



university of  
 groningen

**Appendices to the Teaching and Examination  
Regulations of the Master's degree programme in  
Mechanical Engineering (2021-2022)**

# Appendix I Learning outcomes of the degree programme

## (art. 3.1)

After the completion of a master's degree programme in Mechanical Engineering, the graduate is expected to attain the following learning outcomes.

### **On knowledge and understanding**

The graduate:

- 1.1 has knowledge of the underlying concepts of mechanical engineering, including the necessary physics, mathematics and computer science, at a level that permits admission to a higher level post-graduate programme
- 1.2 is familiar with the quantitative character of mechanical engineering and with the relevant research methods
- 1.3 has operational knowledge and design skills in the field of mechanical engineering
- 1.4A has a thorough understanding of advanced instrumentation (For Advanced Instrumentation Track)
- 1.4B has a thorough understanding of smart processes and products (For Smart Factories Track)
- 1.4C has a thorough understanding of process design (For Process Design for Energy Systems Track)
- 1.4D has a thorough understanding of engineering materials (For Materials for Mechanical Engineering Track)
- 1.5 has knowledge in the field of business and management

### **On the synthesis and application of knowledge and understanding**

The graduate:

- 2.1 is able to carry out research in order to understand phenomena that are usable in developing mechanical engineering applications
- 2.2 is able to analyse a (new) complex applied problem, and develop a structured and well-planned approach to search for a solution
- 2.3 is able to apply his/her mechanical engineering knowledge and skills in his/her own and related subject areas
- 2.4 is able to seek new applications for mechanical engineering concepts
- 2.5 is able to use advanced instrumentation and/or advanced programming tools
- 2.6 is able to apply mechanical engineering concepts in an industrial environment or in an international mechanical engineering research environment
- 2.7 is able to collaborate in a (multi-disciplinary) international research and design team

### **On reasoning and judgement**

The graduate:

- 3.1 is able to obtain relevant information using modern information channels, and interprets this information critically for specific use in mechanical engineering research
- 3.2 judges his/her and others' actions within a scientific context, taking societal and ethical aspects into account
- 3.3 is able to draw conclusions on the basis of limited or incomplete information, and realizes and formulates the limitations of such conclusions

### **On communication skills**

The graduate:

- 4.1 is able to communicate clearly, verbally and in writing, on his/her subject and relevant applications, at different levels understandable to experts and non-experts using relevant communication tools

### **On learning skills**

The graduate:

- 5.1 is able to address issues inside as well as outside his/her main subject area, therefore and thereby gaining new knowledge and skills
- 5.2 is able to familiarize him/herself with recent advances in science and engineering and use them in mechanical engineering applications

## Appendix II Tracks of the degree programme (art. 3.5 and 3.6)

The degree programme has four tracks:

1. Advanced Instrumentation
2. Smart Factories
3. Process Design for Energy Systems
4. Materials for Mechanical Engineering

## Appendix III Content of the degree programme (art. 3.7)

### Advanced Instrumentation Track:

Course unit name	Course code	EC TS	Entry requirements
Basic Detection Techniques	WMAS002-05	5	
Introduction to Data Science	WMME027-05	5	
Computational Mechanics	WMME017-05	5	
Advanced Instrumentation and Extreme Environments	WMME006-05	5	
Analysis and Control of Smart Systems	WMIE015-05	5	
Experimental Design	WMME012-05	5	
Course in Business, Management and Society		5	
Elective courses		25	
Master Design Project Mechanical Engineering	WMME901-20	20	Passed 45 ECTS of the master degree programme courses
Master Research Project Mechanical Engineering	WMME902-40	40	Passed 45 ECTS of the master degree programme courses

### Smart Factories Track:

Course unit name	Course code	EC TS	Entry requirements
Introduction to Data Science	WMME027-05	5	
Robotics for IEM	WMIE005-05	5	
Advanced Processing for Complex Materials	WMME007-05	5	
Computational Mechanics	WMME017-05	5	
Analysis and Control of Smart Systems	WMIE015-05	5	
Experimental Design	WMME012-05	5	
Course in Business, Management and Society		5	
Elective courses		25	
Master Design Project Mechanical Engineering	WMME901-20	20	Passed 45 ECTS of the master degree programme courses
Master Research Project Mechanical Engineering	WMME902-40	40	Passed 45 ECTS of the master degree programme courses

**Process Design for Energy Systems Track:**

Course unit name	Course code	EC TS	Entry requirements
Introduction to Data Science	WMME027-05	5	
Computational Mechanics	WMME017-05	5	
Thermodynamics of Energy Conversion	WMME018-05	5	
Analysis and Control of Smart Systems	WMIE015-05	5	
Advanced Process and Energy Technologies	WMCE012-05	5	
Experimental Design	WMME012-05	5	
Course in Business, Management and Society		5	
Elective courses		25	
Master Design Project Mechanical Engineering	WMME901-20	20	Passed 45 ECTS of the master degree programme courses
Master Research Project Mechanical Engineering	WMME902-40	40	Passed 45 ECTS of the master degree programme courses

**Materials for Mechanical Engineering Track:**

Course unit name	Course code	EC TS	Entry requirements
Introduction to Data Science	WMME027-05	5	
Micromechanics	WMPH012-05	5	
Computational Mechanics	WMME017-05	5	
Surface Engineering and Coating Technology	WMIE013-05	5	
Smart materials for Engineering	WMME021-05	5	
Experimental Design	WMME012-05	5	
Course in Business, Management and Society		5	
Elective courses		25	
Master Design Project Mechanical Engineering	WMME901-20	20	Passed 45 ECTS of the master degree programme courses
Master Research Project Mechanical Engineering	WMME902-40	40	Passed 45 ECTS of the master degree programme courses

The assessment method of the courses can be found in the assessment plan of the degree programme and on [www.rug.nl/ocasys](http://www.rug.nl/ocasys).

The teaching method of the courses can be found on [www.rug.nl/ocasys](http://www.rug.nl/ocasys).

**Courses in Business, Management and Society**

Course unit name	Course code	EC TS	Entry requirements
Technology Based Entrepreneurship	WMIE006-05	5	
Global Change	WMEE008-05	5	
Sustainability for Engineers	WMIE020-05	5	

### Joint project options for obtaining a master's degree in a closely related programme

Course unit name	Course code	ECTS	Entry requirements
Master Research Project IEM-ME*	Will follow	55	- Passed 45 ECTS of courses of both the IEM and ME master programmes - Passed Research Methodology (IEM)
Master Design Project IEM**	WMIE901-25	25	- Passed 45 ECTS of courses of both the IEM and ME master programmes - Passed Research Methodology (IEM)
Master's Research Project ME-EES***	WMEE909-50	50	- Passed 45 ECTS of courses of the ME master programmes

\*The joint Master Research Project IEM-ME is available only to students enrolled in both the Mechanical Engineering and Industrial Engineering and Management master programmes. This joint project replaces, and cannot be combined with, the regular Research Projects in both programmes.

\*\*The IEM Design Project is available to students enrolled in both the Mechanical Engineering and Industrial Engineering and Management master programmes. This project may substitute, or be followed in addition to, the Master Design Project Mechanical Engineering.

\*\*\* The joint Master Research Project ME-EES is available only to students enrolled in both the ME and EES master programmes. This joint project replaces, and cannot be combined with, the regular ME Research Projects. For the entry requirements of EES, check the EES TER appendices.

## Appendix IV Electives (art. 3.8)

### Electives for Advanced Instrumentation Track

Course unit name	Course code	ECTS
Multibody and Nonlinear Dynamics	WMME009-05	5
Robotics for IEM	WMIE005-05	5
Space Mission Technology	WBAS003-05	5
Advanced Bio-Signal Processing for Human Machine Interaction	Will follow	5
Microfluidics	WMME020-05	5
Advanced Detection Techniques	WMME005-05	5
MEMS, NEMS and Nanofabrication	WMIE010-05	5
Fitting Dynamical Models to Data	WMIE007-05	5
Surface Engineering and Coating Technology	WMIE013-05	5
Structure at Macro, Meso and Nano Scale	WMPH020-05	5
Multiscale Contact Mechanics and Tribology	WMIE011-05	5
Applied Optics	WMME010-05	5
Characterisation of Materials	WMPH021-05	5
Scientific Visualisation	WMCS018-05	5
Finite Element Methods for Fluid Dynamics	WMMA016-05	5
Modelling and Control of Complex Nonlinear Engineering Systems	WMMA020-05	5
Product Design by the Finite Element Method	WMIE003-05	5
Medical Imaging Instrumentation	WMME014-05	5
Opto-Mechatronics	WMME015-05	5
Systems Engineering	WMIE021-05	5
Data-Driven Optimization	WMME011-05	5

### Electives for Smart Factories Track

Course unit name	Course code	ECTS
Multibody and Nonlinear Dynamics	WMME009-05	5
Basic Detection Techniques	WMAS002-05	5
Convex Optimization	WMMA006-05	5
Advanced Bio-Signal Processing for Human Machine Interaction	Will follow	5
Advanced Detection Techniques	WMME005-05	5
Fitting Dynamical Models to Data	WMIE007-05	5
Structure at Macro, Meso and Nano Scale	WMPH020-05	5
Multiscale Contact Mechanics and Tribology	WMIE011-05	5
MEMS, NEMS and Nanofabrication	WMIE010-05	5
Surface Engineering and Coating Technology	WMIE013-05	5
Robotics for AI	WMAI011-05	5
Modelling and Control of Complex Nonlinear Engineering Systems	WMMA020-05	5
Characterisation of Materials	WMPH021-05	5
Scientific Visualisation	WMCS018-05	5
Finite Element Methods for Fluid Dynamics	WMMA016-05	5
Product Design by the Finite Element Method	WMIE003-05	5
Smart Materials for Engineering	WMME021-05	5
Finite Element Modelling for Advanced Processing	WMME013-05	5
Data-Driven Optimization	WMME011-05	5
Opto-Mechatronics	WMME015-05	5
Polymer Physics	WMCH025-05	5
Systems Engineering	WMIE021-05	5

### Electives for Process Design for Energy Systems Track

Course unit name	Course code	ECTS
Multibody and Nonlinear Dynamics	WMME009-05	5
Advanced Reactor Technologies	WMME016-05	5
Interfacial Engineering	WMCE003-05	5
Hydrogen, Fuels and Electrolysers	WMME019-05	5
Microfluidics	WMME020-05	5
MEMS, NEMS and Nanofabrication	WMIE010-05	5
Surface Engineering and Coating Technology	WMIE013-05	5
Finite Element Methods for Fluid Dynamics	WMMA016-05	5
Fuel Cell Systems	WMEE015-05	5
Product design by the Finite Element Method	WMIE003-05	5
Processes, Energy and Materials Modeling	WMEE016-05	5
Advanced Polymer Processing	WMCE006-05	5
Compressible Flows	WMCE008-05	5
Finite Element Modelling for Advanced Processing	WMME013-05	5
High- and Low-Temperature Fuel Cells	WMME026-05	5
CFD for Engineers	WMCE013-05	5

### Electives for Materials for Mechanical Engineering Track

Course unit name	Course code	ECTS
Multibody and Non-Linear Dynamics	WMME009-05	5
Interfacial Engineering	WMCE003-05	5
Computational Physics	WMPH007-05	5
Advanced Processing for Complex Materials	WMME007-05	5
Microfluidics	WMME020-05	5
MEMS, NEMS and Nanofabrication	WMIE010-05	5
Multiscale Contact Mechanics and Tribology	WMIE011-05	5
Structure at Macro, Meso and Nano Scale	WMPH020-05	5
Fracture of Materials	WMME023-05	5
Finite Element Methods for Fluid Dynamics	WMMA016-05	5
Characterisation of Materials	WMPH021-05	5
Product Design by the Finite Element Method	WMIE003-05	5
Compressible Flows	WMCE008-05	5
Finite Element Modelling for Advanced Processing	WMME013-05	5
Systems Engineering	WMIE021-05	5
Polymer Physics	WMCH025-05	5
CFD for Engineers	WMCE013-05	5

The assessment method of the courses can be found in the assessment plan of the degree programme and on [www.rug.nl/ocasys](http://www.rug.nl/ocasys).

The teaching methods and entry requirements of the courses can be found on [www.rug.nl/ocasys](http://www.rug.nl/ocasys).

### Appendix V Entry requirements and compulsory order of examinations (art. 4.4)

A student is allowed to start with either the Design- or Research project if at least 45 ECTS of first year courses have been passed.

### Appendix VI Admission to the degree programme and different specializations (art. 2.1)

Holders of the following Bachelor's degrees from Universities in the Netherlands will be admitted to the Master's degree programme:

1. BSc Mechanical Engineering
2. BSc Aerospace Engineering

Holders of the following Bachelor's degrees from the University of Groningen are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in Mechanical Engineering on that basis:

\* BSc Applied Physics:

Requirements:

1. Computer Aided Design and Manufacturing

\* BSc Physics

Requirements:

1. Computer Aided Design and Manufacturing
2. Mechanics for IEM
3. Control Engineering

\* BSc Astronomy, minor Instrumentation and Informatics

Requirements:

1. Computer Aided Design and Manufacturing

\* BSc Applied Mathematics

Requirements:

1. Computer Aided Design and Manufacturing

\* BSc Industrial Engineering and Management

Requirements:

1. Computer Aided Design and Manufacturing
2. Mechanics for IEM
3. Control Engineering

## Appendix VII Transitional provisions (art 7.1)

The transitional arrangement is an arrangement that students can use if they wish to replace a course that is part of their Teaching and Examination Regulations, but either no longer exists or has been changed to a different course in a later set of Teaching and Examination Regulations. In some cases, an arrangement can consist of multiple courses. If a transition is not in the list of transitional arrangements, students will need permission of the Board of Examiners first.

Discontinued course units				Substitute course units				
Course unit code	Course unit name	ECTS	Final exam period	Course unit code	Course unit name	ECTS	Explanation	Equivalent Yes/No
WMME024-05	Advanced Powder Technologies	5	2020-2021*	-	-	-	course has been removed from the programme	-

\*Course was not taught in 2020-2021 due to no participants

### Additional transitional arrangement (2019-2020)

Discontinued course units				Substitute course units				
Course unit code	Course unit name	ECTS	Final exam period	Course unit code	Course unit name	ECTS	Explanation	Equivalent Yes/No
WMME19001	Computational Mechanics 1	5	-	WMME017-05	Computational Mechanics	5	Course has been renamed	Yes
WMME19005	Computational Mechanics 2	5	2020-2021	-	-	-	Course has been removed from the programme	-
EBMo51B05	Strategic Management of Inf. Technology	5	2019-2020	-	-	-	Course has been removed from the	-
WMCS16002	Introduction to Data Science	5	2020-2021	WMME027-05	Introduction to Data Science	-	Course had been replaced by ME-specific course	Yes



## Appendix VIII Application and decision deadlines for admission (art 2.6) and Open Degree Programme (art 5.6)

### Programmes starting on 1 September 2021

Degree programme	Application deadline	Decision deadline
Artificial Intelligence	01 May 2021	15 June 2021
Behavioural and Cognitive Neurosciences - Research (selective)	01 May 2021	15 June 2021
Biology	01 May 2021	15 June 2021
Biomedical Engineering	01 May 2021	15 June 2021
Biomedical Sciences	01 May 2021	15 June 2021
Biomolecular Sciences (selective)	01 May 2021	15 June 2021
Chemistry (selective)	01 May 2021	15 June 2021
Ecology and Evolution (selective)	01 May 2021	15 June 2021
Energy and Environmental Sciences	01 May 2021	15 June 2021
Computational Cognitive Science (formerly Human-Machine Communication)	01 May 2021	15 June 2021
Marine Biology (selective)	01 May 2021	15 June 2021
Mechanical Engineering	01 May 2021	15 June 2021
Industrial Engineering and Management	01 May 2021	15 June 2021
Medical Pharmaceutical Sciences	01 May 2021	15 June 2021
Nanoscience Dutch/EU/EEA (selective)	01 May 2021	15 June 2021
Nanoscience non-EU/EEA (selective)	01 February 2021	15 June 2021
Science Education and Communication	01 May 2021	15 June 2021

### Programmes starting on 1 September 2021 and 1 February 2022

Degree programme	Application deadline 1 September	Decision deadline 1 September	Application deadline 1 February	Decision deadline 1 February
Applied Mathematics	01 May 2021	15 June 2021	15 October 2021	15 November 2021
Applied Physics	01 May 2021	15 June 2021	15 October 2021	15 November 2021
Astronomy	01 May 2021	15 June 2021	15 October 2021	15 November 2021
Chemical Engineering	01 May 2021	15 June 2021	15 October 2021	15 November 2021
Computing Science	01 May 2021	15 June 2021	15 October 2021	15 November 2021
Teacher Education (post-master)	01 May 2021	15 June 2021	15 October 2021	15 November 2021
Mathematics	01 May 2021	15 June 2021	15 October 2021	15 November 2021
Pharmacy	01 May 2021	15 June 2021	15 October 2021	15 November 2021
Physics	01 May 2021	15 June 2021	15 October 2021	15 November 2021
Water Technology (joint degree)	01 May 2021	15 June 2021	15 October 2021	15 November 2021

### Open degree programme

In exceptional circumstances students wishing to pursue an open degree programme may file a request with the Board of Examiners. The Board of Examiners will evaluate whether the proposed curriculum meets the learning outcomes of the degree programme and can determine further conditions in their Rules and Regulations.