-life problem to a more abstract representation of the problem. • physical system: PN-plot, bode, step responses, linear/nonlinear; Control goals; Requirements: Stability, Offset, Settling time, Overshoot, Phase and gain margin; SISO/MIMO; system engineering • Controller design: [analog] PID, lead, lag, anti-windup, smith predictor, bumpless transfer. [digital] Euler/Tustin, zoh, sampling, PWM, bang-bang. The problem analysis will result in a problem solution to be translated in such terms that conclusions can be drawn based on the extent the problem has been solved and objectives fulfilled. Part of the project is the peer review: In a peer review session the contribution of the group members to the project is determined by the group members themselves. The focus is on content and collaboration. Ideally the supervisor (tutor) is also present, but that is not strictly necessary. Students should be aware of their own functioning within the project group, so should arrange peer feedback within their project group regularly (at least twice during the project).
Required literature / description of 'learning material'	Grit. R. (2021). *Project Management, a Practical Approach*. Noordhoff. Elling. R., et. al. (2011). *Report Writing for Readers with Little Time*. Noordhoff.

Recommended literature	-
Required software	Matlab Simulink
Cohesion Relationship	Units of study Applied Control
Compulsory participation	Yes
Activities and/or instructional formats	Research Work Forms: Lectures, Assignment
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Assessment dimensions / learning outcomes	Dimensions of assessment: - Applying knowledge and understanding (analysing and defining problems, design of controllers, testing of controlled systems, conducting research) - Making judgements (analysing and defining problems, design of controllers, testing of controlled systems, conducting research) - Communication (managing work processes, communication and collaboration) - Learning skills (professional development) Learning outcomes: The student presents a clear justification of the project approach. The student plans effectively. The student carries out a project based on a real-life problem in which model development and analysis as well as experimental validation are essential parts by applying knowledge and understanding and making judgements based on analysis and validation techniques. The student structures the working process in the engineering domain and is able to effectively communicate the core findings in a structured and convincing way. The student is able to systematically search for information, such as e.g. models, and judge its relevance. The student communicates the project findings in a clear and structured manner with colleague, customers and the wider public in oral and written forms. The content has been reviewed by peers and/or supervisor. The student reflects on his/her role in the project and on his/her professional development. The student can design and create an analog and/or digital feedback controller for linear physical system choosing appropriate techniques (applying anti-windup and bumpless transfer schemes, selecting resolution and sample rate).

<table>
<tr><td>Assessment criteria</td><td colspan="4">The student will be assessed on the criteria mentioned on the evaluation forms. The result of the MP is determined by 3 exams:
1. Project Plan:
For the Project Plan a pass or no pass will be defined by the examiner. The project plan has to be sufficient before starting the execution of the project.

2. Group Contribution:
For the contribution of the individual student to the group a pass or no pass will be defined by the examiners. The examiners can use the outcome of the peer review, but also can deviate from it.

3. Poster Presentation:
For the Presentation a group mark will be given by the examiners. The individual student mark is equal to the group mark provided that the student’s Group Contribution is sufficient (pass). If the Group Contribution of the student is insufficient, no mark will be given and the student is unable to finish the minor project.</td></tr>
<tr><td colspan="5">Information for each exam and modular exam</td></tr>
<tr><td rowspan="16">Examinations</td><td>Exam name</td><td>MES AC MP Project Plan</td><td>MES AC MP Group contribution</td><td>MES AC MP Poster Presentation</td></tr>
<tr><td>Exam code</td><td>TOETS-03</td><td>TOETS-02</td><td>TOETS-01</td></tr>
<tr><td>Registering and deregistering for exam opportunities</td><td colspan="3">See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”</td></tr>
<tr><td>Exam format</td><td>PROD-O Online / digital product</td><td>PART-F Participation on location</td><td>PRES-F Presentation on location</td></tr>
<tr><td>Exam type</td><td>Hand in</td><td></td><td>Hand in</td></tr>
<tr><td>Exam week</td><td>P1A / P3A (week 9)</td><td>P2A / P4A (week 10)</td><td>P2A / P4A (week 9 / 10)</td></tr>
<tr><td>First examiner</td><td colspan="3">Richard Kaandorp</td></tr>
<tr><td>Permitted resources</td><td colspan="3">Everything, but all results must be the student’s own work</td></tr>
<tr><td>Number of examiners</td><td>1</td><td>At least 1</td><td>2</td></tr>
<tr><td>Assessment</td><td>Pass</td><td>Pass</td><td>Mark</td></tr>
<tr><td>Pass mark</td><td>Pass</td><td>Pass</td><td>55</td></tr>
<tr><td>Minimal result</td><td>Pass</td><td>Pass</td><td>55</td></tr>
<tr><td>Weight</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Reassessment</td><td>1 P2A/P4A (week 2.4 / 4.4)</td><td>-</td><td>1 P5A (week 4.11/4.12)</td></tr>
<tr><td>Compensation</td><td>No</td><td>No</td><td>no</td></tr>
<tr><td>Review</td><td colspan="3">Feedback after presentation / Evaluation form in week 3.4 and 4.12</td></tr>
<tr><td colspan="5">Other information</td></tr>
<tr><td>Required classroom</td><td colspan="4">Regular classroom</td></tr>
</table>

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Project Applied Control: Project plan
Evaluation and Awarding Marks
Name, first name……
Topic……

	Pass	Motivation	Weight factor
Applying knowledge and understanding **C1: Analysing and defining problems** **C2: Design** **C5: Conducting Research** Do the candidates show understanding about the topic? Has the problem been clearly defined? Is the background relevant to the problem? Is the project objective clear and correct?			1
Making judgments **C1: Analysing and defining problems** **C2: Design** **C5: Conducting Research** Have the students presented a clear justification for their approach? Have reliable sources been used to come up with an approach? Do the students account for different alternatives before finalizing the approach?			1
Communication **C4: Managing work processes** **C6: Communication and Collaboration** Are the students able to guide their own work and that of others? Do the students plan effectively? Do the students show clarity in the explanation?			1
Learning Skills **C7: Professional development** Do the students display discernible keenness to tackle the task (initiative, deadline handling)? Is the problem owner involved adequately?			1
Pass total For a pass all items should be sufficient			

Date :

Signature examiner :

HAN_UNIVERSITY OF APPLIED SCIENCES

Project Applied Control: Poster Presentation
Evaluation and Awarding Marks

Name, first name……
Student number: ……
Topic……

	Mark	Motivation	Weight factor
Applying knowledge and understanding **C1: Analysing and defining problems** **C2: Design** **C3: Testing** **C5: Conducting Research** The student is able to identify the process model and operating point based on white box or black box modelling, using relevant literature. The student is able to use appropriate control design techniques using Matlab-Simulink and create an analog and/or digital feedback controller for a linear physical system. The student uses relevant literature to design a controller. The student shows sufficient familiarity with current knowledge. The central questions have been answered. The methods and techniques are properly used. The student shows sufficient analytical skills to master the problem at hand.			1
Making judgments **C1: Analysing and defining problems** **C2: Design** **C3: Testing** **C5: Conducting Research** The student is able to validate both process model and the behaviour of the controlled process. The student has critical appraisal that has been successfully incorporated. The student is able to correctly interpret and evaluate the quality of the results.			1

Communication **C4: Managing work processes** **C6: Communication and Collaboration** The student can communicate his project findings and defend choices in a clear and structured manner. The student is able to present the results to a problem owner. The student is able to work in a project team. Written text on the poster is clearly understandable and in grammatically sound language. The formal requirements for literary sources have been met.			1
Learning Skills **C7: Professional development** The student is able to reflect on his role in the project and on his professional development. Does the student display discernible eagerness to tackle the task? The problem owner is involved adequately. The student shows problem solving skills. The student is self-reliant. The student reflects on the choices made.			1
Final Mark (group) **For a pass all marks should be sufficient**			

Date :

Name and signature examiner 1 :

Name and signature examiner 2 :

Module code **AEA MES M SM**	**Systems Modelling**
Degree program	Master Engineering Systems
Target Group	All students, mandatory
Coordinating lecturer	Frank Poelmans
Code for OSIRIS	SYSTMO60
Professional Task	Modelling Systems
Professional Products	Models
Credits / Study load	15 EC / 420 hours
Relationship with and entry requirements concerning examinations	First module after admission to the program (basic module)
General Description	In this module the student will gain knowledge on analysing physical systems in the mechanical, electrical and thermodynamic/ fluid dynamic domains. Models for physical systems will be established by using white box modelling and by using experimental data. Furthermore computer simulations of established models will be performed to analyse the systems behaviour. The models will be validated by collecting relevant datasets or designing a validation experiment. Finally the theory learned will be implemented in a modelling case where the student also learns to evaluate relevant literature on modelling and learns to create a report and a presentation on the modelling-simulation-validation process.
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Units of study	Applied Physics (2 EC) Introduction Modelling (2 EC) Energy Based Modelling (2 EC) Practice Modelling and Simulation (2 EC) System Identification (2 EC) Systems Modelling Minor Project (5 EC)

Unit of Study (UoS) **AEA MES M SM AP**	**Applied Physics**
General Information	
Long name of unit of study	Applied Physics
Short name of unit of study	Applied Physics
Code for unit of study OSIRIS	APPLPH06
Teaching Term	P1A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2 EC / 56 hours
Study hours (contact hours)	16 contact hours and 3 contact hours exam
Entry requirements	It is expected that the student has mastered basic mathematics skills specifically differential equations.
Content and organization	
General description	The course Applied Physics (AP) covers the following topics: Mechanical systems: • Dynamics and kinematics of general motion of a body (translations, rotations, moment of inertia, transmissions, energy conservation) • Vibrations with multiple DOF (free vibrations, excited vibrations) • 1st and 2nd order mechanical systems Electrical systems: • Electrical networks • Operational amplifier circuits • Electromechanical systems Thermodynamic/Fluid dynamic systems: • Energy balances, mass balances • Heat transfer, Bernoulli flow equation • 1st law and 2nd law of thermodynamics • Reversible changes of ideal gas, thermodynamic diagrams
Required literature / description of 'learning material'	• Erwin Kreyszig, *Advanced Engineering Mathematics,* 10th edition, International Student Version (2011) • Engineering Mechanics: Dynamics SI Edition, R.C. Hibbeler, 14th Edition, Pearson, ISBN 9781292088723 • Norman S. Nise, Control Systems Engineering, 8th edition (EMEA edition), Wiley, ISBN 978-1-119-59013-2 • Reader Introduction Dynamics, E. Tazelaar et al, HAN, 2016 • Lecturing material available on Onderwijs Online
Recommended literature	• Transport Phenomena, The art of Balancing H. vd Akker, R.F. Mudde, Delft Academic Press, ISBN 9789065623584
Required software	-
Cohesion Relationship	Units of study Systems Modelling

Compulsory participation	No, but attendance will be registered	
Activities and/or instructional formats	Self-study, Working on assignments and exercises Work Forms: Lectures	
Examinations		
Final Qualifications	C1 Analysing and defining problems	
Assessment dimensions / learning outcomes	Dimensions of assessment: - Knowledge and understanding (analysing and defining problems) The student is able to analyse moderately complex physical systems in the mechanical, electrical and/or thermodynamic/fluid dynamic domains by describing the systems with differential equations. The system descriptions are found via white box modelling.	
Assessment criteria	The student will be assessed on answering the questions: • clearly and to the point, including sufficient relevant explanation and depth, comparable with the depth of the literature studied • without irrelevant additional information • using correct equations and models for the situation (for example when to use linear or nonlinear models) • using correct units for quantities in equations, graph labels, etc.	
Information for each exam and modular exam		
Examinations	Exam name	MES SM AP written exam
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	KENN-F Knowledge exam on location / written
	Exam type	ANS
	Exam week	P1A (week 9)
	First examiner	Frank Poelmans
	Permitted resources	Open book
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P2A, week 10 (Friday) or P5A)
	Compensation	No
	Review	Review week 2.4
Other information		
Required classroom	Regular classroom	

Unit of Study (UoS) **AEA MES M SM IM**	**Introduction Modelling**
General Information	
Long name of unit of study	Introduction Modelling
Short name of unit of study	Introduction Modelling
Code for unit of study OSIRIS	INTRMO05
Teaching Term	P1A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2 EC / 56 hours
Study hours (contact hours)	16 contact hours and 3 contact hours exam
Entry requirements	It is expected that the student has mastered basic mathematics skills specifically Differential equations, Linear algebra, Laplace transforms and Complex numbers.
Content and organization	
General description	The course Introduction Modelling (IM) covers the following topics: • Modelling goals, process definitions, data flow diagram • 4+1 step approach • Model equations and mathematical solutions • Conversion of differential equations into transfer functions • Model simulation (Simulink, pole-zero map, step-response, bode plot) • Conversion of differential equations into state space models • Process delays, nonlinear systems • Introduction to multi domain systems
Required literature / description of 'learning material'	Erwin Kreyszig, *Advanced Engineering Mathematics,* 10th edition, International Student Version (2011) Norman S. Nise, Control Systems Engineering, 8th edition (EMEA edition), Wiley, ISBN 978-1-119-59013-2 Reader Introduction Dynamics, E. Tazelaar et al, HAN, 2016 Lecturing material available on Onderwijs Online
Recommended literature	-
Required software	Matlab, Simulink
Cohesion Relationship	Units of study Systems Modelling
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Self-study, Working on assignments, Simulation exercises, Case studies Work Forms: Lectures
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design

Assessment dimensions / Learning outcomes	Dimensions of assessment: - Knowledge and understanding (analysing and defining problems) - Applying knowledge and understanding (Design physical systems) The student is able to analyse moderately complex physical systems in the mechanical, electrical and/or thermodynamic/fluid dynamic domains by describing the systems with either differential equations, transfer functions, state-space models or Bode diagrams in order to determine the system characteristics and be able to perform computer simulations. The student is able to describe the system using methods like white box modelling or step response experiments assuming lowest possible complexity for the analysis of relevant system characteristics.	
Assessment criteria	The student will be assessed on answering the questions: • clearly and to the point, including sufficient relevant explanation and depth, comparable with the depth of the literature studied • without irrelevant additional information • using correct equations and models for the situation (for example when to use linear or nonlinear models) • using correct units for quantities in equations, graph labels, etc.	
Information for each exam and modular exam		
Examinations	Exam name	MES SM IM written exam
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	KENN-F Knowledge exam on location / written
	Exam type	ANS
	Exam week	P1A (week 9)
	First examiner	Richard Kaandorp
	Permitted resources	Open book
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P2A, week 10 (Friday) or P5A)
	Compensation	No
	Review	Review week 2.4
Other information		
Required classroom	Regular classroom	

Unit of Study (UoS) **AEA MES M SM PMS**	**Practice Modelling and Simulation**
General Information	
Long name of unit of study	Practice Modelling and Simulation
Short name of unit of study	Practice Modelling and Simulation
Code for unit of study OSIRIS	PRAMOS08
Teaching Term	P1A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2 EC / 56 hours
Study hours (contact hours)	16 contact hours
Entry requirements	There are no further entry requirements after admission
Content and organization	
General description	PMS covers model assignments and simulations with Matlab-Simulink. • General software introduction in Matlab, Simulink • Simulation and analysis a system using different models (i.e. differential equations, state-space and transfer functions) • Analysis of basic cases (exercises at HAN, home taken, by each student separately) based on the domains treated in AP and IM (i.e. mechanical, electrical and thermodynamic/fluid dynamic) • Performing system verification and validation • Perform parametric analysis on systems for using loops. • Creating an efficient connection between scripting and Simulink modelling • Effectively plotting relevant data
Required literature / description of 'learning material'	Lecturing material and hand-outs available on Onderwijs Online
Recommended literature	-
Required software	Matlab, Simulink
Cohesion Relationship	Units of study Systems Modelling
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Home study, working on practical assignments Work forms: Lectures, interactive simulation exercises, assignments, reporting, presentations
Examinations	
Final Qualifications	C2 Design C3 Testing
Assessment dimensions / Learning outcomes	Dimensions of assessment: Applying knowledge and understanding (design, testing) The student is able to analyse, model, verify and validate a given system (in terms of differential equations) which can be from different application fields (i.e. mechanical, electrical and thermodynamic/fluid dynamic) in modelling software *(e.g. Matlab, Simulink or similar tools).* The student is able to convert the system into different models i.e. state-space and transfer function models.

	The verification is performed with logical inputs along with logical references. The validation is done by importing, filtering and comparing relevant datasets with the model data and/or by performing sensitivity analysis on the system parameters.	
Assessment criteria	The student will be assessed on the criteria (questions) mentioned on the evaluation form. (next page)	
Information for each exam and modular exam		
Examinations	Exam name	MES SM PMS Home Taken Exam
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	PROD-O Online digital product
	Exam type	Hand in
	Exam week	P1A (week 9)
	First examiner	Frank Poelmans
	Permitted resources	Everything, but all results must be the student’s own work
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P2A, week 10 (Friday) or P5A)
	Compensation	No
	Review	Evaluation form week 2.4
Other information		
Required classroom	Regular classroom	

Practice Modelling and Simulation

Evaluation and Awarding Marks
Name, first name……..
Student number …….

	Mark	Motivation	Weight factor
Knowledge and understanding **C1: Analyzing and defining problems** Has the candidate acquired appropriate knowledge to model the system (differential equation, transfer function, state space)? Is the modelled system represented in the software tool clearly, effectively and error free?			1
Applying knowledge and understanding **C2: Design** Is the model verified using logical inputs with sufficient justification? Has the candidate sufficient knowledge to validate the system using relevant data (literature, experiment)? Has the candidate performed a justified sensitivity analysis on the system parameters? Do the results show complexity and depth?			1
Mark total			

Date : Signature examiner :

Unit of Study (UoS) **AEA MES M SM EBM**	**Energy Based Modelling**
General Information	
Long name of unit of study	Energy based Modelling
Short name of unit of study	Energy based Modelling
Code for unit of study OSIRIS	ENEBAM10
Teaching Term	P2A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2 EC / 56 hours
Study hours (contact hours)	16 contact hours and 3 contact hours exam
Entry requirements	It is expected that the student has mastered basic mathematics skills specifically differential equations and matrix calculations.
Content and organization	
General description	The course Energy Based Modelling (EBM) covers the following topics: • Introduction to Energy Based Modelling • Generalized variables and coordinate transformations • Energy and power functions • Euler-Lagrange equation • Hamilton's principle, Hamiltonian systems • Modelling complex systems in mechanical and electrical domain • Modelling multi-domain systems
Required literature / description of 'learning material'	Lecturing material and hand-outs, available on Onderwijs Online
Recommended literature	-
Required software	-
Cohesion Relationship	Units of study Systems Modelling
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Self-study, Working on assignments and exercises Work Forms: Lectures
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design C5 Conducting Research
Assessment dimensions / Learning outcomes	Dimensions of assessment: - Knowledge and understanding (analysing and defining problems, conducting research) - Applying knowledge and understanding (design) The student is able to analyse complex mono-/multi-physical systems in the mechanical, electrical and/or thermodynamic/fluid dynamic

	domains by describing the systems with either differential and algebraic equations, transfer functions or state-space representations. The system descriptions are found via advanced white box modelling based on the internal energy of the system.	
Assessment criteria	The student will be assessed on answering the questions: • clearly and to the point, including sufficient relevant explanation and depth, comparable with the depth of the literature studied • without irrelevant additional information • using correct equations and models for the situation (for example when to use linear or nonlinear models) • using correct units for quantities in equations, graph labels, etc.	
Information for each exam and modular exam		
Examinations	Exam name	MES SM EBM written exam
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	KENN-F Knowledge exam on location / written
	Exam type	ANS
	Exam week	P2A (week 9)
	First examiner	Frank Poelmans
	Permitted resources	Open book
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P5A)
	Compensation	No
	Review	Review week 3.4
Other information		
Required classroom	Regular classroom	

Unit of Study (UoS) **AEA MES M SM SI**	**System Identification**
General Information	
Long name of unit of study	System Identification
Short name of unit of study	System Identification
Code for unit of study OSIRIS	SYSTID07
Teaching Term	P2A
Registering for educational components	Go to Part 3 “Regulations for Education, exams and modular exams OSIRIS” for more information.
Credits/study load	2 EC / 56 hours
Study hours (contact hours)	16 contact hours
Entry requirements	There are no further entry requirements after admission to the program.
Content and organization	
General description	Topics: • Data use • Parameter estimation • Sensitivity analysis • Validation
Required literature / description of ‘learning material’	• Reader System Modelling, Data Regression and System Identification, • Lecture notes, P. van Kan, HAN 2018 • Lecturing material available on Onderwijs Online
Recommended literature	-
Required software	Matlab
Cohesion Relationship	Units of study Systems Modelling
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Self-study, working on assignments Work forms: lectures
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design C6 Communication and collaboration
Assessment dimensions / learning outcomes	Dimensions of assessment: • Knowledge and understanding (Analysing and defining problems) • Applying knowledge and understanding (Design) • Communication (Reporting)) The student is able to demonstrate understanding of systems identification on an introductory level regarding data and model structure.

	The student is able to estimate parameters in a linear/nonlinear systems model from real measurement data using (weighted) least-squares methods. The student is able to evaluate a model structure based on output data and goodness of fit. The student communicates the findings of the assignment in a clear and structured manner in written form.	
Assessment criteria	The student will be assessed on the criteria (questions) mentioned on the evaluation form. (next page)	
Information for each exam and modular exam		
Examinations	Exam name	MES SM SI Home Taken Exam
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	PROD-O Online digital product
	Exam type	Hand in
	Exam week	P2A (week 9)
	First examiner	Frank Poelmans
	Permitted resources	Everything, but all results must be the student’s own work
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P5A)
	Compensation	No
	Review	Evaluation form week 3.4
Other information		
Required classroom	Regular classroom	

System Identification

Evaluation and Awarding Marks
Name, first name……

	Mark	Motivation	Weight factor
Knowledge and understanding **C1: Analysing and defining problems** Do the results show complexity and depth? Has the candidate acquired appropriate knowledge?			1
Applying knowledge and understanding **C2: Design** Does the candidate show sufficient familiarity with current knowledge (literature, experiments)? Are the methods and techniques properly used and described?			1
Communication **C6: Communication and Collaboration** The student communicates in a clear and structured manner in written form. Have the requirements for technical reporting been met?	V / NV (= sufficient/ not sufficient)	For a sufficient mark this item should be sufficient	0
Mark total			

Date :

Signature examiner :

Unit of Study (UoS) **AEA MES M SM MP**	**Systems Modelling Minor Project**
General Information	
Long name of unit of study	Systems Modelling Minor Project
Short name of unit of study	Systems Modelling MP
Code for unit of study OSIRIS	MODSYM04
Teaching Term	P1A, P2A (Semester 1)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	5 EC / 140 hours
Study hours (contact hours)	28 contact hours and 4 hours presentation
Entry requirements	-
Content and organization	
Professional task	Evaluate relevant literature and Analyse and validate the model
(Professional) products	Model Report (literature review) and presentation
General description	The students have to carry out an assignment, of which model development and analysis as well as experimental validation are essential parts. The Project serves to challenge the students to apply their knowledge and skills on a real-life problem, in correspondence with a subset of the final qualifications and the course discusses the skills needed to perform a research project and includes performing a literature study. Part of the project is the peer review: In a peer review session the contribution of the group members to the project is determined by the group members themselves. The focus is on content and collaboration. Ideally the supervisor (tutor) is also present, but that is not strictly necessary. Students should be aware of their own functioning within the project group, so should arrange peer feedback within their project group regularly (at least twice during the project).
Required literature / description of 'learning material'	Hanington. B, Martin. B (2012), *Universal Methods of Design*, Rockport Publishers Inc. 2012 Grit. R. (2021). *Project Management, a Practical Approach*. Noordhoff. Elling. R., et. al. (2011). *Report Writing for Readers with Little Time*. Noordhoff. Baarda. D.B. (2010). *Research this is it!* Noordhoff https://www.youtube.com/@GradCoach play list: https://www.youtube.com/playlist?list=PLvcb33xNTVUk-Bj4Y9iuU0n46LowYtjb5
Recommended literature	-
Required software	Matlab Simulink
Cohesion Relationship	Units of study Systems Modelling
Compulsory participation	Yes
Activities and/or instructional formats	Research Work Forms: Lectures, Assignment
Examinations	

Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Assessment dimensions / learning outcomes	Dimensions of assessment: - Knowledge and understanding (Conducting Research) - Applying knowledge and understanding (Analysing and defining problems, Design, Conducting Research) - Making judgements (Analysing and defining problems, Design, Conducting Research - Communication (Managing work processes, Communication and Collaboration) - Learning skills (Professional development) Learning outcomes: The student presents a clear justification of the project approach. The student plans effectively (M SM MP PP). The student carries out a project based on a real-life problem in which model development and analysis as well as experimental validation are essential parts by applying knowledge and understanding and making judgements based on analysis and validation techniques. The system descriptions are found via white box modelling or step response experiments. The student structures the working process in the engineering domain and is able to effectively communicate the core findings in a structured and convincing way. The student is able to systematically search for information, such as e.g. models, and judge its relevance. The student communicates the project findings in a clear and structured manner with colleague, customers and the wider public in oral and written forms. The content has been reviewed by peers and/or supervisor. The student reflects on his/her role in the project and on his/her professional development (M SM MP RP).
Assessment criteria	The student will be assessed on the criteria mentioned on the evaluation forms. The result of the MP is determined by **3 exams**: **4. Project Plan:** For the Project Plan a pass or no pass will be defined by the examiner. The project plan has to be sufficient before starting the execution of the project. **5. Group Contribution:** For the contribution of the individual student to the group a pass or no pass will be defined by the examiners. The examiners can use the outcome of the peer review, but also can deviate from it.

	6. Report and Presentation: For the Report and Presentation a group mark will be given by the examiners. The individual student mark is equal to the group mark provided that the student's Group Contribution is sufficient (pass). If the Group Contribution of the student is insufficient, no mark will be given and the student is unable to finish the minor project.			
Information for each exam and modular exam				
Examinations	Exam name	MES SM MP Project Plan	MES SM MP Group Contribution	MES SM MP RP Report & Presentation
	Exam code	TOETS-01	TOETS-03	TOETS-02
	Registering and deregistering for exam opportunities	See, Part 3 "Regulation for Education, exams and modular exams OSIRIS"		
	Exam format	PROD-O Online / digital product	PART-F Participation on location	PRES-F Presentation on location
	Exam type	Hand in		Hand in
	Exam week	P1A (week 9)	P2A (week 10)	P2A (week 9 / 10)
	First examiner	Frank Poelmans		
	Permitted resources	Everything, but all results must be the student's own work		
	Number of examiners	1	At least 1	2
	Assessment	Pass	Pass	Mark
	Pass mark	Pass	Pass	55
	Minimal result	Pass	Pass	55
	Weight	0	0	1
	Reassessment	1 P2A (week 2.4)	-	1 P5A (week 4.11/4.12)
	Compensation	No	No	no
	Review	Feedback after presentation / Evaluation form in week 3.4 and 4.12		
Other information				
Required classroom	Regular classroom			

Systems Modelling Minor Project: Project plan

Evaluation and Awarding Marks
Name, first name……

Topic……

	Pass	Motivation	Weight factor
Applying knowledge and understanding **C1: Analysing and defining problems** **C2: Design** **C5: Conducting Research** Do the candidates show understanding about the topic? Has the problem been clearly defined? Is the background relevant to the problem? Is the project objective clear and correct?			1
Making judgments **C1: Analysing and defining problems** **C2: Design** **C5: Conducting Research** Have the students presented a clear justification for their approach? Have reliable sources been used to come up with an approach? Do the students account for different alternatives before finalizing the approach?			1
Communication **C4: Managing work processes** **C6: Communication and Collaboration** Are the students able to guide their own work and that of others? Do the students plan effectively? Do the students show clarity in the explanation?			1
Learning Skills **C7: Professional development** Do the students display discernible keenness to tackle the task (initiative, deadline handling)? Is the problem owner involved adequately?			1
Pass total For a pass all items should be sufficient			

Date :

Signature examiner :

Systems Modelling Minor Project: Report and Presentation

Evaluation and Awarding Marks
Name, first name……
Student number……..
Topic……

	Mark	Motivation	Weight factor
Knowledge and understanding **C1: Analysing and defining problems** **C2: Design** **C3: Testing** **C5: Conducting Research** With the range and content of the references selected by the student, does the student shows that he has a good overview of the topic of the research question? Are the methods and techniques for modelling and simulation are properly used? Does the student show sufficient familiarity with current, basic knowledge? Have the central questions been answered? Does the student show sufficient analytical skills to master the problem at hand.			1
Making judgments **C1: Analysing and defining problems** **C2: Design** **C5: Conducting Research** Does the student give a relevant reflection on the content and usefulness of the selected references? is the student is able to validate the process model? Does the student has critical appraisal that has been successfully incorporated? Is the student is able to correctly interpret and evaluate the quality of the results?			1
Communication **C4: Managing work processes** **C6: Communication and Collaboration** Can the student communicate his project findings and defend choices in a			1

clear and structured manner in oral and written forms? Is the student able to present the results to a problem owner? Is the student able to work in a project team? Is the text clearly understandable and in grammatically sound language? Have the formal requirements for literary sources been met?			
Learning Skills **C7: Professional development** is the student able to reflect on his role in the project and on his professional development? Does the student displays discernible eagerness to tackle the task? Is the problem owner involved adequately? Does the student show problem solving skills? Is the student self-reliant? Does the student reflect on the choices made?			
Final Mark (group) **For a pass all marks should be sufficient**			

Date :
Signature examiner 1 :
Signature examiner 2 :

3 Elective Modules

Module code **AEA MES M AVD**	**Advanced Vehicle Dynamics**
Degree program	Master Engineering Systems
Target Group	Elective module
Coordinating Lecturer	Saskia Monsma
Code for OSIRIS	ADVVED60
Professional Task	Model and validate linear and nonlinear vehicle dynamics
Professional Products	Project plan Report Model + data Presentation (progress and final)
Credits / Study load	15 EC / 420 hours
Relationship with and entry requirements concerning examinations	Joined classes in Systems Modelling and Applied Control
General Description	The module covers: modelling and validation of vehicle dynamics: linear and nonlinear, steady state and non-steady state, without and with (driver) control, emphasizing tires, driver, passenger cars, articulated vehicles and motorcycles.
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Units of study	Advanced Vehicle Dynamics Theory 7.5 EC Advanced Vehicle Dynamics Capita Selecta 2.5 EC Advanced Vehicle Dynamics Minor Project 5.0 EC

Unit of Study (UoS) **AEA MES M AVD T**	**Advanced Vehicle Dynamics Theory**
General Information	
Long name of unit of study	Advanced Vehicle Dynamics Theory
Short name of unit of study	Advanced Vehicle Dynamics T
Code for unit of study OSIRIS	ADVVED28
Teaching Term	P1A, P2A, P3A, P4A (Semester 1/ Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	7.5 EC / 210 hours
Study hours (contact hours)	64 contact hours + 3 contact hours exam (written exam AVD1 and 20 minutes oral exam AVD2)
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	The study unit covers modelling of vehicle dynamics: linear and nonlinear, steady state and non-steady state, without and with (driver) control, emphasizing tires, driver, passenger cars, articulated vehicles and motorcycles.
Required literature / description of 'learning material'	Joop P. Pauwelussen, Essentials of Vehicle Dynamics, 2014, Butterworth-Heinemann, ISBN: 9780081000366 Readers, book chapters, papers and lecturing material and hand-outs, all available on Onderwijs Online
Recommended literature	Alessandro Genta and Giancarlo Genta, Road Vehicle Dynamics, Fundamentals of Modeling and Simulation, 2016, World Scientific, ISBN 9814713430, 9789814713436 R.J. Jagacinski, J.M. Flach.: *Control Theory for Humans*, ISBN nr. 0805822925 V. Cossalter.: *Motorcycle Dynamics,* 2nd edition (2006), ISBN nr. 978 – 1 – 4303 – 0861 – 4 P.Sweatman (ed.).: *PBS Explained, Performance Based Standards for Road Transport Vehicles*, report Australian Road Transport Suppliers Association (2003)
Required software	Matlab/Simulink
Cohesion Relationship	Module Applied Control, Module Systems Modelling Advanced Vehicle Dynamics CS, Advanced Vehicle Dynamics MP
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Self-study, Working on assignments Work Forms: Lectures (flipped classroom)
Examinations	
Final Qualifications	C1 Analysing and defining problems
Assessment dimensions / learning outcomes	Dimensions of assessment: • Knowledge and understanding (analysing and defining problems) The student is able to analyse, synthesize and evaluate (AVD WE): • linear and nonlinear tire dynamics and models, including main influences like load transfer, combined slip, camber, suspension characteristic

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- steady state vehicle handling based on the single-track vehicle model including nonlinear tire models
- vertical vehicle dynamics related to road input

The student is able to analyse, synthesize and evaluate (AVD OE):

- steady state and non-steady state dynamics of tires, passenger vehicles, articulated vehicles and motorcycles
- closed-loop driver vehicle system dynamics and modelling with the preview driver model.
</td></tr>
<tr><td>Assessment criteria</td><td colspan="3">

The student will be assessed (M AVD WE and M AVD OE) on answering the questions:

- clearly and to the point, including sufficient relevant explanation and depth, comparable with the depth of the literature studied
- without irrelevant additional information
- using correct equations and models for the situation (for example when to use linear or nonlinear models)
- using correct units for quantities in equations, graph labels, etc.

M AVD WE and M AVD OE: The WarmUp Test result given by the lecturer during the lecturing of the theory determines 20% of the score of the written (re-) exam M AVD WE and 20% of the oral (re-)exam M AVD OE. There are no separate WarmUp Tests for the re-exams.
</td></tr>
<tr><td colspan="4">Information for each exam and modular exam</td></tr>
<tr><td rowspan="15">Examinations</td><td>Exam name</td><td>MES AVD T written exam</td><td>MES AVD T oral exam</td></tr>
<tr><td>Exam code</td><td>TOETS-01</td><td>TOETS-02</td></tr>
<tr><td>Registering and deregistering for exam opportunities</td><td colspan="2">See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”</td></tr>
<tr><td>Exam format</td><td>KENN-F
Knowledge exam on location / written</td><td>KENN-M
Oral knowledge exam</td></tr>
<tr><td>Exam type</td><td>ANS</td><td>Oral</td></tr>
<tr><td>Exam week</td><td>P1A, P3A (week 9)</td><td>P2A, P4A (week 9)</td></tr>
<tr><td>First examiner</td><td colspan="2">Saskia Monsma</td></tr>
<tr><td>Permitted resources</td><td>Open book exam</td><td>none</td></tr>
<tr><td>Number of examiners</td><td>1</td><td>2</td></tr>
<tr><td>Assessment</td><td>Mark</td><td>Mark</td></tr>
<tr><td>Pass mark</td><td colspan="2">55</td></tr>
<tr><td>Minimal result</td><td>45</td><td>45</td></tr>
<tr><td>Weight</td><td>1</td><td>1</td></tr>
<tr><td>Reassessment</td><td>1 (P5A)</td><td>1 (P5A)</td></tr>
<tr><td>Compensation</td><td colspan="2">Yes</td></tr>
<tr><td>Review</td><td>Week 2.4 and 4.4</td><td>Evaluation form week 3.4 and 4.12</td></tr>
<tr><td colspan="4">Other information</td></tr>
<tr><td>Required classroom</td><td colspan="3">Regular classroom</td></tr>
</table>

HAN_UNIVERSITY OF APPLIED SCIENCES

Advanced Vehicle Dynamics T (oral part)

Evaluation and Awarding Marks
Name, first name…….

MES AVD 2 Exam dimensions of assessment:

- Dublin descriptor: 1. Knowledge and understanding
- Competence (final qualification): 1. Analysing and defining problems

Topics	Assessment

Mark: Date:

Examiner 1 name: Signature:

Examiner 2 name: Signature:

Unit of Study (UoS) **AEA MES M AVD CS**	**Advanced Vehicle Dynamics Capita Selecta**
General Information	
Long name of unit of study	Advanced Vehicle Dynamics Capita Selecta
Short name of unit of study	Advanced Vehicle Dynamics CS
Code for unit of study OSIRIS	ADVVED33
Teaching Term	P1A, P2A, P3A, P4A (Semester 1 / Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2.5 EC / 56 hours
Study hours (contact hours)	16 contact hours
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	The theory of AVD is deepened and extended with relevant, actual topics, for example: - vehicle modelling and simulation - control applications in AVD - tire design and performance - race car data analysis - scientific papers on AVD This will be done with different work forms, for example: - guest lectures from industry and/or research - modelling and simulation assignments - review and presentation of scientific papers - workshops
Required literature / description of 'learning material'	Handouts
Recommended literature	Scientific papers
Required software	MATLAB/Simulink
Cohesion Relationship	Module Applied Control, Module Systems Modelling Advanced Vehicle Dynamics T, Advanced Vehicle Dynamics MP
Compulsory participation	Yes
Activities and/or instructional formats	Self-study, case studies Work forms: Lectures, interactive simulation exercises, assignments, reporting
Examinations	
Final Qualifications	C2 Design C5 Conducting Research
Assessment dimensions / learning outcomes	Dimensions of assessment: • Knowledge and understanding (conducting research) • Applying knowledge and understanding (conducting research)

	The student has gained a deepened and /or applied scientific knowledge and skills in the topics covered in this Capita Selecta.	
Assessment criteria	The student will be assessed on the criteria mentioned on the evaluation form.	
Information for each exam and modular exam		
Examinations	Exam name	MES AVD CS Home taken exam
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	PROD-O Online digital product
	Exam type	Hand in
	Exam week	P2A, P4A (week 9)
	First examiner	Saskia Monsma
	Permitted resources	Everything, but all results must be the student’s own work
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P5A, week 4.11, 4.12)
	Compensation	No
	Review	Evaluation form week 3.4 and 4.12
Other information		
Required classroom	Regular classroom	

Advanced Vehicle Dynamics: Capita Selecta, Evaluation and Awarding Marks
Name, first name…….
Topic…….

	Mark	Motivation	Weight factor
Knowledge and understanding **C5: Conducting Research** Provides a basis or opportunity for originality in developing or applying ideas often in a research context**.**			1
Applying knowledge and understanding **C5: Conducting Research** Through problem solving abilities applied in new or unfamiliar environments within broader (or multidisciplinary) context. Using correct equations and models for the situation (for example when to use linear or nonlinear models) using correct units for quantities in equations, graph labels, etc.			1
Making judgments **C5: Conducting Research** Demonstrates the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete data.			1
Communication **C5: Conducting Research** Of their conclusions and underpinning knowledge and rational (restricted scope) to specialist and non-specialist audiences (monologue). (Clearly and to the point, including sufficient relevant explanation and depth as stated in the assignment without irrelevant additional information)			1
Learning Skills **C5: Conducting Research** Study in a manner that may be largely self-directed or autonomous.			1
Mark total			

Date : Signature examiner :

Unit of Study (UoS) **AEA MES M AVD MP**	**Advanced Vehicle Dynamics Minor Project**
General Information	
Long name of unit of study	Advanced Vehicle Dynamics Minor Project
Short name of unit of study	Advanced Vehicle Dynamics MP
Code for unit of study OSIRIS	ADVVEE10
Teaching Term	P1A, P2A, P3A, P4A (Semester 1/ Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	5 EC / 140 hours
Study hours (contact hours)	20 contact hours and 4 contact hours presentation
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
Professional task	Model and validate linear and nonlinear vehicle dynamics
(Professional) products	Model, report, presentation and defence
General description	Students have to carry out an assignment including a literature survey, of which model development and analysis as well as (vehicle instrumentation and) experimental validation and parameter identification are essential parts. Examples are: • To improve a chassis design through damper adjustment • To derive and validate an experimental way to identify and analyse driver control parameters (gains, lead- and lag times, delay time,..) Part of the project is the peer review: In a peer review session the contribution of the group members to the project is determined by the group members themselves. The focus is on content and collaboration. Ideally the supervisor (tutor) is also present, but that is not strictly necessary. Students should be aware of their own functioning within the project group, so should arrange peer feedback within their project group regularly (at least twice during the project).
Required literature / description of 'learning material'	Grit. R. (2021). *Project Management, a Practical Approach*. Noordhoff. Elling. R., et. al. (2011). *Report Writing for Readers with Little Time*. Noordhoff.
Recommended literature	-
Required software	Matlab/Simulink
Cohesion Relationship	Module Applied Control, Module Systems Modelling Advanced Vehicle Dynamics T, Advanced Vehicle Dynamics CS
Compulsory participation	Yes
Activities and/or instructional formats	Research Work Forms: Lectures, assignment, lab/testing guidance, supervisor meetings
Examinations	

Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Assessment dimensions / learning outcomes	Dimensions of assessment: • Applying knowledge and understanding (Analysing and defining problems, Design, Conducting Research) • Making judgements (Analysing and defining problems, Design, Conducting Research • Communication (managing work processes, communication and collaboration) • Learning skills (professional development) Learning outcomes: The student presents a clear justification of the project approach. The student plans effectively. The student carries out a project based on a real-life problem in which model development and analysis as well as experimental validation are essential parts by applying knowledge and understanding and making judgements based on analysis and validation techniques. The student structures the working process in the engineering domain and is able to effectively communicate the core findings in a structured and convincing way. The student is able to systematically search for information, such as e.g. models, and judge its relevance. The student communicates the project findings in a clear and structured manner with colleague, customers and the wider public in oral and written forms. The content has been reviewed by peers and/or supervisor. The student reflects on his/her role in the project and on his/her professional development.
Assessment criteria	The student will be assessed on the criteria mentioned on the evaluation forms. The result of the MP is determined by **3 exams**: **1. Project Plan:** For the Project Plan a pass or no pass will be defined by the examiner. The project plan has to be sufficient before starting the execution of the project. **2. Group Contribution:** For the contribution of the individual student to the group a pass or no pass will be defined by the examiners. The examiners can use the outcome of the peer review, but also can deviate from it. **3. Report and Presentation:** For the Report and Presentation a group mark will be given by the examiners. The individual student mark is equal to the group mark provided that the student's Group Contribution is sufficient (pass). If the Group Contribution of the student is insufficient, no mark will be given and the student is unable to finish the minor project.

Information for each exam and modular exam				
Examinations	Exam name	MES AVD MP Project Plan	MES AVD MP Group Contribution	MES AVD MP Doc. & defence
	Exam code	TOETS-03	TOETS-02	TOETS-01
	Registering and deregistering for exam opportunities	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”		
	Exam format	PROD-O Online / digital product	PART-F Participation on location	PRES-F Presentation on location
	Exam type	Hand in		Hand in
	Exam week	P1A / P3A (week 9)	P2A / P4A (week 10)	P2A / P4A (week 9 / 10)
	First examiner	Saskia Monsma		
	Permitted resources	Everything, but all results must be the student’s own work		
	Number of examiners	1	At least 1	2
	Assessment	Pass	Pass	Mark
	Pass mark	Pass	Pass	55
	Minimal result	Pass	Pass	55
	Weight	0	0	1
	Reassessment	1 P2A/P4A (week 2.4 / 4.4)	-	1 P5A (week 4.11/4.12)
	Compensation	No	No	no
	Review	Feedback after presentation / Evaluation form in week 3.4 and 4.12		
Other information				
Required classroom	Regular classroom			

HAN_UNIVERSITY OF APPLIED SCIENCES

Project Advanced Vehicle Dynamics: Project plan

Evaluation and Awarding Marks

Name, first name……

Topic……

	Pass	Motivation	Weight factor
Applying knowledge and understanding **C1: Analysing and defining problems** **C2: Design** **C5: Conducting Research** Do the candidates show understanding about the topic? Has the problem been clearly defined? Is the background relevant to the problem? Is the project objective clear and correct?			1
Making judgments **C1: Analysing and defining problems** **C2: Design** **C5: Conducting Research** Have the students presented a clear justification for their approach? Have reliable sources been used to come up with an approach? Do the students account for different alternatives before finalizing the approach?			1
Communication **C4: Managing work processes** **C6: Communication and Collaboration** Are the students able to guide their own work and that of others? Do the students plan effectively? Do the students show clarity in the explanation?			1
Learning Skills **C7: Professional development** Do the students display discernible keenness to tackle the task (initiative, deadline handling)? Is the problem owner involved adequately?			1
Pass total For a pass all items should be sufficient			

Date :

Signature examiner :

Project Advanced Vehicle dynamics: Project Documentation and Defence,
Evaluation and Awarding Marks
Name, first name…….
Student number …….

	Mark	Motivation	Weight factor
Applying knowledge and understanding C1: Analysing and defining problems C2: Design C3: Testing C5: Conducting Research Does the candidate show sufficient familiarity with current knowledge? Have the central questions been answered? Are the methods and techniques properly used? Does the student show sufficient analytical skills to master the problem at hand?			1
Making judgments C1: Analysing and defining problems C2: Design C3: Testing C5: Conducting Research Has critical appraisal been successfully incorporated? Is the student able to correctly interpret and evaluate the quality?			1
Communication C4: Managing work processes C6: Communication and Collaboration Is the student able to present the results to a problem owner? Is the student able to work in a project team? Is the text clearly understandable and in grammatically sound language? Have the formal requirements for literary sources been met?			1
Learning Skills C7: Professional development Does the student display discernible eagerness to tackle the task? Is the problem owner involved adequately? Does the student show problem solving skills? Is the student self-reliant? Does the student reflect on the choices?			1
Final Mark (group) **For a pass all marks should be sufficient**			

Date : Signature examiner : Signature examiner :

Module code **AEA MES M BDSD**	**Big Data & Small Data**
Degree program	Master Engineering Systems
Target Group	Elective module
Coordinating lecturer	Dixon Devasia
Code for OSIRS	BIGDAS80
Professional Task	Collect dataset, interpret features of dataset and create prediction model
Professional Products	Models
Credits / Study load	15 EC / 420 hours
Relationship with and entry requirements concerning examinations	Module Systems Modelling
General Description	The module covers the following tasks: • Collect a relevant dataset • Interpret the features of the dataset • Offline create prediction model using either system identification techniques or supervised machine learning • Evaluate the model
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Units of study	Data Collection and machine learning (7.5 EC) Capita Selecta in Machine learning (2.5 Big Data & Small Data Minor Project (5 EC)

Unit of Study (UoS) **AEA MES M BDSD T**	**Big Data and Small Data Theory**
General Information	
Long name of unit of study	Big Data and Small Data Theory
Short name of unit of study	Big Data and Small Data T
Code for unit of study OSIRIS	DATCOM02
Teaching Term	P1A, P2A, P3A, P4A (Semester 1/ Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	7.5 EC / 210 hours
Study hours (contact hours)	80 contact hours
Entry requirements	Joined classes Systems Modelling and Applied Control
Content and organization	
General description	The students have to carry out assignments in which they learn how to clean up a dataset so that it is directly usable for prediction purposes. Furthermore students will analyse the data within the dataset and find e.g. correlation among variables. The student also learns how to make prediction models using a large number of supervised machine learning algorithms. The student can apply these models to datasets and knows the advantages and disadvantages of the different methods.
Required literature / description of 'learning material'	Coursera course: Machine learning (Andrew NG)
Recommended literature	-
Required software	Matlab Simulink
Cohesion Relationship	Module Applied Control, Module Systems Modelling Big Data and Small Data CS, Big Data and Small Data MP
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Working on applied assignments using a simulation environment Work forms: Lectures, flipped classroom, assignments
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing
Assessment dimensions / learning outcomes	Dimensions of assessment: - Knowledge and understanding (Analysing and defining problems, design and testing algorithms) - Applying knowledge and understanding (design) - Making judgements (testing) The student formulates a question on what they want to achieve with the dataset (BDSD HTE1)

	The student judges if the dataset contains enough data and the data contains the right features to answer the formulated question. He or she knows how to deal with missing or erroneous data and can scale that dataset if necessary and can select test and validation sets (BDSD HTE1) The student interprets the features of the dataset. He or she is able to use clustering techniques line K-means and look for correlation between data and use PCA (BDSD HTE1) The student can apply supervised machine learning techniques for predictive analysis like linear regression, logistic regression and neural networks and motivate why they chose that particular technique. (BDSD HTE1) The student can evaluate and compare models by picking a relevant metric like e.g. R^2. (BDSD HTE1) The student can apply supervised machine learning techniques for predictive analysis like techniques from System Identification. (BDSD HTE2)		
Assessment criteria	The student will be assessed on the criteria (questions) mentioned on the evaluation form. (next page)		
Information for each exam and modular exam			
Examinations	Exam name	MES BDSD T home taken exam 1	MES BDSD T home taken exam 2
	Exam code	TOETS-01	TOETS-02
	Registering and deregistering for exam opportunities	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”	
	Exam format	PROD-O Online / digital product	PROD-O Online / digital product
	Exam type	Hand in	Hand in
	Exam week	P1A, P3A (week 9)	P2A, P4A (week 9)
	First examiner	Marijn Jongerden, Hatim Mala	
	Permitted resources	Everything, but all results must be the student’s own work	
	Number of examiners	1	1
	Assessment	Mark	mark
	Pass mark	55	
	Minimal result	45	45
	Weight	3	1
	Reassessment	1 (P5A)	1 (P5A)
	Compensation	Yes	
	Review	Week 2.4 and 4.4	Evaluation form week 3.4 and 4.12
Other information			
Required classroom	Regular classroom		

HAN_UNIVERSITY OF APPLIED SCIENCES

Big Data and Small Data: Data Collection and Machine Learning, Evaluation and Awarding Marks

Name, first name……
Topic……

	Mark	Motivation	Weight factor
Knowledge and understanding **C1: Analysing and defining problems** **C2: Design** **C3: Testing** Can the student explain how supervised machine learning algorithms for predictive analysis like linear regression, logistic regression, neural networks and System Identification techniques work?			1
Applying knowledge and understanding **C2 Design** Can the student identify when feature scaling is needed? Can the student apply supervised machine learning algorithms for predictive analysis like linear regression, logistic regression, neural networks and System Identification techniques work to a dataset? Can the student evaluate and compare models by picking a relevant metric?			1
Making judgments **C3: Testing** Can the student motivate choices they made in the application of a particular machine learning algorithm ? Can the student interpret and explain the results obtained from a particular machine learning algorithm? Can the student motivate why they chose a certain metric to compare models?			1
Mark total			

Date : Signature examiner :

Unit of Study (UoS) **M BDSD CS**	**Big Data and Small Data Capita Selecta**
General Information	
Long name of unit of study	Big Data and Small Data Capita Selecta
Short name of unit of study	Big Data and Small Data CS
Code for unit of study OSIRIS	CAPSEM07
Teaching Term	P2A, P4A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2.5 EC / 56 hours
Study hours (contact hours)	16 contact hours
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	Critical review of literature on machine learning in a certain application area.
Required literature / description of 'learning material'	Scientific papers
Recommended literature	-
Required software	Matlab, Simulink
Cohesion Relationship	Module Applied Control, Module Systems Modelling Big Data and Small Data T, Big Data and Small Data MP
Compulsory participation	Yes
Activities and/or instructional formats	Self-study, case studies Work forms: Lectures, reporting / presentations
Examinations	
Final Qualifications	C5 Conducting Research
Assessment dimensions / learning outcomes	Dimensions of assessment: - knowledge and understanding (conducting research) - Applying knowledge and understanding - Making judgements (conducting research) The student can critically review work of others on machine learning applications and suggest how to improve the work.
Assessment criteria	The student will be assessed on the criteria mentioned on the evaluation form. (next page)
Information for each exam and modular exam	

Examinations	Exam name	MES BDSD CS Home taken exam: Article
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	PROD-O, Online digital product
	Exam type	Hand in
	Exam week	P2A, P4A (week 9)
	First examiner	Marijn Jongerden
	Permitted resources	Everything, but all results must be the student’s own work
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P5A, week 4.11, 4.12)
	Compensation	No
	Review	Evaluation form week 3.4 and 4.12
Other information		
Required classroom	Regular classroom	

HAN_UNIVERSITY OF APPLIED SCIENCES

Big Data and Small Data: Capita Selecta

Evaluation and Awarding Marks
Name, first name……
Topic……

	Mark	Motivation	Weight factor
Knowledge and understanding **C5: Conducting Research** Can the student explain and compare the machine learning algorithms used in literature?			1
Applying knowledge and understanding **C5: Conducting Research** Can the student review the application of the machine learning algorithm in literature ? (e.g. data used, settings, etc.)			1
Making judgments **C5: Conducting Research** Can the student motivate how the machine learning algorithms used in literature might be improved?			1
Mark total			

Date :

Signature examiner :

Unit of Study (UoS) **M BDSD MP**	**Big data and Small Data Minor Project**
General Information	
Long name of unit of study	Big Data and Small Data Minor Project
Short name of unit of study	Big Data and Small Data MP
Code for unit of study OSIRIS	BIGDAM05
Teaching Term	P1A, P2A, P3A, P4A (Semester 1/ Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	5 EC / 140 hours
Study hours (contact hours)	32 contact hours and 4 contact hours presentation
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
Professional task	Create a predictive model
(Professional) products	A predictive model, Project documentation, Presentation
General description	The Project serves to challenge the students to apply their knowledge and skills on a real-life problem, in correspondence with a subset of the final qualifications. The project covers the following topics: - Analysing data of a real life problem - Developing a prediction model for this problem. The problem analysis will result in a problem solution to be translated in such terms that conclusions can be drawn based on the extent the problem has been solved and objectives fulfilled. Part of the project is the peer review: In a peer review session the contribution of the group members to the project is determined by the group members themselves. The focus is on content and collaboration. Ideally the supervisor (tutor) is also present, but that is not strictly necessary. Students should be aware of their own functioning within the project group, so should arrange peer feedback within their project group regularly (at least twice during the project).
Required literature / description of 'learning material'	Grit. R. (2021). *Project Management, a Practical Approach*. Noordhoff. Elling. R., et. al. (2011). *Report Writing for Readers with Little Time*. Noordhoff.
Recommended literature	-
Required software	Matlab, Simulink, R, python, SPSS
Cohesion Relationship	Module Applied Control, Module Systems Modelling Big Data and Small Data T, Big Data and Small Data CS
Compulsory participation	Yes
Activities and/or instructional formats	Research Work Forms: Lectures, Assignment

	Analysing data and creation of a predictive model using techniques from system identification and/or machine learning.
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Assessment dimensions / learning outcomes	Dimensions of assessment: - Applying knowledge and understanding (analysing and defining problems, design, testing, conducting research) - Making judgements (analysing and defining problems, design, testing, conducting research) - Communication (managing work processes, communication and collaboration) - Learning skills (professional development) Learning outcomes: The student presents a clear justification of the project approach. The student plans effectively. The student carries out a project based on a real-life problem in which model development and analysis as well as experimental validation are essential parts by applying knowledge and understanding and making judgements based on analysis and validation techniques. The student structures the working process in the engineering domain and is able to effectively communicate the core findings in a structured and convincing way. The student is able to systematically search for information, such as e.g. models, and judge its relevance. The student communicates the project findings in a clear and structured manner with colleague, customers and the wider public in oral and written forms. The content has been reviewed by peers and/or supervisor. The student reflects on his/her role in the project and on his/her professional development. The student can make a motivated choice of which machine learning techniques he/she uses. The student can evaluate and compare models by picking a relevant metric like e.g. R^2.

<table>
<tr><td>Assessment criteria</td><td colspan="3">The student will be assessed on the criteria mentioned on the evaluation forms.

The result of the minor project is determined by 2 exams:

1. Group Contribution:
For the contribution of the individual student to the group a pass or no pass will be defined by the examiners. The examiners can use the outcome of the peer review, but also can deviate from it.

2. Documentation and defence:
For the Report and Presentation a group mark will be given by the examiners. The individual student mark is equal to the group mark provided that the student’s Group Contribution is sufficient (pass). If the Group Contribution of the student is insufficient, no mark will be given and the student is unable to finish the minor project.</td></tr>
<tr><td colspan="4">Information for each exam and modular exam</td></tr>
<tr><td rowspan="14">Examinations</td><td>Exam name</td><td>MES BDSD MP Group contribution</td><td>MES BDSD MP Report and defence</td></tr>
<tr><td>Exam code</td><td>TOETS-02</td><td>TOETS-01</td></tr>
<tr><td>Registering and deregistering for exam opportunities</td><td colspan="2">See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”</td></tr>
<tr><td>Exam format</td><td>PART-F Participation on location</td><td>PRES-F Presentation on location</td></tr>
<tr><td>Exam type</td><td>Hand in</td><td>Hand in</td></tr>
<tr><td>Exam week</td><td>P2A / P4A (week 10)</td><td>P2A / P4A (week 9 / 10)</td></tr>
<tr><td>First examiner</td><td colspan="2">Dixon Devasia</td></tr>
<tr><td>Permitted resources</td><td colspan="2">Everything, but all results must be the student’s own work</td></tr>
<tr><td>Number of examiners</td><td>At least 1</td><td>2</td></tr>
<tr><td>Assessment</td><td>Pass</td><td>Mark</td></tr>
<tr><td>Pass mark</td><td>Pass</td><td>55</td></tr>
<tr><td>Minimal result</td><td>Pass</td><td>55</td></tr>
<tr><td>Weight</td><td>0</td><td>1</td></tr>
<tr><td>Reassessment</td><td>-</td><td>1 (P5A, week 4.11/4.12)</td></tr>
<tr><td>Compensation</td><td>no</td><td>no</td></tr>
<tr><td>Review</td><td colspan="2">Feedback after presentation / Evaluation form in week 3.4 and 4.12</td></tr>
<tr><td colspan="4">Other information</td></tr>
<tr><td>Required classroom</td><td colspan="3">Regular classroom</td></tr>
</table>

HAN_UNIVERSITY OF APPLIED SCIENCES

Big Data & Small Data: Project Documentation and Defence, Evaluation and Awarding Marks
Name, first name…….
Student number……..

	Mark	Motivation	Weight factor
Applying knowledge and understanding **C1: Analysing and defining problems** **C2: Design** **C3: Testing** **C5: Conducting Research** Does the candidate show sufficient familiarity with current knowledge? Have the central questions been answered? Are the methods and techniques properly used? Does the student show sufficient analytical skills to master the problem at hand?			1
Making judgments **C1: Analysing and defining problems** **C2: Design** **C3: Testing** **C5: Conducting Research** Has critical appraisal been successfully incorporated? Is the student able to correctly interpret and evaluate the quality?			1
Communication **C4: Managing work processes** **C6: Communication and Collaboration** Is the student able to present the results to a problem owner? Is the student able to work in a project team? Is the text clearly understandable and in grammatically sound language? Have the formal requirements for literary sources been met?			1
Learning Skills **C7: Professional development** Does the student display discernible eagerness to tackle the task? Is the problem owner involved adequately? Does the student show problem solving skills? Is the student self-reliant? Does the student reflect on the choices?			1
Final Mark (group) **For a pass all marks should be sufficient**			

Date : Signature examiner: Signature examiner:

Module **AEA MES M EC**	**Embedded Control**
Degree program	Master of Engineering Systems
Target Group	Elective module
Coordinating lecturer	Dimitri Jeltsema
Code for OSIRIS	EAMDEC01
Professional Task	Analyse, synthesize, design, implement, and validate embedded control systems
Professional Products	Theory and Capita Selecta: concepts, data, design, and validation Minor Project: project plan, report, presentation
Credits / Study load	15 EC / 420 hours
Relationship with and entry requirements concerning examinations	Joined both modules Systems Modelling and Applied Control and a basic level of programming embedded systems, preferably in C-coding (reader available on Onderwijs Online).
General Description	The majority of modern control systems (automotive control systems, robotics, industrial processes, smart grids, etc.) are realized as real-time embedded systems. The primary objective of this module is to provide a solid understanding of the principles on which such cyber-physical systems are based, both at the level of theory and capita selecta. In the minor project these principles are assembled and applied to a real-life physical system that is augmented with sensors, actuators, communication protocols, and processing hard- and software.
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Units of study	This module consists of the following 3 units: Embedded Control Theory 7.5 EC Embedded Control Capita Selecta 2.5 EC Embedded Control Minor Project 5.0 EC

Unit of Study (UoS) **AEA MES M EC**	**Embedded Control Theory**
General Information	
Long name of unit of study	Embedded Control Theory
Short name of unit of study	Embedded Control T
Code for unit of study OSIRIS	EAECTH01
Teaching Term	P3A, P4A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	7.5 EC / 210 hours
Study hours (contact hours)	68 hours
Entry requirements	Joined both modules Systems Modelling and Applied Control and a basic level of programming embedded systems, preferably in C-coding (reader available on Onderwijs Online).
Content and organization	
General description	The theoretical part of this module provides the student with the knowledge and skills required to analyse and design embedded control systems. One of the key principles is real-time behaviour, including the limitations of computational resources and how this affects the qualitative requirements (reliability and performance) of an embedded control system. On a more fundamental level, the topics to be discussed in this course are system design, distributed systems, real-time aspects, communication protocols, fault-handling, and maintenance. At the same time, the necessary background in linear and nonlinear system analysis, measuring techniques, numerical mathematics and statistics, and a thorough overview of the state-of-the-art in control methodologies is provided.
Required literature / description of 'learning material'	Readers, book chapters, papers, online (video) tutorials, lecturing material, and hand-outs, to be distributed using Onderwijs Online. • Kopetz, H. (2011). *Real-Time Systems: Design Principles for Distributed Embedded Applications*. Springer. • Khalil, H.K. (2002). *Nonlinear Systems*. Prentice-Hall.
Recommended literature	• Van Steen, M. & Tanenbaum, A.S. (2017). *Distributed Systems: Principles and Paradigms*. Prentice-Hall. • Kreyszig, E. (2011). *Advanced Engineering Mathematics*. Wiley.
Required software	Matlab/Simulink and C
Cohesion Relationship	Module Systems Modelling, Module Applied Control Embedded Control Capita Selecta, Embedded Control Minor Project Module Advanced Vehicle Dynamics/Module Big Data Small Data
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Self-study, case-studies, working on practical assignments. Work forms: Lectures, interactive simulation exercises, assignments, reporting practical assignments.
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design of control systems

Assessment dimensions / learning outcomes	Dimensions of assessment: • Knowledge and understanding (analysis) • Applying knowledge and understanding (design) Learning outcomes: the student • Shows how to deal with the design concepts and principles of embedded control systems, such as distributed systems, architectural design, real-time aspects, communication protocols, fault handling, and maintenance. • applies linear and nonlinear analysis and control techniques to different processes and knows how to simulate and evaluate a conceptual control system design. • converts continuous-time control concepts to their discrete-time equivalents. • applies numerical methods in simulation and in real-time embedded programming. • Is able to measure both physical quantities using sensors and embedded system metrics, such as performance and energy consumption. • performs data acquisition and signal conditioning. He/she understands practical and statistical issues, such as relative error, accuracy, uncertainty, sensitivity, and reliability. • develops computer algorithms that incorporate the values and principles of agile software development.	
Assessment criteria	The student will be assessed (HTE) on the criteria mentioned on the evaluation form.	
Information for each exam and modular exam		
Examinations	Exam name	MES EC T home taken exam
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	PROD-O, Online digital product
	Exam type	Hand in
	Exam week	P4A (week 9)
	First examiner	Dimitri Jeltsema
	Permitted resources	Everything, but all results must be the student’s own work
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P5A)
	Compensation	No
	Review	Evaluation Form week 4.12
Other information		
Required classroom	Regular classroom	

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Embedded Control T: Home Taken Exam
Evaluation and Awarding Marks

Name, first name…….

	Mark	Motivation	Weight factor
Knowledge and understanding **C1 Analysing and defining problems** Can the student use first principles and/or system identification techniques to model a given system? Does the student understand the limitations of the models and can the student decide when to use linear or nonlinear techniques? Does the student understand the analysis techniques and the outcomes of the analysis? Is the student able to relate an abstract design model to a digital implementation of a distributed real-time system?		-	1
Applying knowledge and understanding **C2 Design** Can the student apply the analysis techniques, interpret the outcomes and design controllers? Is the student able to design a fault tolerant distributed system? Does the student understand the practical constraints and limitations of the approach? Is the report complete, well organized, and clearly written?			1
Mark total			

Date :
Signature examiner :

Unit of Study (UoS) **AEA MES M EC CS**	**Embedded Control Capita Selecta**
General Information	
Long name of unit of study	Embedded Control Capita Selecta
Short name of unit of study	Embedded Control CS
Code for unit of study OSIRIS	EAECCS01
Teaching Term	P3A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2.5 EC / 70 hours
Study hours (contact hours)	1 hour for oral presentation
Entry requirements	Joined both modules Systems Modelling and Applied Control and a basic level of programming embedded systems, preferably in C-coding (reader available on Onderwijs Online).
Content and organization	
General description	A thorough analysis, reproduction, and validation of (a) peer reviewed scientific paper(s) in the field of embedded control systems is performed and the results are discussed in an oral presentation. The type of application depends on the student's own interest and should be strongly connected to the application of the minor project (automotive versus industrial applications) and depending on a focus towards software (algorithms, protocols, communication) or hardware (design, sensors and actuators).
Required literature / description of 'learning material'	To be decided during class, depending on the subject.
Recommended literature	To be decided during class, depending on the subject.
Required software	Matlab/Simulink and C
Cohesion Relationship	Module Systems Modelling, Module Applied Control Embedded Control Theory, Embedded Control Minor Project Module Advanced Vehicle Dynamics Module Big Data Small Data
Compulsory participation	Yes
Activities and/or instructional formats	Self-study, case studies, and literature survey Work forms: assignments, reporting, presentations
Examinations	
Final Qualifications	C5 Conducting Research C6 Communication
Assessment dimensions / Learning outcomes	Dimensions of assessment: • Knowledge and understanding (conducting research) • Applying knowledge and understanding (conducting research) • Making judgements (conducting research) • Communication (conducting research) • Learning skills (conducting research)

	Learning outcomes: The student • Is aware of embedded control systems in one or more contemporary applications. • Finds and selects relevant scientific resources for a selected application. • Is able to interpret, analyse, reproduce, and validate the main aspects of an embedded control system. • Is able to highlight and explain the main results of the performed research in an oral presentation.	
Assessment criteria	The student will be assessed on the criteria (questions) mentioned on the evaluation form.	
Information for each exam and modular exam		
Examinations	Exam name	MES EC CS oral
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	oral
	Exam type	Hand in
	Exam week	P4A (week 4)
	First examiner	Dimitri Jeltsema
	Permitted resources	Everything, but all results must be the student’s own work
	Number of examiners	2
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P5A), week 4.11/4.12
	Compensation	No
	Review	Feedback after oral exam Evaluation form week 4.6
Other information		
Required classroom	Regular classroom	

Embedded Control A: Presentation/Oral Exam
Evaluation and Awarding Marks
Name, first name……
Topic……

	Mark	Motivation	Weight factor
Knowledge and understanding **C5: Conducting Research** Provides a basis or opportunity for originality in developing or applying ideas often in a research context**.**			1
Applying knowledge and understanding **C5: Conducting Research** Through problem solving abilities applied in new or unfamiliar environments within broader (or multidisciplinary) context.			1
Making judgments **C5: Conducting Research** Demonstrates the ability to integrate knowledge and handle complexity and formulate judgements with incomplete data.			1
Communication **C5: Conducting Research** Of their conclusions and underpinning knowledge and rational (restricted scope) to specialist and non-specialist audiences (monologue).			1
Learning Skills **C5: Conducting Research** Study in a manner that may be largely self-directed or autonomous.			1
Mark total			

Date :

Signature examiner :

Signature examiner :

Unit of Study (UoS) **AEA MES M EC MP**	**Embedded Control Minor Project**
General Information	
Long name of unit of study	Embedded Control Minor Project
Short name of unit of study	Embedded Control MP
Code for unit of study OSIRIS	EAECMP01
Teaching Term	P3A, P4A
Registering for educational components	Go to Part 3 “Regulations for Education, exams and modular exams OSIRIS” for more information.
Credits/study load	5 EC / 140 hours
Study hours (contact hours)	64 contact hours and 4 hours presentation
Entry requirements	Joined both modules Systems Modelling and Applied Control and a basic level of programming embedded systems, preferably in C-coding (reader available on Onderwijs Online).
Content and organization	
Professional task	Design, implement, verify and test embedded control systems
(Professional) products	Model Report (literature review), presentation and defence
General description	In the Minor Project the students will design, implement, verify, and test the principles of embedded control systems in a project depending on the chosen co-module within the Cyber-Physical Systems track. This means that students following the Embedded Control module in conjunction with the module Advanced Vehicle Dynamics will focus on an automotive control application, whereas students that are involved in the module Big Data Small Data will focus on a control application that involves techniques from reinforcement- and machine learning. Part of the project is the peer review: In a peer review session the contribution of the group members to the project is determined by the group members themselves. The focus is on content and collaboration. Ideally the supervisor (tutor) is also present, but that is not strictly necessary. Students should be aware of their own functioning within the project group, so should arrange peer feedback within their project group regularly (at least twice during the project).
Required literature / description of ‘learning material’	Grit. R. (2021). *Project Management, a Practical Approach*. Noordhoff. Elling. R., et. al. (2011). *Report Writing for Readers with Little Time*. Noordhoff.
Recommended literature	-
Required software	MATLAB/Simulink and C
Cohesion Relationship	Module Applied Control, Module Systems Modelling Module Advanced Vehicle Dynamics / Module Big Data Small Data Embedded Control CS, Embedded Control Theory
Compulsory participation	Yes
Activities and/or instructional formats	Conducting research Work Forms: Assignment

Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Assessment dimensions / learning outcomes	Dimensions of assessment • Applying knowledge and understanding (analysing and defining problems, design, conducting research) • Making judgements (analysing and defining problems, design, conducting research) • Communication (managing work processes, communication and collaboration) • Learning skills (professional development) Learning outcomes: the student • Presents a clear justification of the project approach. • Plans effectively. • Carries out a project based on a real-life problem in which model development and analysis as well as experimental validation are essential parts by applying knowledge and understanding and making judgements based on analysis and validation techniques. • Structures the working process in the engineering domain and is able to effectively communicate the core findings in a structured and convincing way. • Is able to systematically search for information, such as e.g. models, and judge its relevance. • Communicates the project findings in a clear and structured manner with colleague, customers and the wider public in oral and written forms. The content has been reviewed by peers and/or supervisor. Reflects on his/her role in the project and on his/her professional development.
Assessment criteria	The student will be assessed on the criteria mentioned on the evaluation forms. The result of the Minor Project is determined by: 1. **Project Plan:** For the Project Plan a GO or NO GO will be defined by the examiner. The project plan has to be sufficient before starting the execution of the project. 2. **Group Contribution**: For the contribution of the individual student to the group a pass or no pass will be defined by the examiners. The examiners can use the outcome of the peer review, but also can deviate from it. 3. **Report and Presentation**: For the report and presentation, a group mark will be given by the examiners. The individual student mark is equal to the group mark provided that the student's Group Contribution is sufficient (pass). If the Group Contribution of the student is insufficient, no mark will be given, and the student is unable to finish the minor project.

Information for each exam and modular exam				
Examinations	Exam name	MES EC MP Project Plan	MES EC MP Group Contribution	MES EC MP Report and Presentation
	Exam code	TOETS-01	TOETS-02	TOETS-03
	Registering and deregistering for exam opportunities	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”		
	Exam format	PROD-O Online / digital product	PART-F Participation on location	PRES-F Presentation on location
	Exam type	Hand in		Hand in
	Exam week	P3A (week 9)	P4A (week 10)	P4A (week 9 / 10)
	First examiner	Dimitri Jeltsema / Nikhil Muthakana		
	Permitted resources	Everything, but all results must be the student’s own work		
	Number of examiners	1	At least 1	2
	Assessment	Pass	Pass	Mark
	Pass mark	Pass	Pass	55
	Minimal result	Pass	Pass	55
	Weight	0	0	1
	Reassessment	P4A (week 4.4)	-	1 (P5A, week 4.11/4.12)
	Compensation	No	No	No
	Review	Feedback after presentation / Evaluation form in week 3.4 and 4.12		
Other information				
Required classroom	Regular classroom/workshop			

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Minor Project Embedded Control: Project Plan

Evaluation and Awarding Marks

Name, first name……

Topic……

	Pass	Motivation	Weight factor
Applying knowledge and understanding **C1: Analysing and defining problems** **C2: Design** **C5: Conducting Research** Do the candidates show understanding about the topic? Has the problem been clearly defined? Is the background relevant to the problem? Is the project objective clear and correct?			1
Making judgments **C1: Analysing and defining problems** **C2: Design** **C5: Conducting Research** Have the students presented a clear justification for their approach? Have reliable sources been used to come up with an approach? Do the students account for different alternatives before finalizing the approach?			1
Communication **C4: Managing work processes** **C6: Communication and Collaboration** Are the students able to guide their own work and that of others? Do the students plan effectively? Do the students show clarity in the explanation?			1
Learning Skills **C7: Professional development** Do the students display discernible keenness to tackle the task (initiative, deadline handling)? Is the problem owner involved adequately?			1
Pass total For a pass all items should be sufficient			

Date :

Signature examiner :

Signature examiner :

Minor Project Embedded Control: Project Documentation and Defence
Evaluation and Awarding Marks
Name, first name……
Student number……

	Mark	Motivation	Weight factor
Applying knowledge and understanding C1: Analysing and defining problems C2: Design C3: Testing C5: Conducting Research Does the candidate show sufficient familiarity with current knowledge? Have the central questions been answered? Are the methods and techniques properly used? Does the student show sufficient analytical skills to master the problem at hand?			1
Making judgments C1: Analysing and defining problems C2: Design C3: Testing C5: Conducting Research Has critical appraisal been successfully incorporated? Is the student able to correctly interpret and evaluate the quality?			1
Communication C4: Managing work processes C6: Communication and Collaboration Is the student able to present the results to a problem owner? Is the student able to work in a project team? Is the text clearly understandable and in grammatically sound language? Have the formal requirements for literary sources been met?			1
Learning Skills C7: Professional development Does the student display discernible eagerness to tackle the task? Is the problem owner involved adequately? Does the student show problem solving skills? Is the student self-reliant? Does the student reflect on the choices?			1
Final Mark (group) **For a pass all marks should be sufficient**			

Date :
Signature examiner :
Signature examiner :

Module **AEA MES M HT**	**Hydrogen Technology**
Degree program	Master Engineering Systems
Target Group	Elective module
Coordinating lecturer	Chris Huijboom
Code for OSIRIS	HYDRTE60
Professional Task	Understand, analyse and contribute to technical and societal aspects of hydrogen technology and the interactions.
Professional Products	Project plan (project) Report (project and capita selecta) Presentation (progress and final) Test plan and test report (project) if appropriate
Credits / Study load	15 EC / 420 hours
Relationship with and entry requirements concerning examinations	Applied Control Systems Modelling
General Description	The Module HT focuses on the role hydrogen can play in the energy transition. We will mainly focus on decentralized systems, ranging from electrolysers and fuel cell stacks to internal combustion engines running on hydrogen. System design, integration and control will be important aspects, but also safety and other standards will be addressed. A separate course on safe working with hydrogen is part of the module. Applications will range from static sustainable energy storage to mobile applications in cars, trucks and inland shipping. All main design aspects will be covered, mainly by using model based design techniques. The student will get familiar with analysing and performing technical- and economical calculations on energy systems. Next to that the student will learn how to apply and understand relevant state-of-the art scientific literature. The students will work in a project to apply the knowledge, application skills and insights acquired during the lectures. The student will get the opportunity to perform lab experiments.
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Units of study	Hydrogen Technology Theory (7.5 EC) Hydrogen Technology Capita Selecta (2.5 EC) Hydrogen Technology Project (5 EC)

Unit of Study (UoS) **AEA MES M HT T**	**Hydrogen Technology Theory**
General Information	
Long name of unit of study	Hydrogen Technology Theory
Short name of unit of study	Hydrogen Technology T
Code for unit of study OSIRIS	HYDTET01
Teaching Term	P3A. P4A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	7.5 EC / 210 hours
Study hours (contact hours)	64 contact hours + 6 contact hours exam (2 written exams)
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	The course Hydrogen technology covers the following topics: • Role of hydrogen in the energy transition (Storage (MH, LH2, LOHC) • Applications of hydrogen • Hydrogen systems (engines, combustion, FC, DCDC, heaters, etc.), modelling, Energy management and sizing • Safety course on working with hydrogen • Rules and regulations (Automotive, Stationair) • Hydrogen sources (Electrolysis, Gas reforming, Biological sources) • Aspects of Process technology • Electrochemistry and thermodynamics (Bindingsenthalpie, Catalyse and Elektroliet) • Heat production and use • System durability
Required literature / description of 'learning material'	Fuel Cell Handbook / 7th Edition 2004 Atkins, P. and Jones, L., Chemical Principles: The Quest for Insight, W. H. Freeman. Lecturing materials and hand-outs on Onderwijs Online
Recommended literature	Not applicable
Required software	Matlab Simulink
Cohesion Relationship	Module Systems Modelling, Module Applied Control Hydrogen Technology CS, Hydrogen Technology MP
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Lectures, Self-study, Working on assignments, discussion of literature
Examinations	
Final Qualifications	C1 Analysing and defining problems
Assessment dimensions / learning outcomes	Dimensions of assessment: • Knowledge and understanding (analysing and defining problems), analysis, fundamentals and applications Learning outcomes: The student • has developed knowledge and understanding of the

<table>
<tr><td></td><td colspan="4">fundamentals of hydrogen, its practical applications and its role in the energy transition.
• Is able design on a concept level, able to analyse and suggest improvements on system level for hydrogen based energy systems
• Can apply rules and regulations for system design
• Has practical knowledge on how to work with hydrogen according to safety regulations</td></tr>
<tr><td>Assessment criteria</td><td colspan="4">The student will be assessed on answering the questions:
• Clearly and to the point, including sufficient relevant explanation and depth, comparable with the depth of the literature studied
• Without irrelevant additional information
• Using correct equations and models for the situation</td></tr>
<tr><td colspan="5">Information for each exam and modular exam</td></tr>
<tr><td rowspan="15">Examinations</td><td>Exam name</td><td>MES HT T home taken exam</td><td>MES HT T Written exam 1</td><td>MES HT T Written exam 2</td></tr>
<tr><td>Exam code</td><td>TOETS-03</td><td>TOETS-01</td><td>TOETS-02</td></tr>
<tr><td>Registering and deregistering for exam opportunities</td><td colspan="3">See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”</td></tr>
<tr><td>Exam format</td><td>PROD-O Online / digital product</td><td>KENN-F Knowledge exam on location / written</td><td>KENN-F Knowledge exam on location / written</td></tr>
<tr><td>Exam type</td><td>Hand in</td><td>ANS</td><td>ANS</td></tr>
<tr><td>Exam week</td><td>P4A (week 6)</td><td>P3A (week 9)</td><td>P4A (week 9)</td></tr>
<tr><td>First examiner</td><td colspan="3">Chris Huijboom</td></tr>
<tr><td>Permitted resources</td><td>Everything, but all results must be the student’s own work</td><td colspan="2">Open Book</td></tr>
<tr><td>Number of examiners</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>Assessment</td><td>mark</td><td>mark</td><td>mark</td></tr>
<tr><td>Pass mark</td><td colspan="3">55</td></tr>
<tr><td>Minimal result</td><td>55</td><td>45</td><td>45</td></tr>
<tr><td>Weight</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>Reassessment</td><td>1 (P5A)</td><td>1 (P5A)</td><td>1 (P5A)</td></tr>
<tr><td>Compensation</td><td colspan="3">Yes</td></tr>
<tr><td>Review</td><td>Evaluation form week 4.12</td><td>Review Week 4.4</td><td>Review week 4.12</td></tr>
<tr><td colspan="5">Other information</td></tr>
<tr><td>Required classroom</td><td colspan="4">Regular classroom</td></tr>
</table>

Hydrogen Technology - HTE

Evaluation and Awarding Marks
Name, first name…….
Student number ……

	Mark	Motivation	Weight factor
Knowledge and Understanding: C1 Analysing and defining problems Does the student show sufficient familiarity with current, basic knowledge? Do the results show depth?			1
Applying knowledge and understanding: C1 Analysing and defining problems C2 Design Does the candidate show sufficient familiarity with current knowledge? Are the methods and techniques properly used and described? Is the student able to correctly interpret and evaluate the quality of the results?			1
Mark total			

Date :
Signature examiner :

Unit of Study (UoS) **AEA MES M HT CS**	**Hydrogen Technology Capita Selecta**
General Information	
Long name of unit of study	Hydrogen Technology Capita Selecta
Short name of unit of study	Hydrogen Technology CS
Code for unit of study OSIRIS	HYDTEC01
Teaching Term	P3A
Registering for educational components	Go to Part 3 “Regulations for Education, exams and modular exams OSIRIS” for more information.
Credits/study load	2,5 EC / 70 hours
Study hours (contact hours)	16 contact hours
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	Make a thorough comparative analysis of a peer reviewed scientific paper(s) on innovations in hydrogen technology.
Required literature / description of ‘learning material’	Handouts and papers
Recommended literature	-
Required software	-
Cohesion Relationship	Systems Modelling, Applied Control Hydrogen Technology MP, Hydrogen Technology T
Compulsory participation	Yes
Activities and/or instructional formats	Self-study, discussion of literature. Work Forms: Lectures, Colloquia
Examinations	
Final Qualifications	C5 Conducting Research
Assessment dimensions / learning outcomes	Dimensions of assessment: - Knowledge and understanding (conducting research) - Making judgements (conducting research) - Communication (conducting research) Learning outcome: The student is able to understand scientific literature and presents and discusses the contents with fellow students while providing a relevant context..
Assessment criteria	The student will be assessed on the criteria (questions) mentioned on the evaluation form.
Information for each exam and modular exam	

Examinations	Exam name	MES HT CS Presentation and defence
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	PRES-F Presentation on location
	Exam type	Hand in
	Exam week	P3A (week 9)
	First examiner	Chris Huijboom
	Permitted resources	Everything, but all results must be the student’s own work
	Number of examiners	2
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 P5A (week 4.11/4.12)
	Compensation	No
	Review	Feedback after presentation Evaluation form week 4.4
Other information		
Required classroom	Regular classroom	

Hydrogen Technology Capita Selecta

Evaluation and Awarding Marks
Name, first name……
Topic……

	Mark	Motivation	Weight factor
Knowledge and understanding C5: Conducting Research Student makes a critical analysis of a scientific paper on innovations in powertrains.			1
Making judgments C5: Conducting Research Student identifies the strengths and potential shortcomings of the scientific paper and comes up with a proposal for extending or enhancing the research.			1
Communication C5: Conducting Research Student is able to communicate the outcome of his analysis to a specialist audience (monologue). Student is able to discuss his analysis with a specialist audience.			1
Learning Skills C5: Conducting Research Study in a manner that may be largely self-directed or autonomous.			1
Mark total			

Date :
Signature examiner :
Signature examiner :

Unit of Study (UoS) **M HT MP**	**Hydrogen Technology Minor Project**
General Information	
Long name of unit of study	Hydrogen Technology Minor Project
Short name of unit of study	Hydrogen Technology MP
Code for unit of study OSIRIS	HYDTEM05
Teaching Term	P3A, P4A (Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	5 EC / 140 hours
Study hours (contact hours)	20 contact hours and 4 contact hours presentation
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
Professional task	The professional task consists of: - Design a hydrogen based Energy system, make a model and simulate output - Perform tests on a hydrogen based energy system Determine economic and social, legal viability and safety of hydrogen based energy system(s)
(Professional) products	Project plan, Report and Presentation/Defence
General description	The Project serves to challenge the students to apply their knowledge and skills on a real-life problem, in correspondence with a subset of the final qualifications. The project covers the following topics: • The problem to be solved requires an understanding and active analysis of distinctive disciplines. • The project will always include the step from a real-life problem to a more abstract representation of the problem. Required results are described under the professional product section. The problem analysis will result in a problem solution to be translated in such terms that conclusions can be drawn based on the extent the problem has been solved and objectives fulfilled. Part of the project is the peer review: In a peer review session the contribution of the group members to the project is determined by the group members themselves. The focus is on content and collaboration. Ideally the supervisor (tutor) is also present, but that is not strictly necessary. Students should be aware of their own functioning within the project group, so should arrange peer feedback within their project group regularly (at least twice during the project).
Required literature / description of 'learning material'	Grit. R. (2021). *Project Management, a Practical Approach*. Noordhoff. Elling. R., et. al. (2011). *Report Writing for Readers with Little Time*. Noordhoff.
Recommended literature	-
Required software	MATLAB/Simulink

Cohesion Relationship	Applied Control, Systems Modelling Hydrogen Technology CS, Hydrogen Technology T
Compulsory participation	Yes
Activities and/or instructional formats	Research Work Forms: Assignments, lectures
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Assessment dimensions / learning outcomes	Dimensions of assessment: - Applying knowledge and understanding (Analysing and defining problems, Design, Conducting Research) - Making judgements (Analysing and defining problems, Design, Conducting Research - Communication (managing work processes, communication and collaboration) - Learning skills (professional development) **Learning outcomes (general):** The student presents a clear justification of the project approach. The student plans effectively. The student carries out a project based on a real-life problem in which model development and analysis as well as experimental validation are essential parts by applying knowledge and understanding and making judgements based on analysis and validation techniques. The student structures the working process in the engineering domain and is able to effectively communicate the core findings in a structured and convincing way. The student is able to systematically search for information, such as e.g. models, and judge its relevance. The student communicates the project findings in a clear and structured manner with colleague, customers and the wider public in oral and written forms. The content has been reviewed by peers and/or supervisor. The student reflects on his/her role in the project and on his/her professional development. **Learning outcomes (specific):** The student can critique on and analysis of problems in the field of energy system design, system simulation and testing, feasibility study. The student evaluates energy models and make informed decisions based on scenario information. The student creates a proposal for improvement on an analysed and evaluated energy system or plan a new design for an energy system;

	taking into account use of renewable resources, energy efficiency and environmental sustainability.			
Assessment criteria	The student will be assessed on the criteria mentioned on the evaluation forms. The result of the MP is determined by **3 exams**: **1. Project Plan:** For the Project Plan a pass or no pass will be defined by the examiner. The project plan has to be sufficient before starting the execution of the project. **2. Group Contribution:** For the contribution of the individual student to the group a pass or no pass will be defined by the examiners. The examiners can use the outcome of the peer review, but also can deviate from it. **3. Report and Presentation:** For the Report and Presentation a group mark will be given by the examiners. The individual student mark is equal to the group mark provided that the student's Group Contribution is sufficient (pass). If the Group Contribution of the student is insufficient, no mark will be given and the student is unable to finish the minor project.			
Information for each exam and modular exam				
Examinations	Exam name	MES HT MP Project Plan	MES HT MP Group Contribution	MES HT MP Report and Presentation
	Exam code	TOETS-03	TOETS-01	TOETS-02
	Registering and deregistering for exam opportunities	See, Part 3 "Regulation for Education, exams and modular exams OSIRIS"		
	Exam format	PROD-O Online / digital product	PART-F Participation on location	PRES-F Presentation on location
	Exam type	Hand in		Hand in
	Exam week	P3A (week 9)	P4A (week 10)	P4A (week 9 / 10)
	First examiner	Chris Huijboom		
	Permitted resources	Everything, but all results must be the student's own work		
	Number of examiners	1	at least 1	2
	Assessment	Pass	Pass	Mark
	Pass mark	Pass	Pass	55
	Minimal result	Pass	Pass	55
	Weight	0	0	1
	Reassessment	1 P4A (week 4.3)	-	1 (P5A, week 4.11/4.12)
	Compensation	No	No	No
	Review	Feedback after presentation / Evaluation form in week 3.4 and 4.12		
Other information				
Required classroom	Regular classroom			

Project Hydrogen Technology: Project plan, Evaluation and Awarding Marks

Name, first name……

Topic……

	Pass	Motivation	Weight factor
Applying knowledge and understanding **C1: Analysing and defining problems** **C2: Design** **C5: Conducting Research** Do the candidates show understanding about the topic? Has the problem been clearly defined? Is the background relevant to the problem? Is the project objective clear and correct?			1
Making judgments **C1: Analysing and defining problems** **C2: Design** **C5: Conducting Research** Have the students presented a clear justification for their approach? Have reliable sources been used to come up with an approach? Do the students account for different alternatives before finalizing the approach?			1
Communication **C4: Managing work processes** **C6: Communication and Collaboration** Are the students able to guide their own work and that of others? Do the students plan effectively? Do the students show clarity in the explanation?			1
Learning Skills **C7: Professional development** Do the students display discernible keenness to tackle the task (initiative, deadline handling)? Is the problem owner involved adequately?			1
Pass total For a pass all items should be sufficient			

Date :

Signature examiner :

HAN_UNIVERSITY OF APPLIED SCIENCES

Hydrogen Technology: Report and Presentation
Evaluation and Awarding Marks
Name, first name……
Student number ……
Topic……

	Mark	Motivation	Weight factor
Applying knowledge and understanding C1: Analysing and defining problems C2: Design C3: Testing C5: Conducting Research Does the candidate show sufficient familiarity with current knowledge? Have the central questions been answered? Are the methods and techniques properly used? Does the student show sufficient analytical skills to master the problem at hand?			1
Making judgments C1: Analysing and defining problems C2: Design C3: Testing C5: Conducting Research Has critical appraisal been successfully incorporated? Is the student able to correctly interpret and evaluate the quality?			1
Communication C4: Managing work processes C6: Communication and Collaboration Is the student able to present the results to a problem owner? Is the student able to work in a project team? Is the text clearly understandable and in grammatically sound language? Have the formal requirements for literary sources been met?			1
Learning Skills C7: Professional development Does the student display discernible eagerness to tackle the task? Is the problem owner involved adequately? Does the student show problem solving skills? Is the student self-reliant? Does the student reflect on the choices?			1
Final Mark (group) **For a pass all marks should be sufficient**			

Date : Signature examiner Signature examiner

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Module **AEA MES M IPT**	**Innovation in Powertrains**
Degree program	Master Engineering Systems
Target Group	Elective module
Coordinating lecturer	Aishwarya Aswal
Code for OSIRIS	INNINP60
Professional Task	Understand, analyse and contribute to innovations in electric hybrid and fuel cell powertrains
Professional Products	Minor Project: Project plan, Report, Presentation Theory: Model and report Capita Selecta: Presentation
Credits / Study load	15 EC / 420 hours
Relationship with and entry requirements concerning examinations	Applied Control Systems Modelling
General Description	In this module the student will gain knowledge on analysing innovative powertrains concerning performance, energy efficiency, environmental sustainability, costs or any other relevant aspect. **Theory:** In the theory part the student will gain knowledge of the physics required for analysing powertrains. The working principals of the powertrain, its subsystems and components will be studied. The student will model powertrains using grey box models. Attention will be paid to relevant control aspects of powertrains regarding optimization of energy efficiency in hybrid systems. The student will learn the physical implications of the concept choices made. **Project:** The student will implement the theory learned in a modelling project having the appropriate level of detail and showing the powertrain layout, relations between components and powertrain output. Validation will be done using experimental data.
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Units of study	This module consists of the following 3 units: Innovation in powertrains Theory (7.5 EC) Innovation in powertrains Capita Selecta (2.5 EC) Innovation in powertrains Minor Project (5 EC)

Unit of Study (UoS) **AEA MES M IPT T**	**Innovation in Powertrains Theory**
General Information	
Long name of unit of study	Innovation in Powertrains Theory
Short name of unit of study	Innovation in Powertrains T
Code for unit of study OSIRIS	INNPOT25
Teaching Term	P1A, P2A, P3A, P4A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	7.5 EC / 210 hours
Study hours (contact hours)	64 contact hours + 6 contact hours exam (2 written exams)
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	The course covers the following topics: • The vehicle powertrain as a system • Main powertrain functions • Powertrain subsystems and components • Powertrain modelling and model validation • Optimization of energy efficiency • Analysis on environmental sustainability • Control aspects of powertrains
Required literature / description of 'learning material'	• Mehrdad Ehsani, Yimin Gao, Ali Emadi, *Modern Electric, Hybrid Electric, and Fuel Cell Vehicles*, Third edition, ISBN 9781138330498 • Lecturing materials and hand-outs on OnderwijsOnline
Recommended literature	• Lino Guzzella, Antonio Sciarretta, *Vehicle Propulsion systems*, Third edition, Print ISBN 9783642359125 and online ISBN 9783642359132
Required software	MATLAB/Simulink, Laptop with sufficient internal memory
Cohesion Relationship	Module Systems Modelling, Module Applied Control Innovations in Powertrains CS, Innovations in Powertrains MP
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Lectures, Self-study, Working on assignments
Examinations	
Final Qualifications	C1 Analysing and defining problems
Assessment dimensions / learning outcomes	Dimensions of assessment: - Knowledge and understanding (analysing and defining problems) The student analyses advanced and innovative configurations of a complete vehicle powertrain and is able to make conceptual design choices concerning it. The student uses relevant white box or grey box modelling methods to determine the physical model of a vehicle powertrain. The student understands relevant control aspects of powertrains regarding optimization of energy efficiency. (WE1 and WE2)

<table>
<tr><td></td><td colspan="4">The student is able to analyse a problem in the field of automotive powertrains by using state of the art Computer Aided Engineering (CAE) tools.
The student is able to create an optimized solution for an automotive powertrain. (HTE)</td></tr>
<tr><td>Assessment criteria</td><td colspan="4">The student will be assessed on answering the questions:
• clearly and to the point, including sufficient relevant explanation and depth, comparable with the depth of the literature studied
• without irrelevant additional information
• using correct equations and models for the situation (for example when to use linear or nonlinear models)
• using correct units for quantities in equations, graph labels, etc.
M IPT WE1 and WE2: The WarmUp Test result given by the lecturer during the lecturing of the theory determines 20% of the score of the written (re-) exams. For re-exams the WarmUp Test result of the previous attempt no longer counts.’</td></tr>
<tr><td colspan="5">Information for each exam and modular exam</td></tr>
<tr><td rowspan="15">Examinations</td><td>Exam name</td><td>MES IPT T home taken exam</td><td>MES IPT T Written exam 1</td><td>MES IPT T Written exam 2</td></tr>
<tr><td>Exam code</td><td>TOETS-01</td><td>TOETS-02</td><td>TOETS-03</td></tr>
<tr><td>Registering and deregistering for exam opportunities</td><td colspan="3">See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”</td></tr>
<tr><td>Exam format</td><td>PROD-O Online / digital product</td><td>KENN-F Knowledge exam on location / written</td><td>KENN-F Knowledge exam on location / written</td></tr>
<tr><td>Exam type</td><td>Hand in</td><td>ANS</td><td>ANS</td></tr>
<tr><td>Exam week</td><td>P2A, P4A (week 7)</td><td>P1A, P3A (week 9)</td><td>P2A, P4A (week 9)</td></tr>
<tr><td>First examiner</td><td colspan="3">Ad Oomen, Thymen Kamerling</td></tr>
<tr><td>Permitted resources</td><td>Everything, but all results must be the student’s own work</td><td>Open book</td><td>Open book</td></tr>
<tr><td>Number of examiners</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>Assessment</td><td>Mark</td><td>mark</td><td>mark</td></tr>
<tr><td>Pass mark</td><td colspan="3">55</td></tr>
<tr><td>Minimal result</td><td>45</td><td>45</td><td>45</td></tr>
<tr><td>Weight</td><td>1</td><td>2</td><td>2</td></tr>
<tr><td>Reassessment</td><td>1 (P5A)</td><td>1 (P5A)</td><td>1 (P5A)</td></tr>
<tr><td>Compensation</td><td colspan="3">Yes</td></tr>
<tr><td>Review</td><td>Evaluation form week 3.4 / 4.12</td><td>Review Week 2.4 / 4.4</td><td>Review week 3.4 / 4.12</td></tr>
<tr><td colspan="5">Other information</td></tr>
<tr><td>Required classroom</td><td colspan="4">Regular classroom</td></tr>
</table>

Innovation in powertrains - HTE

Evaluation and Awarding Marks
Name, first name……
Student number ……

	Mark	Motivation	Weight factor
Knowledge and Understanding : C1 Analysing and defining problems Does the student show sufficient familiarity with current, basic knowledge? Do the results show depth?			1
Applying knowledge and understanding: C1 Analysing and defining problems C2 Design Does the candidate show sufficient familiarity with current knowledge? Are the methods and techniques properly used and described? Is the student able to correctly interpret and evaluate the quality of the results?			1
Mark total			

Date :
Signature examiner :

Unit of Study (UoS) **AEA MES M IPT CS**	**Innovation in Powertrains Capita Selecta**
General Information	
Long name of unit of study	Innovations in Powertrains Capita Selecta
Short name of unit of study	Innovations in Powertrains CS
Code for unit of study OSIRIS	INNPOC01
Teaching Term	P1A, P2A, P3A, P4A (Semester 1 / Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2,5 EC / 70 hours
Study hours (contact hours)	16 contact hours
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	Make a thorough comparative analysis of a peer reviewed scientific paper(s) on innovations in drive lines.
Required literature / description of 'learning material'	-
Recommended literature	-
Required software	-
Cohesion Relationship	Module Applied Control, Module Systems Modelling Innovations in Powertrains T, Innovations in Powertrains MP
Compulsory participation	Yes
Activities and/or instructional formats	Self-study, Instruction on demand, reporting, presenting
Examinations	
Final Qualifications	C5 Conducting Research
Assessment dimensions / learning outcomes	Dimensions of assessment: - Knowledge and understanding (conducting research) - Making judgements (conducting research) - Communication (conducting research) The student is able to analyse a scientific paper on innovations in powertrains and to identify its strengths and potential shortcomings. The student is able to formulate a proposal for extending or enhancing the analysed scientific research. The student understands the role of powertrain innovations and developments in the perspective of the modern, evolving society.
Assessment criteria	The student will be assessed on the criteria (questions) mentioned on the evaluation form.

Information for each exam and modular exam		
Examinations	Exam name	MES IPT CS Presentation
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	PRES-F Presentation on location
	Exam type	Hand in
	Exam week	P2A, P4A (week 1)
	First examiner	Ad Oomen, Thymen Kamerling
	Permitted resources	Everything, but all results must be the student’s own work
	Number of examiners	2
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P5A, week 4.11/4.12)
	Compensation	No
	Review	Feedback after presentation Evaluation form week 2.4/ 4.4
Other information		
Required classroom	Regular classroom	

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Innovation in powertrains - Capita Selecta

Evaluation and Awarding Marks
Name, first name……
Student number ……

	Mark	Motivation	Weight factor
Knowledge and understanding C5: Conducting Research Student makes a critical analysis of a scientific paper on innovations in powertrains.			1
Making judgments C5: Conducting Research Student identifies the strengths and potential shortcomings of the scientific paper and comes up with a proposal for extending or enhancing the research.			1
Communication C5: Conducting Research Student is able to communicate the outcome of his analysis to a specialist audience (monologue). Student is able to discuss his analysis with a specialist audience.			1
Mark total			

Date :
Signature examiner 1 :
Signature examiner 2 :

Unit of Study (UoS) **AEA MES M IPT MP**	**Innovation in Powertrains Minor Project**
General Information	
Long name of unit of study	Innovation in Powertrains Minor Project
Short name of unit of study	Innovation in Powertrains MP
Code for unit of study OSIRIS	INNPOM01
Teaching Term	P1A, P2A, P3A, P4A (Semester 1/ Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	5 EC / 140 hours
Study hours (contact hours)	20 contact hours and 4 contact hours presentation
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
Professional task	Conducting literature research Modelling and validation
(Professional) products	Project plan Model Report Presentation
General description	The students have to carry out an assignment of which model development and analysis as well as experimental validation are essential parts. The Project serves to challenge the students to apply their knowledge and skills on a real-life problem, in correspondence with a subset of the final qualifications and the course discusses the skills needed to perform a research project and includes performing a literature study. Part of the project is the peer review: In a peer review session the contribution of the group members to the project is determined by the group members themselves. The focus is on content and collaboration. Ideally the supervisor (tutor) is also present, but that is not strictly necessary. Students should be aware of their own functioning within the project group, so should arrange peer feedback within their project group regularly (at least twice during the project).
Required literature / description of 'learning material'	Grit. R. (2021). *Project Management, a Practical Approach*. Noordhoff. Elling. R., et. al. (2011). *Report Writing for Readers with Little Time*. Noordhoff.
Recommended literature	-
Required software	MATLAB/Simulink, AMESim can be used as secondary tool on requirement basis.
Cohesion Relationship	Applied Control, Systems Modelling Innovations in Powertrains CS, Innovations in Powertrains T
Compulsory participation	Yes
Activities and/or instructional formats	Research Work Forms: Assignment
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design

	C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Assessment dimensions / learning outcomes	Dimensions of assessment - Applying knowledge and understanding (analysing and defining problems, design, conducting research) - Making judgements (analysing and defining problems, Design, Conducting Research - Communication (managing work processes, communication and collaboration) - Learning skills (professional development) Learning outcomes: The student presents a clear justification of the project approach. The student plans effectively. The student carries out a project based on a real-life problem in which model development and analysis as well as experimental validation are essential parts by applying knowledge and understanding and making judgements based on analysis and validation techniques. The student structures the working process in the engineering domain and is able to effectively communicate the core findings in a structured and convincing way. The student is able to systematically search for information, such as e.g. models, and judge its relevance. The student communicates the project findings in a clear and structured manner with colleague, customers and the wider public in oral and written forms. The content has been reviewed by peers and/or supervisor. The student reflects on his/her role in the project and on his/her professional development. The student is able to analyse a real life problem concerning powertrains. The student is able to create a model for a powertrain problem and to perform a relevant analysis. The student is able to validate modelling results against the real-life situation and problem definition. The student is able to formulate a proposal for improvement of a powertrain problem and is able to make an assessment of its viability taking into account energy efficiency and environmental sustainability using proper techniques like prototyping, modelling or analysis.

<table>
<tr><td>Assessment criteria</td><td colspan="4">The student will be assessed on the criteria mentioned on the evaluation forms. The result of the MP is determined by 3 exams:
7. Project Plan:
For the Project Plan a pass or no pass will be defined by the examiner. The project plan has to be sufficient before starting the execution of the project.

8. Group Contribution:
For the contribution of the individual student to the group a pass or no pass will be defined by the examiners. The examiners can use the outcome of the peer review, but also can deviate from it.

9. Report and Presentation:
For the Report and Presentation a group mark will be given by the examiners. The individual student mark is equal to the group mark provided that the student’s Group Contribution is sufficient (pass). If the Group Contribution of the student is insufficient, no mark will be given and the student is unable to finish the minor project.</td></tr>
<tr><td colspan="5">Information for each exam and modular exam</td></tr>
<tr><td rowspan="15">Examinations</td><td>Exam name</td><td>MES IPT MP Project Plan</td><td>MES IPT MP Group Contribution</td><td>MES IPT MP Documentation and defence</td></tr>
<tr><td>Exam code</td><td>TOETS-03</td><td>TOETS-01</td><td>TOETS-02</td></tr>
<tr><td>Registering and deregistering for exam opportunities</td><td colspan="3">See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”</td></tr>
<tr><td>Exam format</td><td>PROD-O Online / digital product</td><td>PART-F Participation on location</td><td>PRES-F Presentation on location</td></tr>
<tr><td>Exam type</td><td>Hand in</td><td></td><td>Hand in</td></tr>
<tr><td>Exam week</td><td>P1A / P3A (week 9)</td><td>P2A / P4A (week 10)</td><td>P2A / P4A (week 9 / 10)</td></tr>
<tr><td>First examiner</td><td colspan="3">Ad Oomen, Aishwarya Aswal</td></tr>
<tr><td>Permitted resources</td><td colspan="3">Everything, but all results must be the student’s own work</td></tr>
<tr><td>Number of examiners</td><td>1</td><td>At least 1</td><td>2</td></tr>
<tr><td>Assessment</td><td>Pass</td><td>Pass</td><td>Mark</td></tr>
<tr><td>Pass mark</td><td>Pass</td><td>Pass</td><td>55</td></tr>
<tr><td>Minimal result</td><td>Pass</td><td>Pass</td><td>55</td></tr>
<tr><td>Weight</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Reassessment</td><td>1 P2A/P4A (week 2.4 / 4.4)</td><td>-</td><td>1 (P5A, week 4.11/4.12)</td></tr>
<tr><td>Compensation</td><td>No</td><td>No</td><td>No</td></tr>
<tr><td>Review</td><td colspan="3">Feedback after presentation / Evaluation form in week 3.4 and 4.12</td></tr>
<tr><td colspan="5">Other information</td></tr>
<tr><td>Required classroom</td><td colspan="4">Regular classroom</td></tr>
</table>

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Minor Project Innovations in Powertrains: Project plan
Evaluation and Awarding Marks
Name, first name……
Topic……

	Pass	Motivation	Weight factor
Applying knowledge and understanding **C1: Analysing and defining problems** **C2: Design** **C5: Conducting Research** Do the candidates show understanding about the topic? Has the problem been clearly defined? Is the background relevant to the problem? Is the project objective clear and correct?			1
Making judgments **C1: Analysing and defining problems** **C2: Design** **C5: Conducting Research** Have the students presented a clear justification for their approach? Have reliable sources been used to come up with an approach? Do the students account for different alternatives before finalizing the approach?			1
Communication **C4: Managing work processes** **C6: Communication and Collaboration** Are the students able to guide their own work and that of others? Do the students plan effectively? Do the students show clarity in the explanation?			1
Learning Skills **C7: Professional development** Do the students display discernible keenness to tackle the task (initiative, deadline handling)? Is the problem owner involved adequately?			1
Pass total For a pass all items should be sufficient			

Date :
Signature examiner :
Signature examiner :

HAN_UNIVERSITY OF APPLIED SCIENCES

Innovation in powertrains - Minor Project: Project Documentation and defence
Evaluation and Awarding Marks
Name, first name……
Student number……

	Mark	Motivation	Weight factor
Applying knowledge and understanding C1: Analysing and defining problems C2: Design C3: Testing C5: Conducting Research Does the candidate show sufficient familiarity with current knowledge? Have the central questions been answered? Are the methods and techniques properly used? Does the student show sufficient analytical skills to master the problem at hand?			1
Making judgments C1: Analysing and defining problems C2: Design C3: Testing C5: Conducting Research Has critical appraisal been successfully incorporated? Is the student able to correctly interpret and evaluate the quality?			1
Communication C4: Managing work processes C6: Communication and Collaboration Is the student able to present the results to a problem owner? Is the student able to work in a project team? Is the text clearly understandable and in grammatically sound language? Have the formal requirements for literary sources been met?			1
Learning Skills C7: Professional development Does the student display discernible eagerness to tackle the task? Is the problem owner involved adequately? Does the student show problem solving skills? Is the student self-reliant? Does the student reflect on the choices?			1
Final Mark (group) **For a pass all marks should be sufficient**			

Date :
Signature examiner:
Signature examiner:

Module **AEA MES M IM**	**Intelligent Mobility**
Degree program	Master Engineering Systems
Target Group	Elective module
Coordinating lecturer	Marith Dieker
Code for OSIRIS	EAMDIM01
Professional Task	Analysis and design of: - automated driving systems, cooperative driving and intelligent infrastructure systems, and driver support systems and taking into account: - legal issues, political and governance issues, environmental issues, safety issues and traffic flow issues Within the context of smart mobility innovations
Professional Products	Project plan, (final) report, model + data, presentations, research article
Credits / Study load	15 EC / 420 hours
Relationship with and entry requirements concerning examinations	Applied Control & Systems Modelling
General Description	The module focuses on the following topics: • Automated vehicle technologies, with a discussion of recent developments, including topics like intelligent merging, ACC/stop and go, chain stability , object recognition (traffic signs, passing pedestrians,..) and classification, collision warning and avoidance, etc. • ADAS systems, especially focusing on the increasing amount of support systems inside the cabin, and its impact on driver attention, safety, legal issues etc. • Local area and global area mobile communication • Environmental perception by intelligent vehicles • Supporting infrastructure systems • General (Social, historic) perspective and relevance of evolving mobility needs • Intelligent logistics and chain management • Special examples of Automated Guided Vehicles, cyber cars and people movers.
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Units of study	Intelligent Mobility Theory (7.5 EC) Intelligent Mobility Capita Selecta (2.5 EC) Intelligent Mobility Minor Project (5.0 EC)

Unit of Study (UoS) **AEA MES M IM T**	**Intelligent Mobility Theory**
General Information	
Long name of unit of study	Intelligent Mobility Theory
Short name of unit of study	Intelligent Mobility T
Code for unit of study OSIRIS	EAIMTH01
Teaching Term	P1A, P2A, P3A, P4A (Semester 1/ Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	7.5 EC / 210 hours
Study hours (contact hours)	64 contact hours
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	In lectures the topics from the general description are discussed to understand the topic and its relation to the environment of networked vehicles. The students will deepen the theory of Intelligent Mobility and extend their knowledge with relevant, actual topics by conducting a literature review based on scientific papers and other primary sources. With the critical review the student shows the ability to analyse and evaluate today's and yesterday's problems and conduct research on the implementation of new technologies for connected and automated transport, keeping in mind their various capabilities, vehicle types, performance, functional design, security and privacy concerns, as well as the interplay between the vehicle and its human users.
Required literature / description of 'learning material'	Lecturing material (readers, papers and handouts) will be made available on Onderwijs Online
Recommended literature	-
Required software	-
Cohesion Relationship	Module Applied Control, Module Systems Modelling Intelligent Mobility CS, Intelligent Mobility MP
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Self-study, Working on assignments, Case study Work Forms: Lectures and interactive discussions, interactive exercises, reporting
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design C5 Conducting research
Assessments dimensions / learning outcomes	Dimensions of assessment: - Knowledge and understanding (analysing and defining problems) - Applying knowledge and understanding (Conducting Research) - Making judgements (Design) Learning outcome: The student is able to analyse, synthesize and evaluate (article + oral exam):

<table>
<tr><td></td><td colspan="3">• Vehicle technology and control
• AI and Deep learning
• Governance and Procurement
• Societal and behavioural impact</td></tr>
<tr><td>Assessment criteria</td><td colspan="3">The student will be assessed on answering the questions:
• Clearly and to the point, including sufficient relevant explanation and depth, comparable with the depth of the literature studied;
• Without irrelevant additional information;
• Using correct equations, models and graphs, including labels and units, for the situation (for example when to use linear or nonlinear models).
The student will be assessed on the criteria (questions) mentioned on the evaluation form. Furthermore, the paper will primarily be assessed on its:
• Clarity, for teaching staff as well as for other classmates;
• Depth, showing and illustrating the complexity of the topic;
• Critical thinking, showing and illustrating the student's critical view on the reviewed papers and other primary sources.

In case of a re-exam: students cannot do a re-exam of one category (paper or oral) , only a full re-exam is possible (paper + Oral exam)</td></tr>
<tr><td colspan="4">Information for each exam and modular exam</td></tr>
<tr><td rowspan="15">Examinations</td><td>Exam name</td><td>MES IM T Report</td><td>MES IM T oral Exam</td></tr>
<tr><td>Exam code</td><td>TOETS-01</td><td>TOETS-02</td></tr>
<tr><td>Registering and deregistering for exam opportunities</td><td colspan="2">See, Part 3 "Regulation for Education, exams and modular exams OSIRIS"</td></tr>
<tr><td>Exam format</td><td>PROD-O
Online digital product</td><td>KENN-M
Oral knowledge exam</td></tr>
<tr><td>Exam type</td><td>Hand in</td><td>Hand in</td></tr>
<tr><td>Exam week</td><td>P2A, P4A (week 7)</td><td>P2A, P4A (week 9)</td></tr>
<tr><td>First examiner</td><td colspan="2">Marith Dieker</td></tr>
<tr><td>Permitted resources</td><td colspan="2">Everything, but all results must be the student's own work</td></tr>
<tr><td>Number of examiners</td><td>1</td><td>2</td></tr>
<tr><td>Assessment</td><td>pass</td><td>mark</td></tr>
<tr><td>Pass mark</td><td colspan="2">55</td></tr>
<tr><td>Minimal result</td><td>pass</td><td>45</td></tr>
<tr><td>Weight</td><td>0</td><td>1</td></tr>
<tr><td>Reassessment</td><td>1 (P5A)</td><td>1 (P5A)</td></tr>
<tr><td>Compensation</td><td colspan="2">Yes</td></tr>
<tr><td>Review</td><td colspan="2">Evaluation form in week 3.2 / 4.12</td></tr>
<tr><td colspan="4">Other information</td></tr>
<tr><td>Required classroom</td><td colspan="3">Regular classroom</td></tr>
</table>

HAN_UNIVERSITY OF APPLIED SCIENCES

Intelligent Mobility T paper
Evaluation and Awarding Marks
Name, first name……

	Pass / no pass (= sufficient/ not sufficient)	**Motivation** **Only in case of no pass**
Is the documentation structured according to the assignment?		
Knowledge and understanding ***C1 Analysing and defining problems***: Goes the content in-depth on issues with the item discussed as per the questions in the article instructions (showing the level of understanding of the topic by the author)?		
Applying knowledge and understanding ***C5 Conducting research***: *Does the text indicate clearly that the research activities will lead methodically to the answering of the main research question?*		
Applying knowledge and understanding ***C5 Conducting research***: *Does the text show a methodical approach and are methods and techniques chosen expertly?*		
Making judgements ***C2 Design:*** Does the paper contain an original point of view or sharp analysis?		
Pass / no pass **For a pass all items should be sufficient**	**Pass / no pass**	

Date : Signature examiner :

HAN_UNIVERSITY OF APPLIED SCIENCES

Intelligent Mobility T (oral part)

Evaluation and Awarding Marks
Name, first name…….

MES SV oral part exam dimensions of assessment:

- Dublin descriptor: Knowledge and understanding
- Competence (final qualification): Analysing and defining problems
  Design
  Conducting research

Topics	Assessment

Mark: Date:

Examiner 1 name: Signature:

Examiner 2 name: Signature:

Unit of Study (UoS) **AEA MES M IM CS**	**Intelligent Mobility Capita Selecta**
General Information	
Long name of unit of study	Intelligent Mobility Capita Selecta
Short name of unit of study	Intelligent Mobility CS
Code for unit of study OSIRIS	EAIMCS01
Teaching Term	P1A, P2A, P3A, P4A (Semester 1 / Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2.5 EC / 70 hours
Study hours (contact hours)	12 contact hours
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	The students will deepen the theory of Intelligent Mobility and extend their knowledge with relevant, state of the art topics by conducting and writing a literature review article/report based on scientific papers which can also be used in the Minor Project. Students will work together in selecting the topic of their CS paper as preparation part of the minor project. Part of the CS is the mandatory peer review: In a (scheduled) peer review session the quality of the report is reviewed by other Intelligent Mobility students (peers). Presenting the results of their CS literature review before the CS report submission date is also part of the Capita Selecta final grade.
Required literature / description of 'learning material'	To be decided during class, depending on the subject.
Recommended literature	To be decided during class, depending on the subject.
Required software	-
Cohesion Relationship	Module Applied Control, Module Systems Modelling Intelligent Mobility T, Intelligent Mobility MP
Compulsory participation	Yes
Activities and instructional formats	Self-study, case studies Work forms: Lectures, interactive exercises, peer-review, reporting and presenting
Examinations	
Final Qualifications	C5 Conducting research
Assessment dimensions / Learning outcomes	Dimensions of assessment: • Applying knowledge and understanding (Conducting research) • Making judgements (Conducting research) • Communication (Clear reports, presentations and presenting) Learning outcomes: The student evaluates intelligent mobility technologies and writes a literature review article/report about developments in intelligent

<table>
<tr><td></td><td colspan="3">mobility technology. The report has a summary, introduction, a main text that includes discussion, a conclusion, and references.
The student specifies references according to a reference manual (APA or IEEE). The student determines the validity of referenced resources.
The student reviews the article/report of peers (IM students).</td></tr>
<tr><td>Assessment criteria</td><td colspan="3">The student will be assessed on the criteria (questions) mentioned on the evaluation form (next page). Furthermore, the paper will primarily be assessed on its:
• Clarity, for teaching staff as well as for other classmates
• Depth, showing and illustrating the complexity of the topic
• Critical thinking, showing and illustrating the student's critical view on the reviewed papers
• Presentation of results
• Attending and participating in the peer review class</td></tr>
<tr><td colspan="4">Information for each exam and modular exam</td></tr>
<tr><td rowspan="15">Examinations</td><td>Exam name</td><td>MES IM CS Peer Review</td><td>MES IM CS Article</td></tr>
<tr><td>Exam code</td><td>TOETS-01</td><td>TOETS-02</td></tr>
<tr><td>Registering for re-exam OSIRIS</td><td colspan="2">See, Part 3 "Regulation for Education, exams and modular exams OSIRIS"</td></tr>
<tr><td>Exam format</td><td>PROD-O
Online digital product</td><td>PROD-O
Online digital product</td></tr>
<tr><td>Exam type</td><td>Hand in</td><td>Hand in</td></tr>
<tr><td>Exam week</td><td colspan="2">P2A, P4A (week 6)</td></tr>
<tr><td>First examiner</td><td colspan="2">Marith Dieker</td></tr>
<tr><td>Permitted resources</td><td colspan="2">Everything, but all results must be the student's own work</td></tr>
<tr><td>Number of examiners</td><td colspan="2">1</td></tr>
<tr><td>Assessment</td><td>pass</td><td>mark</td></tr>
<tr><td>Pass mark</td><td>pass</td><td>55</td></tr>
<tr><td>Minimal result</td><td>pass</td><td>55</td></tr>
<tr><td>Weight</td><td>0</td><td>1</td></tr>
<tr><td>Reassessment</td><td colspan="2">1 (P5A, week 4.11 / 4.12)</td></tr>
<tr><td>Compensation</td><td colspan="2">No</td></tr>
<tr><td>Review</td><td colspan="2">Evaluation form in week 2.10 / 4.10</td></tr>
<tr><td colspan="4">Other information</td></tr>
<tr><td>Required classroom</td><td colspan="3">Regular classroom</td></tr>
</table>

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Intelligent Mobility: Capita Selecta, Evaluation and Awarding Marks
Name, first name, student number……
Topic……

	Mark	Motivation	Weight factor
The summary **C6: Communication and Collaboration** Does the summary describe the essence of the article and does the summary advertise further reading of the article?			1
The main text **C5: Conducting research** **C6: Communication and Collaboration** Introduction: contains problem description, hypothesis/research questions that you evaluate in the article and the structure of your story. Are the reasons for choosing this specific subject clarified in the article?			1
Methodology used and research undertaken **C5: Conducting research** **C6: Communication and Collaboration** Are design/research/development questions elaborated logically? Is the article structured logically? Are the results of the study presented in an complete. concise, clear and correct way? Are the reasoning and the results based on literature from the professional domain? Is the difference between fact and opinion sufficiently clear?			1
Discussion and conclusion **C5: Conducting research** **C6: Communication and Collaboration** *about the discussion*: Does the author return to the aim of the research? Does the author reflect critically on his/her own work? *about the conclusion:* Do the conclusions provide the answer to the research questions in the introduction? Do the conclusions result from the described theory and the elaborated experiments?			1
References **C6: Communication and Collaboration** Have the formal requirements for literary sources been met?			1
Mark total			

Date : Signature examiner :

Unit of Study (UoS) **M IM MP**	**Intelligent Mobility Minor Project**
General Information	
Long name of unit of study	Intelligent Mobility Minor Project
Short name of unit of study	Intelligent Mobility MP
Code for unit of study OSIRIS	EAIMMP01
Teaching Term	P1A, P2A, P3A, P4A (Semester 1/ Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	5 EC / 140 hours
Study hours (contact hours)	64 contact hours and 4 contact hours presentation
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
Professional task	Model a problem on a functional level, model the technical solution on a functional and profound level and evaluate the impact on human behaviour, people, security, privacy and functional design.
Professional products	Model, report and presentation
General description	The students have to carry out an assignment, including a literature survey, of which model development and analysis as well as experimental validation are essential parts. The Project serves to challenge the students to apply their knowledge and skills on a real-life problem, in correspondence with a subset of the final qualifications. In a practical assignment, students are stimulated to work together on a real-life intelligent mobility case, e.g.: • Introduction of new sensors on cars and buses • Introduction of automated logistics • Introduction of AI and deep learning technologies • Introduction of retro-fit ADAS on existing cars Students are challenged to model the problem on a functional level, model the technical solution on a functional and profound level and evaluate the impact on human behaviour, people, security, privacy and functional design. Throughout the semester multiple progress meetings will take place. During these meetings the MP-groups will update the project owner, as well as their fellow peers about the MP progress. Part of the project is the peer review: In a peer review session the contribution of the group members to the project is determined by the group members themselves. The focus is on content and collaboration. Ideally the supervisor (tutor) is also present, but that is not strictly necessary. Students should be aware of their own functioning within the project group, so should arrange peer feedback within their project group regularly (at least twice during the project).
Required literature / description of 'learning material'	Grit. R. (2021). *Project Management, a Practical Approach*. Noordhoff. Elling. R., et. al. (2011). *Report Writing for Readers with Little Time*. Noordhoff.

Recommended literature	-
Required Software	MATLAB Simulink, Phyton, Olimexino, Jetson and other materials that may be relevant for the project
Cohesion Relationship	Module Applied Control, Module Systems Modelling Intelligent Mobility T, Intelligent Mobility CS
Compulsory participation	Yes
Activities and instructional formats	Research Work Forms: monitored group work, assignment
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Assessment dimensions / learning outcomes	Dimensions of assessment: • Applying knowledge and understanding (analysing and defining problems, design, testing, conducting research) • Making judgements (analysing and defining problems, design, conducting research) • Communication (managing work processes, collaboration and communication) • Learning skills (professional development) Learning outcomes: The student presents a clear justification of the project approach. The student plans effectively. The student carries out a project based on a real-life problem in which model development and analysis as well as experimental validation are essential parts by applying knowledge and understanding and making judgements based on analysis and validation techniques. The student structures the working process in the engineering domain and is able to effectively communicate the core findings in a structured and convincing way. The student is able to systematically search for information, such as e.g. models, and judge its relevance. The student communicates the project findings in a clear and structured manner with colleague, customers and the wider public in oral and written forms. The content has been reviewed by peers and/or supervisor. The student reflects on his/her role in the project and on his/her professional development. The student designs and implements future intelligent mobility technology.

<table>
<tr><td>Assessment criteria</td><td colspan="4">The student will be assessed on the criteria mentioned on the evaluation forms. The result of the MP is determined by 3 exams:
4. Project Plan:
For the Project Plan a pass or no pass will be defined by the examiner. The project plan has to be sufficient before starting the execution of the project.
5. Group Contribution:
For the contribution of the individual student to the group a pass or no pass will be defined by the examiners. The examiners can use the outcome of the peer review, but also can deviate from it.
6. Report and Presentation:
For the Report and Presentation a group mark will be given by the examiners. The individual student mark is equal to the group mark provided that the student’s Group Contribution is sufficient (pass). If the Group Contribution of the student is insufficient, no mark will be given and the student is unable to finish the minor project.</td></tr>
<tr><td colspan="5">Information for each exam and modular exam</td></tr>
<tr><td rowspan="15">Examinations</td><td>Exam name</td><td>IM MP Project plan</td><td>IM MP Group contribution</td><td>IM MP Report & Presentation</td></tr>
<tr><td>Exam code</td><td>TOETS-01</td><td>TOETS-02</td><td>TOETS-03</td></tr>
<tr><td>Registering and deregistering for exam opportunities</td><td colspan="3">See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”</td></tr>
<tr><td>Exam format</td><td>PROD-O Online / digital product</td><td>PART-F Participation on location</td><td>PRES-F Presentation on location</td></tr>
<tr><td>Exam type</td><td>Hand in</td><td></td><td>Hand in</td></tr>
<tr><td>Exam week</td><td>P1A / P3A (week 9)</td><td>P2A / P4A (week 10)</td><td>P2A / P4A (week 9 / 10)</td></tr>
<tr><td>First examiner</td><td colspan="3">Marith Dieker</td></tr>
<tr><td>Permitted resources</td><td colspan="3">Everything, but all results must be the student’s own work</td></tr>
<tr><td>Number of examiners</td><td>1</td><td>At least 1</td><td>2</td></tr>
<tr><td>Assessment</td><td>Pass</td><td>Pass</td><td>Mark</td></tr>
<tr><td>Pass mark</td><td>Pass</td><td>Pass</td><td>55</td></tr>
<tr><td>Minimal result</td><td>Pass</td><td>Pass</td><td>55</td></tr>
<tr><td>Weight</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Reassessment</td><td>1 (P2A/P4A week 2.4 / 4.4)</td><td>-</td><td>1 (P5A, week 4.11/4.12)</td></tr>
<tr><td>Compensation</td><td>No</td><td>No</td><td>No</td></tr>
<tr><td>Review</td><td colspan="3">Feedback after presentation / Evaluation form in week 3.4 and 4.12</td></tr>
<tr><td colspan="5">Other information</td></tr>
<tr><td>Required classroom</td><td colspan="4">Regular classroom</td></tr>
</table>

HAN_UNIVERSITY OF APPLIED SCIENCES

Intelligent Mobility - Project Plan, Evaluation and Awarding Marks

Name, first name……

Student number……

	Mark	Motivation	Weight factor
Applying knowledge and understanding C1: Analysing and defining problems C2: Design C5: Conducting Research Do the candidates show understanding about the topic? Has the problem been clearly defined? Is the background relevant to the problem? Is the project objective clear and correct?			1
Making judgments C1: Analysing and defining problems C2: Design C5: Conducting Research Have the students presented a clear justification for their approach? Have reliable sources been used to come up with an approach? Do the students account for different alternatives before finalizing the approach?			1
Communication C4: Managing work processes C6: Communication and Collaboration Are the students able to guide their own work and that of others? Do the students plan effectively? Do the students show clarity in the explanation?			1
Learning Skills C7: Professional development Do the students display discernible keenness to tackle the task (initiative, deadline handling)? Is the problem owner involved adequately?			1
Final Mark (group) **For a pass all marks should be sufficient**			

Date: Signature examiner 1:

HAN_UNIVERSITY OF APPLIED SCIENCES

Intelligent Mobility – Project Report and Presentation, Evaluation and Awarding Marks

Name, first name……

Student number……

	Mark	Motivation	Weight factor
Applying knowledge and understanding C1: Analysing and defining problems C2: Design C3: Testing C5: Conducting Research Does the candidate show sufficient familiarity with current knowledge? Have the central questions been answered? Are the methods and techniques properly used? Does the student show sufficient analytical skills to master the problem at hand?			1
Making judgments C1: Analysing and defining problems C2: Design C3: Testing C5: Conducting Research Has critical appraisal been successfully incorporated? Is the student able to correctly interpret and evaluate the quality?			1
Communication C4: Managing work processes C6: Communication and Collaboration Is the student able to present the results to a problem owner? Is the student able to work in a project team? Is the text clearly understandable and in grammatically sound language? Have the formal requirements for literary sources been met? Are the results presented in a professional manner?			1
Learning Skills C7: Professional development Does the student display discernible eagerness to tackle the task? Is the problem owner involved adequately? Does the student show problem solving skills? Is the student self-reliant? Does the student reflect on the choices?			1
Final Mark (group) **For a pass all marks should be sufficient**			

Date: Signature examiner 1: Signature examiner 2:

Module **AEA MES M SPS**	**Smart Power Supply**
Degree program	Master Engineering Systems
Target Group	Elective module
Coordinating lecturer	Ballard Asare-Bediako
Code for OSIRIS	SMAPOS60
Professional Task	Understand, apply and analyse aspects related to power supply and grid stability in a changing energy system, create and evaluate power supply models
Professional Products	Models
Credits / Study load	15 EC / 420 hours
Relationship with and entry requirements concerning examinations	Applied Control Systems Modelling Sustainable Energy Systems
General Description	In this module the student learns to understand aspects of the energy supply system (generation, transmission and distribution systems), which is changing towards a complex system with centralized and localized sustainable energy production. Students will understand and be able to apply fundamentals of power supply: • Basics of the current energy grid, power supply and assets • Understand consequences of the energy transition for electrical grid stability • Understand the concept of interchangeability of power and heat/gas as energy • Select and apply optimization algorithms for energy management • Model and simulate power control (systems) • Analyse, interpret and mitigate power quality problems • Analyse and design asset management of power system Apply knowledge to expected and existing energy grid problems
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Units of study	Energy Management (2.5 EC) Power Control (2.5 EC) Power Quality (2.5 EC) Asset Management(2.5 EC) Minor Project (5 EC)

Unit of Study (UoS) **AEA MES M SPS EM**	**Energy Management**
General Information	
Long name of unit of study	Energy Management
Short name of unit of study	Energy Management
Code for unit of study OSIRIS	ENERMA02
Teaching Term	P4A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2.5 EC / 70 hours
Study hours (contact hours)	16 contact hours
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	This course covers the following topics: - Power systems structure (physical, economic and regulatory layers) - Energy optimization: methods, constraints, boundaries, etc. - Economic dispatch and unit commitment application to the power systems. - Smart Grids: Balancing throughout the power system value chain - Grid Evolution & Cyber security
Required literature / description of 'learning material'	Lecture notes (to be distributed during the lectures) and scientific papers
Recommended literature	Antonio J. Conejo; Luis Baringo, Power System Operations, Springer, ISBN:978-3-319-69406-1, 978-3-319-69407-8
Required software	Matlab, Excel, Vision Network Analysis
Cohesion Relationship	Systems Modelling, Applied Control, Sustainable Energy Systems Smart Power Supply CS, Smart Power Supply MP
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Lectures, (company) guest lectures, self-study and case studies, based on scientific papers.
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design
Assessment dimensions / learning outcomes	Dimensions of assessment: - Knowledge and understanding (Analysing and defining problems, making judgements) - Applying Knowledge and understanding (design) The student explains the different layers of the energy supply systems – physical, economic and regulatory. The student differentiates, tests and implements optimization algorithms for energy management making trade-offs between technical and economic measures and taking into account the regulatory aspects. The student recognizes and describes the Smart Grid concept and is able to design and implement the desired configuration(s) and the control system in a power system value chain.

Assessment criteria	The student will be assessed on the criteria (questions) mentioned on the evaluation form.	
Information for each exam and modular exam		
Examinations	Exam name	MES SPS EM home taken exam, case study
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	PROD-O Online digital product
	Exam type	Hand in
	Exam week	P4A (week 9)
	First examiner	Ballard Asare-Bediako
	Permitted resources	Everything, but all results must be the student’s own work
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P5A)
	Compensation	No
	Review	Evaluation form week 4.12
Other information		
Required classroom	Regular classroom	

Smart Power Supply, Energy Management, Evaluation and Awarding Marks
Name, first name and student number ……

	Mark	Motivation	Weight factor
Knowledge and understanding **C1: Analysing and defining problems** Can the student explain the demand-supply concept in the energy supply system? Can the student analyse if the given set of consumption data and generation units are enough to answer the formulated question? Can the student apply appropriate techno-economic optimization algorithms to match demand and supply?			1
Applying knowledge and understanding **C2 Design** Can the student design a model with available simulation tools for the given question? Can the student design a model and apply appropriate simulation tools, matlab, vision, etc. to solve the given problem? Can the student apply economic dispatch and unit-commitment to find techno-economic optimum for a given demand and supply dataset? Does the student deal with missing or erroneous data correctly?			1
Making judgments **C1: Analysing and defining problems** Can the student evaluate and compare models and optimization techniques? Can the student motivate the choice of an optimization algorithm? Can the student motivate the assumptions made and explain the results of the model simulations?			1
Mark total			

Date : Signature examiner :

Unit of Study (UoS) **AEA MES M SPS PC**	**Power Control (Capita Selecta)**
General Information	
Long name of unit of study	Power Control
Short name of unit of study	Power Control
Code for unit of study OSIRIS	POWECO01
Teaching Term	P3A
Registering for educational components	Go to Part 3 “Regulations for Education, exams and modular exams OSIRIS” for more information.
Credits/study load	2,5 EC / 70 hours
Study hours (contact hours)	16 contact hours
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	This course covers the following topics: - Introduction to electrical circuits - Introduction to power systems - Steady-state analysis of power systems - Synchronous generators - Inverter-based generators - Principles of power system control
Required literature / description of ‘learning material’	To be announced
Recommended literature	To be announced
Required software	MATLAB, Vision Network Analysis
Cohesion Relationship	Units of study Smart Power Supply
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Lectures, (company) guest lectures, self-study and case studies based on scientific papers.
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 (System) Design
Assessment dimensions / Learning outcomes	Dimensions of assessment: Knowledge and understanding (analysing the problem) Applying knowledge and understanding (Design) Making judgements (analysing the problem) The student is able to construct a model of a power system. The student can solve power balance problems and perform technical analysis of a power system performance. The student understands and is able to explain principles used for power system control.

Assessment criteria	The student will be assesses on the criteria (questions) on the evaluation form (next page).	
Information for each exam and modular exam		
Examinations	Exam name	MES SPS PC home taken exam
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	PROD-O Online digital product
	Exam type	Hand in
	Exam week	P3A (week 9)
	First examiner	Ballard Asare-Bediako
	Permitted resources	Everything, but all results must be the student’s own work
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P5A)
	Compensation	No
	Review	Evaluation form week 4.4
Other information		
Required classroom	Regular classroom	

Smart Power Supply, Power Control, Evaluation and Awarding Marks

Name, first name……

	Mark	Motivation	Weight factor
Knowledge and understanding **C1: Analysing and defining problems** Can the student explain the power balance principle of the electricity network, formulate and solve power flow equations using appropriate mathematical tools? Can the student describe voltage and frequency control concepts of a power system? Is the student able to elaborate on the difference between small-signal and transient stability analysis of a power system?			1
Applying knowledge and understanding **C2 Design** Can the student design a power system model with available simulation tools for the given question? Does the student deal with missing or erroneous data correctly? Can the student perform power flow analysis, determine system bottlenecks and propose solutions to potential problems? Is the student able to perform small-signal stability analysis and determine the source of potential instability? Can the student perform transient stability analysis and calculate the critical clearing time of a network?			1
Mark total			

Date : Signature examiner :

Unit of Study (UoS) **AEA MES M SPS PQ**	**Power Quality**
General Information	
Long name of unit of study	Power Quality
Short name of unit of study	Power Quality
Code for unit of study OSIRIS	POWEQU01
Teaching Term	P4A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2,5 EC / 70 hours
Study hours (contact hours)	16 contact hours + 3 contact hours exam
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	This unit deals with the quality of the public electricity grid and electrical installations in general. The use of nonlinear loads and sensitive electronic equipment in the industry, commercial sectors and the domestic environments increased considerably over the last decades. Unfortunately, the same type of equipment often generates disturbances in the energy supply, which in turn affect other devices negatively and give rise to poor power quality. Both theoretical and practical aspects are discussed: • What is power quality and why it is important; • Cost of power quality; • Review of electrical circuits and quantities; • Power quality phenomena (dips, transients, harmonics, flicker); • Fourier theory; • Efficiency and power factor; • Asymmetry and unbalance; • Norms; • Monitoring and analysis; • Power conditioning.
Required literature / description of 'learning material'	Lecture notes (to be distributed during the lectures) and relevant scientific papers
Recommended literature	To be announced
Required software	Matlab, Excel and Power Quality Teaching Tools by PSL. Freely available at http://www.powerstandards.com
Cohesion Relationship	Units of study Smart Power Supply
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Lectures, (company) guest lectures, self-study and case studies.
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 System Design

Assessment dimensions / Learning outcomes	Dimensions of assessment: - Applying knowledge and understanding (System Design) - Making judgements (Analysing and defining problems) The student is able to understand the various aspects of power quality. The student applies the obtained knowledge and skills to a real life power quality problem. The student is able to analyse power quality problems and develop solutions.	
Assessment criteria	The student will be assessed on answering the questions: • clearly and to the point, including sufficient relevant explanation and depth, comparable with the depth of the literature studied • without irrelevant additional information using correct equations, models and graphs, including labels and units, for the situation (for example when to use linear or nonlinear models)	
Information for each exam and modular exam		
Examinations	Exam name	MES SPS PQ written exam
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	KENN-F Knowledge exam on location / written
	Exam type	ANS
	Exam week	P4A week 9
	First examiner	Dimitri Jeltsema
	Permitted resources	Open book
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P5A)
	Compensation	No
	Review	Review 4.12
Other information		
Required classroom	Regular classroom	

Unit of Study (UoS) **AEA MES M SPS AM**	**Asset Management**
General Information	
Long name of unit of study	Asset Management
Short name of unit of study	Asset Management
Code for unit of study OSIRIS	ASSEMA01
Teaching Term	P3A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2,5 EC / 70 hours
Study hours (contact hours)	16 contact hours + 3 contact hours exam
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	This course covers the following topics: • Asset management - why? Philosophies and organization • Materials for grid components and ageing mechanisms • Maintenance and Incident management • Uncertainty and confidence •
Required literature / description of 'learning material'	R. Ross, Reliability Analysis for Asset Management of Electric Power Grids, John Wiley, (eBook: ISBN: 978-1-119-12519-8; hard copy: ISBN: 978-1-119-12517-4) Reader Material analysis (free pdf)
Recommended literature	IAM: Asset Management – an anatomy
Required software	Matlab, Excel, Vision Network Analysis
Cohesion Relationship	Units of study Smart Power Supply
Compulsory participation	No, but attendance will be registered
Activities and/or instructional formats	Lectures, (company) guest lectures, self-study and case studies.
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design
Assessment dimensions / Learning outcomes	Dimensions of assessment: - Applying knowledge and understanding (analysing and Design systems) The student is able to apply Asset Management methodology to power grids. The student is able to evaluate the suitability of materials and investigate aspects related to failure research and forensic studies. The student is able to judge and formulate maintenance concepts. The student is able to formulate confidence boundaries and

	significance.	
Assessment criteria	The student will be assessed on answering the questions: • clearly and to the point, including sufficient relevant explanation and depth, comparable with the depth of the literature studied • without irrelevant additional information using correct equations, models and graphs, including labels and units, for the situation (for example when to use linear or nonlinear models)	
Information for each exam and modular exam		
Examinations	Exam name	MES SPS AM written exam
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	KENN-F Knowledge exam on location / written
	Exam type	ANS
	Exam week	P3A (week 9)
	First examiner	Ballard Asare-Bediako
	Permitted resources	Open book
	Number of examiners	1
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 (P5A)
	Compensation	No
	Review	Review 4.4
Other information		
Required classroom	Regular classroom	

Unit of Study (UoS) **AEA MES M SPS MP**	**Smart Power Supply Minor Project**
General Information	
Long name of unit of study	Smart Power Supply Minor Project
Short name of unit of study	Smart Power Supply MP
Code for unit of study OSIRIS	SMAPOS04
Teaching Term	P3A, P4A (Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	5 EC / 140 hours
Study hours (contact hours)	28 contact hours and 4 hours presentation
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
Professional task	Create models of a selected problem related to expected changes from the energy transition onto the energy grid
(Professional) products	A project report on the modelling of the selected problem including a detailed analysis of the obtained results from simulations using the model.
General description	The Project serves to challenge the students to apply their The project serves to challenge the students to apply their knowledge and skills on an expected or existing real-life problem, in correspondence with a subset of the final qualifications The project covers the following topics: • The problem to be solved requires an understanding and active analysis of distinctive disciplines. • The project will always include the step from a real-life problem to a more abstract representation of the problem in order to be able to create a model • The project also asks to simulate different conditions and/or options using the model, and to translate the results back to the real-life situation. Required results are described under the professional product section. The problem analysis will result in a problem solution to be translated in such terms that conclusions can be drawn based on the extent the problem has been solved and objectives fulfilled. Part of the project is the peer review: In a peer review session the contribution of the group members to the project is determined by the group members themselves. The focus is on content and collaboration. Ideally the supervisor (tutor) is also present, but that is not strictly necessary. Students should be aware of their own functioning within the project group, so should arrange peer feedback within their project group regularly (at least twice during the project).
Required literature / description of 'learning material'	Grit. R. (2021). *Project Management, a Practical Approach*. Noordhoff. Elling. R., et. al. (2011). *Report Writing for Readers with Little Time*. Noordhoff.
Recommended literature	-

Required software	MATLAB/Simulink, AMEsim
Cohesion Relationship	Applied Control, Systems Modelling Sustainable Energy Systems Smart Power Supply CS, Smart Power Supply T
Compulsory participation	Yes
Activities and/or instructional formats	Research Work Forms: Lectures, Assignment Development and analysis of an energy grid related problem by working in a team on a problem.
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Assessment dimensions / learning outcomes	Dimensions of assessment: - Applying knowledge and understanding (analysing and defining problems, design, testing, conducting research) - Making judgements (conducting research) - Communication (managing work processes, communication and collaboration) - Learning skills (professional development) Learning outcomes: The student presents a clear justification of the project approach. The student plans effectively. The student carries out a project based on a real-life problem in which model development and analysis as well as experimental validation are essential parts by applying knowledge and understanding and making judgements based on analysis and validation techniques. The student structures the working process in the engineering domain and is able to effectively communicate the core findings in a structured and convincing way. The student is able to systematically search for information, such as e.g. models, and judge its relevance. The student communicates the project findings in a clear and structured manner with colleague, customers and the wider public in oral and written forms. The content has been reviewed by peers and/or supervisor. The student reflects on his/her role in the project and on his/her professional development. The student is able to analyse real life problems concerning effects of energy transition on the power systems. The student is able to design a power system related model and perform simulations and tests. The student is able to interpret results from simulations and tests and develop solutions to the problem.

<table>
<tr><td>Assessment criteria</td><td colspan="3">The student will be assessed on the criteria mentioned on the evaluation forms.

The result of the minor project is determined by 2 exams:
1. Group Contribution:
For the contribution of the individual student to the group a pass or no pass will be defined by the examiners.
The examiners can use the outcome of the peer review, but also can deviate from it.

2. Documentation and defence:
For the Report and Presentation a group mark will be given by the examiners. The individual student mark is equal to the group mark provided that the student’s Group Contribution is sufficient (pass). If the Group Contribution of the student is insufficient, no mark will be given and the student is unable to finish the minor project.</td></tr>
<tr><td colspan="4">Information for each exam and modular exam</td></tr>
<tr><td rowspan="15">Examinations</td><td>Exam name</td><td>MES SPS MP Group Contribution</td><td>MES SPS MP Documentation and defence</td></tr>
<tr><td>Exam code</td><td>TOETS-2</td><td>TOETS-01</td></tr>
<tr><td>Registering and deregistering for exam opportunities</td><td colspan="2">See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”</td></tr>
<tr><td>Exam format</td><td>PART-F Participation on location</td><td>PRES-F Presentation on location</td></tr>
<tr><td>Exam type</td><td></td><td>Hand in</td></tr>
<tr><td>Exam week</td><td>P4A (week 10)</td><td>P4A (week 9 / 10)</td></tr>
<tr><td>First examiner</td><td colspan="2">Ballard Asare-Bediako</td></tr>
<tr><td>Permitted resources</td><td colspan="2">Everything, but all results must be the student’s own work</td></tr>
<tr><td>Number of examiners</td><td>At least 1</td><td>2</td></tr>
<tr><td>Assessment</td><td>Pass</td><td>Mark</td></tr>
<tr><td>Pass mark</td><td>Pass</td><td>55</td></tr>
<tr><td>Minimal result</td><td>Pass</td><td>55</td></tr>
<tr><td>Weight</td><td>0</td><td>1</td></tr>
<tr><td>Reassessment</td><td>-</td><td>1 (P5A, week 4.11/4.12)</td></tr>
<tr><td>Compensation</td><td>No</td><td>no</td></tr>
<tr><td>Review</td><td colspan="2">Feedback after presentation / Evaluation form in week 4.12</td></tr>
<tr><td colspan="4">Other information</td></tr>
<tr><td>Required classroom</td><td colspan="3">Regular classroom</td></tr>
</table>

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Smart Power Supply: Project Documentation and defence, Evaluation and Awarding Marks

Name, first name……

	Mark	Motivation	Weight factor
Applying knowledge and understanding C1: Analysing and defining problems C2: Design C3: Testing C5: Conducting Research Does the candidate show sufficient familiarity with current knowledge? Have the central questions been answered? Are the methods and techniques properly used? Does the student show sufficient analytical skills to master the problem at hand?			1
Making judgments C5: Conducting Research Has critical appraisal been successfully incorporated? Is the student able to correctly interpret and evaluate the quality?			1
Communication C4: Managing work processes C6: Communication and Collaboration Is the student able to present the results to a problem owner? Is the student able to work in a project team? Is the text clearly understandable and in grammatically sound language? Have the formal requirements for literary sources been met?			1
Learning Skills C7: Professional development Does the student display discernible eagerness to tackle the task? Is the problem owner involved adequately? Does the student show problem solving skills? Is the student self-reliant? Does the student reflect on the choices?			1
Final Mark (group) **For a pass all marks should be sufficient**			

Date : Signature examiner Signature examiner

Module code **AEA MES M SES**	**Sustainable Energy Systems**
Degree program	Master Engineering Systems
Target Group	Elective module
Coordinating lecturer	Rik Catau
Code for OSIRIS	SUSENS60
Professional Task	Understand and design Sustainable Energy Systems
Professional Products	Models
Credits / Study load	15 EC / 420 hours
Relationship with and entry requirements concerning examinations	Joined classes in Applied Control and Systems Modelling
General Description	This module covers the width of the sustainable energy transition, ranging from energy science and engineering to energy markets and geopolitics. Firstly the student will study the broad range of existing renewable energy generation options. The student will study energy balancing and power balancing calculations and apply these to develop and optimize the same. Additionally the student will learn to evaluate the feasibility of system solutions in their societal and engineering contexts. Secondly, the module treats energy storage applications. Aside from the technical aspects of these applications, the student studies the connections and dependencies between energy storage systems and high levels of sustainable energy sources, as well as their impact on the existing energy grid. Thirdly the module treats energy policy, geopolitics, the energy markets, and the relevant stakeholders, as the energy transition is in large part dependent on these factors rather than technological advancements. The student will learn to consider environmental aspects as well as interaction between actors which can be complex for energy systems. Finally, the student will practice working with, understanding, and applying relevant state-of-the art scientific literature. The student conducts a project to apply the knowledge, application skills and insights acquired during the lectures to solve a real-world challenge.
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Units of study	Sustainable Energy Systems Theory (7.5 EC) Sustainable Energy Systems Capita Selecta (2.5 EC) Sustainable Energy Systems Minor Project (5 EC)

Unit of Study (UoS) **AEA MES M SES T**	**Sustainable Energy Systems Theory**
General Information	
Long name of unit of study	Sustainable Energy Systems Theory
Short name of unit of study	Sustainable Energy Systems T
Code for unit of study OSIRIS	SUSENS10
Teaching Term	P1A, P2A, P3A, P4A (Semester 1/ Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	7.5 EC / 210 hours
Study hours (contact hours)	64 contact hours + 6 contact hours exam (2 written exams)
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	The course sustainable energy systems theory gets the student familiar with several sustainable energy technologies. It covers the following topics: - Energy systems: o Theory of a range of energy carriers and sources o Theory of a range of generation technologies, energy transport and consumption - Electrical energy generation o Introduction to sutainable electricity generation o Light and olar energy (solar electricity and solar heat) o Digital photovoltaics practical: PVLabs o Grid scale wind energy - Storage & conversion of electrical energy o Grid storage applications and technologies o Specifics of battery energy storage o Specifics of hydrogen energy storage o Storage in autonomous systems - Modelling, scenarios & application of energy o Explore modelling tools for creating scenarios - Introduction into energy modelling - Heat applications o Conventional thermal generation & biomass o Waste heat & heat storage o Heat pump systems & cooling. o Applications in the built environment & industry - Environment, emissions & regulation:

	○ Emission protocols such as the European Emission Trading System (ETS) ○ Emission calculations & verification ○ Overview policy instruments & outlook - Markets & stakeholders: ○ Introduction to electricity markets ○ Energy market overview, business and geopolitical implications ○ Stakeholder, who are the main relevant stakeholders ○
Required literature / description of 'learning material'	Renewable Energy in Power Systems, 2nd Edition 2020 Author: D. Infield, L. Freris, Publisher Wiley, ISBN: 978-1-118-64993-0 Handouts
Recommended literature	-
Required software	Software that is required will be made available (Amongst others EnergyTransitionModel).
Cohesion Relationship	Module Applied Control, Module Systems Modelling Sustainable Energy Systems CS, Sustainable Energy Systems MP
Compulsory participation	Attendance will be registered for regular classes and contact moment.
Activities and/or instructional formats	Self-study, discussion of literature, assignments and exercises.
Examinations	
Final Qualifications	C1 Analysing and defining problems
Assessment dimensions / learning outcomes	The topics of M SES T taught in the 1st half of the semester are assessed in the 1st written exam (WE1) and the topics taught in the 2nd half of the semester are assessed in the 2nd written exam (WE2). The topic of modelling is separately assessed with the home taken exam (HTE). M SES T WE assessment dimensions: • Knowledge and understanding: analysis, fundamentals and applications M SES T WE Learning outcomes: • The student has developed knowledge and understanding of the fundamentals of sustainable energy systems and its applications. • Is able to apply, analyse and evaluate wind- & solar energy-, power balance- and storage application problems • Is able to apply, analyse and evaluate thermal energy conversion and CO2 emissions & emissions trading system

	problems, general energy policy questions, and can distinguish and make relevant observations on stakeholder problems. • Can distinguish (engineering) bottlenecks in an energy system and propose improvements to the system. • The student has developed an understanding of the societal impact of sustainable energy and the context of regulations. In every written exam, each of the learning outcomes above will be evaluated. However, emphasis may be on a subset of the learning outcomes, which may vary between examinations. The student is expected to study and master the Module curriculum completely, and will not be informed in advance whether or not there will be emphasis on certain learning outcomes in a given written exam. so that overall learning outcomes are equally covered in consecutive exams. The student is not informed in advance on which learning outcome emphasis will be put and thus must prepare for all topics. M SES T HTE assessment dimensions: • Knowledge and understanding: analysis, fundamentals and applications M SES T HTE Learning outcomes: • The student is able to use energy modelling to formulate strategies and work on moderately complex energy scenario problems in the form of an assignment • The student is able to compare and draw conclusions on the outcomes of an assignment on moderately complex energy scenario problems
Assessment criteria	M SES T WE, the student will be assessed on answering the questions: • Clearly and to the point, including sufficient relevant explanation and depth, comparable with the depth of the literature studied • Without irrelevant additional information • Using correct equations and models for the situation (for example when to use linear or nonlinear models) • Using correct units for quantities in equations, graph labels, etc. M SES T HTE, criteria assessed in the assignment made by the student are: • Strategies are well formulated, consistent, applicable and contain sufficient variables per strategy • Scenarios are established based on strategies containing substantiated choices and sufficient detail • The comparison between the scenarios and discussion and conclusions are formulated clearly • Judgements and decisions are supported and reporting is concise, complete, unambiguous and readable.
Information for each exam and modular exam	

Examinations	Exam name	MES SES T written exam 1	MES SES T written exam 2	MES SES T home taken exam
	Exam code	TOETS-01	TOETS-02	TOETS-03
	Registering and deregistering for exam opportunities	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”		
	Exam format	KENN-F Knowledge exam on location / written	KENN-F Knowledge exam on location / written	PROD-O Online / digital product
	Exam type	ANS	ANS	Hand in
	Exam week	P1A, P3A (week 9)	P2A, P4A (week 9)	P2A, P4A (week 9)
	First examiner	Rik Catau		
	Permitted resources	Open book	Open book	Everything, but all results must be the student’s own work
	Number of examiners	1	1	1
	Assessment	mark	mark	mark
	Pass mark	55		
	Minimal result	45	45	55
	Weight	5	4	1
	Reassessment	1 (P5A)	1 (P5A)	1 (P5A)
	Compensation	Yes		
	Review	Evaluation form week 4.12/3.4	Review Week 4.4 / 2.4	Review week 4.12 / 3.4
Other information				
Required classroom	Regular classroom			

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Sustainable Energy Systems HTE
Evaluation and Awarding Marks
Name, first name……

	Mark	Motivation	Weight factor
Knowledge and understanding C1: Analysing and defining problems Do the results show complexity and depth? Has the candidate acquired appropriate knowledge?		-	1
Knowledge and understanding C2: Design Is the student able to work on moderately complex energy modelling problems and answer questions on definition of energy or emission scenarios in the form of an assignment?			1
Mark total			

Date : Signature examiner :

Unit of Study (UoS) **AEA MES M SES CS**	**Sustainable Energy Systems Capita Selecta**
General Information	
Long name of unit of study	Sustainable Energy Systems Capita Selecta
Short name of unit of study	Sustainable Energy Systems CS
Code for unit of study OSIRIS	SUSENS08
Teaching Term	P1A, P2A, P3A, P4A (Semester 1 / Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	2,5 EC / 70 hours
Study hours (contact hours)	16 contact hours
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
General description	Relevant literature is provided and papers are discussed in a journal club.
Compulsory literature	Handouts and papers
Recommended literature	-
Software and other materials	-
Relationship	Module Applied Control Module Systems Modelling Sustainable Energy Systems T Sustainable Energy Systems MP
Compulsory participation	Presence at colloquia, journal club meetings and presentations is mandatory.
Activities and instructional formats	Self-study, discussion of literature. Work Forms: Lectures, Colloquia and Journal Club
Examinations	
Final Qualifications	C5 Conducting research
Assessment dimensions / learning outcomes	Assessment dimensions • Knowledge and understanding: analysis, fundamentals and applications • Application and making judgments: structuring of research, design and testing • Communication of knowledge; oral and in the form of a presentation Learning outcomes: The student is able to find, understand, and evaluate relevant scientific literature efficiently. The student is able to present and discuss the contents of a scientific paper with fellow students while providing a relevant context.

Assessment criteria	The student will be assessed on the criteria (questions) mentioned on the evaluation form.	
Information for each exam and modular exam		
Examinations	Exam name	MES SES CS Presentation
	Exam code	TOETS-01
	Registering for re-exam OSIRIS	See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”
	Exam format	PRES-F Presentation on location
	Exam type	Hand in
	Exam week	P1A, P3A (week 9)
	First examiner	Rik Catau
	Permitted resources	Everything, but all results must be the student’s own work
	Number of examiners	2
	Assessment	Mark
	Pass mark	55
	Minimal result	55
	Weight	1
	Reassessment	1 P5A (week 4.11/4.12)
	Compensation	No
	Review	Feedback after presentation Evaluation form week 2.4 / 4,4
Other information		
Required classroom	Regular classroom	

Sustainable Energy Systems, Capita Selecta, Evaluation and Awarding Marks

Name: ……

Student number: ……..

	Mark	Motivation	Weight factor
Knowledge and understanding **C5: Conducting Research** Student makes a critical analysis of a scientific paper on a sustainable energy subject.			1
Making judgments **C5: Conducting Research** Student identifies the strengths and potential shortcomings of the scientific paper and comes up with a proposal for extending or enhancing the research. Student assesses the relevance of the scientific papers to the research and/or professional fields.			1
Communication **C5: Conducting Research** Student is able to communicate the outcome of their analysis to a non-specialist audience with a technical background (monologue). Student is able to discuss their analysis with this non-specialist audience, as well as critically discuss the analysis of their peers.			1
Mark total			

Date :

Signature examiner :

Signature examiner :

Unit of Study (UoS) **AEA MES M SES MP**	**Sustainable Energy Systems Minor Project**
General Information	
Long name of unit of study	Sustainable Energy Systems Minor Project
Short name of unit of study	Sustainable Energy Systems MP
Code for unit of study OSIRIS	SUSENS35
Teaching Term	P1A, P2A, P3A, P4A (Semester 1/ Semester 2)
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	5 EC / 140 hours
Study hours (contact hours)	20 contact hours and 4 contact hours presentation
Entry requirements	Joined classes in Applied Control and Systems Modelling
Content and organization	
Professional task	Conducting literature research Modelling and validation
(Professional) products	Project plan Model Report Presentation
General description	The Project serves to challenge the students to apply their knowledge and skills on a real-life problem, in correspondence with a subset of the final qualifications. The project covers the following topics: • The problem to be solved requires an understanding and active analysis of distinctive disciplines, which are covered by lectures. • The project will always include the transition from a real-life problem to a more abstract representation. Required results are described under the professional product section. The problem analysis will result in a problem solution to be translated in such terms that conclusions can be drawn based on the extent the problem has been solved and objectives fulfilled. Part of the project is the peer review: In a peer review session the contribution of the group members to the project is determined by the group members themselves. The focus is on content and collaboration. Ideally the supervisor (tutor) is also present, but that is not strictly necessary. Students should be aware of their own functioning within the project group, so should arrange peer feedback within their project group regularly (at least twice during the project).
Required literature / description of 'learning material'	Grit. R. (2021). *Project Management, a Practical Approach*. Noordhoff. Elling. R., et. al. (2011). *Report Writing for Readers with Little Time*. Noordhoff.
Recommended literature	-
Required software	No required specific purpose software. Students may choose to use modelling software such as MATLAB & Simulink with a license provided by HAN for the minor project. If students choose to use dedicated modelling software there are allowed to do to. Licensing costs are in this case to be paid by the students themselves.

Cohesion Relationship	Module Applied Control, Module Systems Modelling Sustainable Energy Systems T, Sustainable Energy Systems CS
Compulsory participation	Yes
Activities and/or instructional formats	Research Work Forms: Lectures, Assignment Development and analysis of (sustainable) energy system(s) by working on a problem with fellow student.
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Assessment dimensions / learning outcomes	Dimensions of assessment: • Knowledge and understanding: analysis, fundamentals and applications • Application and making judgments: structuring of research, design and testing • Communication of knowledge; oral and in the form of a presentation and in a report • Conducting research and generating working hypotheses • Organizing work processes and implementing communication and collaboration • Learning skills (professional development) Learning outcomes (general): • The student presents a clear justification of the project approach. • The student plans effectively. • The student carries out a project based on a real-life problem in which model development and analysis as well as experimental validation are essential parts by applying knowledge and understanding and making judgements based on analysis and validation techniques. • The student structures the working process in the engineering domain and is able to effectively communicate the core findings in a structured and convincing way. • The student is able to systematically search for information, such as e.g. models, and judge its relevance. • The student communicates the project findings in a clear and structured manner with colleague, customers and the wider public in oral and written forms. The content has been reviewed by peers and/or supervisor. • The student reflects on his/her role in the project and on his/her professional development. Learning outcomes (specific): • The student can critique on and analysis of problems in the fields of energy system design, power balancing, system

<table>
<tr><td></td><td colspan="3">simulation and feasibility studies.
• The student evaluates relevant models and makes informed decisions based on scenario information.
• The student creates a proposal for improvement on an analysed and evaluated energy system or plans a new design for an energy system; taking into account use of renewable resources, power balance, energy efficiency, possible need for energy storage and overall feasibility including environmental sustainability.</td></tr>
<tr><td>Assessment criteria</td><td colspan="3">The student will be assessed on the criteria mentioned on the evaluation forms. The result of the MP is determined by 2 exams:
1. Group Contribution:
For the contribution of the individual student to the group a pass or no pass will be defined by the examiners.
The examiners can use the outcome of the peer review, but also can deviate from it.
2. Project documentation and defence:
For the Report and Presentation a group mark will be given by the examiners. The individual student mark is equal to the group mark provided that the student’s Group Contribution is sufficient (pass). If the Group Contribution of the student is insufficient, no mark will be given and the student is unable to finish the minor project.</td></tr>
<tr><td colspan="4">Information for each exam and modular exam</td></tr>
<tr><td rowspan="15">Examinations</td><td>Exam name</td><td>MES SES MP Group Contribution</td><td>MES SES MP Documentation and defence</td></tr>
<tr><td>Exam code</td><td>TOETS-02</td><td>TOETS-01</td></tr>
<tr><td>Registering and deregistering for exam opportunities</td><td colspan="2">See, Part 3 “Regulation for Education, exams and modular exams OSIRIS”</td></tr>
<tr><td>Exam format</td><td>PART-F Participation on location</td><td>PRES-F Presentation on location</td></tr>
<tr><td>Exam type</td><td></td><td>Hand in</td></tr>
<tr><td>Exam week</td><td colspan="2">P2A / P4A, (week 9 / 10)</td></tr>
<tr><td>First examiner</td><td colspan="2">Rik Catau</td></tr>
<tr><td>Permitted resources</td><td colspan="2">Everything, but all results must be the student’s own work</td></tr>
<tr><td>Number of examiners</td><td>At least 1</td><td>2</td></tr>
<tr><td>Assessment</td><td>Pass</td><td>Mark</td></tr>
<tr><td>Pass mark</td><td>Pass</td><td>55</td></tr>
<tr><td>Minimal result</td><td>Pass</td><td>55</td></tr>
<tr><td>Weight</td><td>0</td><td>1</td></tr>
<tr><td>Reassessment</td><td>-</td><td>1 (P5A, week 4.11/4.12)</td></tr>
<tr><td>Compensation</td><td>No</td><td>no</td></tr>
<tr><td>Review</td><td colspan="2">Feedback after presentation / Evaluation form in week 3.4 and 4.12</td></tr>
<tr><td colspan="4">Other information</td></tr>
<tr><td>Required classroom</td><td colspan="3">Regular classroom</td></tr>
</table>

HAN_UNIVERSITY OF APPLIED SCIENCES

Sustainable Energy Systems: Project Documentation and defence
Evaluation and Awarding Marks
Name, first name……
Student number……

	Mark	Motivation	Weight factor
Applying knowledge and understanding C1: Analysing and defining problems C2: Design C3: Testing C5: Conducting Research Does the candidate show sufficient familiarity with current knowledge? Have the central questions been answered? Are the methods and techniques properly used? Does the student show sufficient analytical skills to master the problem at hand?			1
Making judgments C1: Analysing and defining problems C2: Design C3: Testing C5: Conducting Research Has critical appraisal been successfully incorporated? Is the student able to correctly interpret and evaluate the quality?			1
Communication C4: Managing work processes C6: Communication and Collaboration Is the student able to present the results to a problem owner? Is the student able to work in a project team? Is the text clearly understandable and in grammatically sound language? Have the formal requirements for literary sources been met?			1
Learning Skills C7: Professional development Does the student display discernible eagerness to tackle the task? Is the problem owner involved adequately? Does the student show problem solving skills? Is the student self-reliant? Does the student reflect on the choices?			1
Final Mark (group) **For a pass all marks should be sufficient**			

Date : Signature examiner 1, Signature examiner 2

4 Major Project

Module code **AEA MES M MAJP**	**Major Project**
Degree program	Master Engineering Systems
Target Group	All students, mandatory
Coordinating lecturer	Major Project Board
Code for OSIRIS	EAMDMP01
Credits / Study load	30 EC / 840 hours
Relationship with and entry requirements concerning examinations	Major Project: Relationship: all modules **Entry requirements**: all requirements from the theoretical phase are met.
General Description	The master graduation project is motivated by a real-life problem, supplied by an engineering company. For a detailed description and the procedure see the Manual Major Project published on Onderwijs Online.
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Units of study	Major Project

Unit of Study (UoS) **AEA MES M MAJP MP**	**Major Project**
General Information	
Long name of unit of study	Major Project
Short name of unit of study	Major Project
Code for unit of study OSIRIS	EAMAPR01
Teaching Term	P1A, P2A, P3A, P4A
Registering for educational components	Go to Part 3 "Regulations for Education, exams and modular exams OSIRIS" for more information.
Credits/study load	30 EC / 840 h.
Study hours (contact hours)	-
Entry requirements	As the student has to demonstrate that he/she can act and function at master level within the context of the major project, we have the following entry requirements: **Entry requirements to start the major project:** As soon as all requirements of the theoretical phase are met 1. the student has the possibility (OSIRIS) to do a request for her/his master degree. 2. The student is allowed to hand in the major project Project Plan. **Entry requirements oral defence**: theoretical phase and all other fulfilments of the module major project.
Content and organization	
General description	Graduation projects are motivated by real-life problems, supplied by engineering companies. A problem analysis will result in a problem solution, to be translated in terms such that conclusions can be drawn to what extent the problem has been solved and objectives fulfilled. A representative of a company is involved, to verify (1) whether the thesis result match the expectations of the company, and (2) whether the rated aspects of the major project are relevant for the company. In this way, feedback is obtained on the professional requirements regarding the intended learning outcomes. The assignment is carried out by a single student, communicating with an external problem owner. The assignment results are presented and defended in a final presentation, and included in a project report. A detailed description complemented with a procedure can be found in the Manual Major Project Master Engineering Systems (#OO).
Required literature / description of 'learning material'	Lecturing material, papers and hand-outs (Power Point, on Onderwijs Online), Manual Major Project Master Engineering Systems Grit. R. (2021). *Project Management, a Practical Approach*. Noordhoff. Elling. R., et. al. (2011). *Report Writing for Readers with Little Time*. Noordhoff. Baarda. D.B. (2010). *Research this is it!* Noordhoff

	https://www.youtube.com/@GradCoach play list: https://www.youtube.com/playlist?list=PLvcb33xNTVUk-Bj4Y9iuU0n46LowYtjb5
Recommended literature	-
Required software	-
Cohesion Relationship	Units of study Major Project Minor projects Chosen elective modules
Compulsory participation	Yes
Activities and instructional formats	Self-study, Work form: research and supervisor meetings
Examinations	
Final Qualifications	C1 Analysing and defining problems C2 Design C3 Testing C4 Managing work processes C5 Conducting research C6 Communication and collaboration C7 Professional development
Assessment dimensions / Learning outcomes	Dimensions of assessment: - Knowledge and understanding (C1 Analysing and defining problems, C5 Conducting Research) - Applying knowledge and understanding (C2 Design, C3 Testing, C4 Managing Work processes) - Making judgements (C1 Analysing and defining problems, C2 Design, C4 Managing Work processes C5 Conducting Research) - Communication (C1 Analysing and defining problems, Communication and Collaboration) - Professional Skills (Professional Development) Learning outcomes: *Analysing and defining problems:* To be able to critically analyse the engineering problem through active communication with the problem owner, to translate this to a problem formulation, feasible solution approaches and scientifically valid conclusions and recommendations, to be communicated again to the problem owner. *Design:* To be able to systematically translate the engineering problem to a model at an abstract level, (i.e. reducing it to its essentials in terms of model and problem requirements) and to validate results against the real life situation and problem formulation. Testing: To be able to systematically translate the engineering problem to a concrete level, and to validate results against the real life situation and problem formulation. *Managing work processes:* To be able to put engineering activities within the perspective of engineering company processes, including quality control principles. To be able to incorporate the economical (cost) and societal (safety, sustainability) consequences in the design or development process. *Conducting research:* To have gained specialized scientific knowledge and skills in the field of engineering. *Communication and collaboration:* Being able to work on a problem within a multidisciplinary context in an industrial environment. Being able to work on a problem in an international engineering context in an

	industrial environment *Professional development:* To be able, through self-reflection, to improve one's own professional acting					
Assessment criteria	The student will be assessed on the criteria mentioned on the evaluation form. (next pages)					
Information for each exam and modular exam						
Examinations For detailed information Manual Major Project on Onderwijs Online	Exam name	MAJP proposal	MAJP project plan	MAJP progress evaluation	MAJP documen-tation	MAJP defence
	Exam code	TOETS-01	TOETS-02	TOETS-03	TOETS-04	TOETS-05
	Registering and deregistering for exam opportunities	See, Part 3 "Regulation for Education, exams and modular exams OSIRIS"				
	Exam format	PROD-O	PROD-O	PROD-O	PROD-O	PRES-F
	Exam type	Hand in	Hand in	Hand in	Hand in	Hand in / oral
	Exam week	YEAR Documentation and Defence: Time table Practical guide				
	First examiner	Proposal	Project plan	Progress evaluation	Report	Defence
		MP board	HAN supervisor	HAN supervisor	MP board	MP board
	Exam method	Form	Report	Report	Report	oral
	Permitted resources	Everything, but all results must be the student's own work				
	Number of examiners	2	1	1	2	2
	Assessment	Pass	Pass	Pass	Pass	Mark
	Pass mark	P	P	P	P	55
	Minimal result	P	P	P	P	55
	Weight	0	0	0	0	1
	Reassessment	1	1	1	1	0
	Compensation	-	-	-	-	-
	Review	Feedback after defence. Evaluation Form within 2 working days				
Other information						
Required classroom	Regular classroom for presentation and defence					

HAN_UNIVERSITY OF APPLIED SCIENCES

Proposal Major Project Engineering Systems (including evaluation)
Fill in this form (should fit on 2 pages) and send it to finalthesis.tm@han.nl
General information:

Student name:	
Mobile number:	
Email address:	
Study modules obtained: (for which you obtained 15 EC)	
Study modules currently following:	
Company name:	
Telephone number (company):	
Name of the company supervisor:	
E-mail address (company supervisor)	
Date:	
Major project start	Day – month – year
Date Defence:	Defence in <month>

***Major project:*:**

Project title:	
Background Provide a general description of the context of the problem and give the reason for doing this research. Why should the problem be solved?	
Objective: What is the project trying to achieve? Formulate a concise and declarative statement that clarifies which problem should be solved. Note: activities are not objectives!	• …
Activities How are you going to analyze/solve the problem? Sum up the main activities, max. 4.	• … • … •
Deliverables : Sum up the expected final result(s) / deliverables, what will you deliver? Next to your report, this could be one or more models (also state in which form, like Matlab, GTPower, ..), software and/or hardware, manuals, etc.	• Thesis report and presentation • … • …
Demonstrating Master level	
Master level: The main goal of working on a Major Project is to demonstrate your master level. State how you intend to demonstrate your master level. Why do you think this subject can be helpful? Note: do not sum up your study modules here. See the document: *9 tcd_level_ descriptors_full_text_council _8_march_06.pdf*, esp. the introduction and section 3.4	
In case the chosen modules are from different tracks: how do you think the subject fits in the MES?	

The proposal is assessed in light of the following consideration: is the student able to show master level with this subject? Confirmation to students by mail / hand in.	Yes/no

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Evaluation Project plan Engineering Systems

Student name :

The Major Project plan will be judged by the HAN supervisor (after feedback from the company supervisor) on:

	V / NV (= sufficient/ not sufficient)	**Motivation**
Is the project plan structured according to the format given on #OO)?		
Does the text indicate clearly that the research activities will lead methodically to the answering of the main research question?		
Does the text show a methodical approach and are methods and techniques chosen expertly?		
Are the requirements SMART and complete?		
Are the restrictions sufficiently described?		
Are the Activities and Products sufficiently described?		
Are the objectives clear and correct?		
Is the English text understandable and of sufficient level with respect to spelling and grammar?		
Time plan *Present and plausible?*		
V / NV **For a pass all items should be sufficient**	**V / NV**	

Date :

Signature HAN supervisor :

HAN_UNIVERSITY OF APPLIED SCIENCES

Progress evaluation Engineering Systems

Student name :

Student number :

The Major Project progress will be judged by the HAN supervisor on:

	V / NV (= sufficient/ not sufficient)	**Motivation**
Is the major project report structured according to the format given on #OO?		
Does the text show a methodical approach and are methods and techniques chosen expertly?		
Is the table of contents present and sufficiently thought out?		
Chapter 2: Is the study of literature performed adequately and are the references known?		
Chapter 3: Has the student presented a clear justification for his/her approach, based on quantifiable choices?		
Is the English text understandable and of sufficient level with respect to spelling and grammar?		
Are the references correct according to one consistent standard?		
V / NV For a pass all items should be sufficient	V / NV	

Date :

Signature HAN supervisor :

HAN_UNIVERSITY OF APPLIED SCIENCES

Evaluation Major project report by HAN supervisor and major project board

Student name:
Student number:

Check on plagiarism	Percentage:	
Check pages	Body text > 40 pages	GO / NOGO
Decision GO / NO GO Decision based on check on plagiarism an evaluations of the major project and the HAN supervisor (next pages).	Motivation	

Date :
Name HAN supervisor: *Signature*

Name member major project board: *Signature*

In case you need additional explanation of the given motivation of the marks, contact your examiners.

The Major Project Report will be assessed by the member of the major project board on:

	V / NV (= sufficient/ not sufficient)	Motivation
Knowledge and understanding C1: Analysing and defining problems C5: Conducting Research Has the student demonstrated relevant product knowledge and expertise in the field? Do the student's results show complexity and depth? Have the central questions been answered?		
Applying knowledge and understanding C2: Design C3: Testing Are the methods and techniques properly used and described? Do the student's project results demonstrate a structured approach?		
Making judgments C1: Analysing and defining problems C2: Design C5: Conducting Research Does the report incorporate critical appraisal?		
Communication C1: Analysing and defining problems Is the student able to present the content in a convincing way? Does the summary display the process of research and is there a logical consistency between goals and results? Have the formal requirements for diagrams, tables, literary sources etc. been met?		

The Major Project report/article will be judged by the HAN Supervisor on:

	V / NV (= sufficient/ not sufficient)	Motivation
Knowledge and understanding C1: Analysing and defining problems C5: Conducting Research Are the goals of the report clear? Do the conclusions indicate if the goals are achieved and if not, do they indicate why not?		
Applying knowledge and understanding C2: Design C3: Testing Are the results obtained in a logical way and are they implementable? Do the recommendations describe their impact on the company?		
Making judgments C5: Conducting research Has the student presented a clear justification for his/her approach, based on quantifiable choices? Has the student verified the design?		
Communication C1: Analysing and defining problems C6: Communication and collaboration How is the language; are the texts well formulated? Does the report have a logical structure? Is the relation between goals and results described adequately?		
References Is the study of literature performed adequately and are the references known and correct according to one consistent standard?		

Major Project : Evaluation and Awarding Marks

Name, first name
Topic
Company
Company representative

Evaluation (for criteria cf. back of this sheet)
The Master thesis / Major Project will be assessed by the examiners assisted by an external expert, the company coach and the main supervisor. The names of the examiners will be made known to the Masters candidate when work on the thesis ends (after the last GO).

	Mark	Motivation
Knowledge and understanding C1: Analysing and defining problems C5: Conducting Research Weight factor 1, mark ≥ 55		
Applying knowledge and understanding C2: Design C3: Testing C4: Managing work processes Weight factor 1, mark ≥ 55		
Making judgments C1: Analysing and defining problems C2: Design C4: Managing work processes C5: Conducting Research Weight factor 1, mark ≥ 55		
Communication C1: Analysing and defining problems C6: Communication and Collaboration Weight factor 1, mark ≥ 55		
Learning Skills C7: Professional development Weight factor 1, mark ≥ 55		
Mark total		

Date :
Signature examiner 1 :
Signature examiner 2 :

In case you need additional explanation of the given motivation of the marks, contact your examiners within a week after the defence date.

Masters Degrees

Qualifications which signify the completion of the second cycle (Masters degrees) are awarded to students who have completed a program of study that enables them to show:

DUBLIN DESCRIPTOR	QUALIFICATION
Knowledge and understanding Provides a basis or opportunity for originality in developing or applying ideas often in a research context.	*Analysing and defining problems:* To be able to critically analyse the engineering problem through active communication with the problem owner, to translate this to a problem formulation, feasible solution approaches and scientifically valid conclusions and recommendations, to be communicated again to the problem owner. *Conducting research:* To have gained specialized scientific knowledge and skills in the field of engineering.
Applying knowledge and understanding Through problem solving abilities applied in new or unfamiliar environments within broader (or multidisciplinary) context.	*Design:* To be able to systematically translate the engineering problem to a model at an abstract level, (i.e. reducing it to its essentials in terms of model and problem requirements) and to validate results against the real life situation and problem formulation. Testing: To be able to systematically translate the engineering problem to a concrete level, and to validate results against the real life situation and problem formulation. *Managing work processes:* To be able to put engineering activities within the perspective of engineering company processes, including quality control principles. To be able to incorporate the economical (cost) and societal (safety, sustainability) consequences in the design or development process.
Making judgements Demonstrates the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete data.	*Conducting research:* To have gained specialized scientific knowledge and skills in the field of engineering. *Analysing and defining problems:* To be able to critically analyse the engineering problem through active communication with the problem owner, to translate this to a problem formulation, feasible solution approaches and scientifically valid conclusions and recommendations, to be communicated again to the problem owner. *Design:* To be able to systematically translate the engineering problem to a model at an abstract level, (i.e. reducing it to its essentials in terms of model and problem requirements) and to validate results against the real life situation and problem formulation. *Managing work processes:* To be able to put engineering activities within the perspective of engineering company processes, including quality control principles. To be able to incorporate the economical (cost) and societal (safety, sustainability) consequences in the design or development process.
Communication Of their conclusions and underpinning knowledge and rational (restricted scope) to specialist and non-specialist audiences (monologue).	*Analysing and defining problems:* To be able to critically analyse the engineering problem through active communication with the problem owner, to translate this to a problem formulation, feasible solution approaches and scientifically valid conclusions and recommendations, to be communicated again to the problem owner. *Communication and collaboration:* Being able to work on a problem within a multidisciplinary context in an industrial environment. Being able to work on a problem in an international engineering context in an industrial environment.
Learning skills Study in a manner that may be largely self-directed or autonomous.	*Learning skills:* To be able, through self-reflection, to improve one's own professional acting

GUIDELINES

Criteria

The following questions pertaining to the individual criteria are not final and can vary in importance depending on the type of thesis.

Knowledge and understanding (Dd1)

Provides a basis or opportunity for originality in developing or applying ideas often in a research context.

Criteria to scientific know-how:

- Has the student demonstrated relevant product knowledge and expertise in the field?
- Do the student's results show complexity and depth?
- Has the candidate acquired appropriate knowledge?

Criteria to independent scientific thinking / originality:

- Does the candidate use and develop original ideas?
- Are known ideas interwoven in a new way?
- Are the core findings presented in clear statements?
- Does the thesis incorporate critical appraisal?
- Are the possibilities and limitations of the applied method discussed?

Criteria to logic of the structure, scientific argumentation

- Have the central questions been answered?
- Is a comparison made between the results and published data? Are the results placed in a broader context?
- Are generalizations supported by facts?
- Are the facts clearly distinguishable from hypotheses and suppositions?
- Is the exposition of the topic clear, are the aims logically stated?
- Does the thesis include clearly formulated hypotheses?
- Does the structure of the thesis show a logical approach to the topic?
- Are the results of the research and conclusions clearly and logically presented?

Applying knowledge and understanding (Dd2)

Through problem solving abilities applied in new or unfamiliar environments within broader (or multidisciplinary) context.

Criteria:

- Does the candidate show sufficient familiarity with current knowledge (literature, experiments)?
- Is reference made to gaps in knowledge, based on analyses of literature?
- Are the methods and techniques properly used and described?
- Are the methods adopted appropriate to the subject matter?
- Has the research (field work, collecting data, experiments, models, etc.) been carried out carefully and adequately?
- International sources of information have been explored appropriately
- The relevant state of art has been discussed adequately, from an international industrial perspective.
- Has the results been sufficiently tested by statistical analyses?
- Do the student's project results show consideration for stakeholders?
- Do the student's project results demonstrate a structured approach?

Making judgments (Dd3)

Demonstrates the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete data.

Criteria:

- Has the student presented a clear justification for his/her approach, based on quantifiable choices?
- Has the student verified the design?
- Is the student able to correctly interpret and evaluate the quality?

- Are issues mentioned that have not been dealt with?
- Has the research been carried out independently?
- Has critical appraisal been successfully incorporated?

Communication (Dd4)
Of their conclusions and underpinning knowledge and rational (restricted scope) to specialist and non-specialist audiences (monologue).

Criteria:

- Is the student able to operate independently enough in the professional field?
- Is the student able to guide his own work and that of others?
- Does the student work with others in an organization?
- Does the student plan effectively and carry those plans through?
- that they can communicate their conclusions, and knowledge, rationale and processes underpinning these, to specialist and non-specialist audiences clearly and unambiguously

- Is the student able to present the content in a convincing way?
- Does the student get the message across?
- Has the student formulated concrete recommendations based on the results?
- Is the student able to effectively converse with people from other relevant fields?
- Have the formal requirements for diagrams, tables, literary sources etc. been met?
- Is there a comprehensive informative summary?
- Is the text scientifically correct, clearly understandable and in grammatically sound language?
- Is the layout attractive for readers?

Learning Skills (Dd5)
Study in a manner that may be largely self-directed or autonomous.

Criteria:

- Does the candidate display discernible keenness to tackle the task?
- The student has taken a clear responsibility in the project taking initiative in the project finding his way within the company.
- The problem owner (company) has been involved adequately, with feedback actively explored and used in the project.
- Has the student displayed out-of-the-box thinking?
- Is the student able to make the transition to other areas of expertise?
- Does the student reflect on his/her choices, initiatives and judgments?