Appendix Master degree programme Chemical Engineering

Appendix I Learning outcomes of the degree programme (art. 3.1)

The objectives of the master's degree programme Chemical Engineering are:

- to prepare students for an independent professional career; in this context this means being able to carry out fundamental or applied scientific research, as well as applying state of the art scientific variety of new practical situations,
- to make students develop skills, knowledge and insight in a specialization area of the field of study, with a focus on insight in and approach to scientific problems,
- to make students develop the ability to clearly and concisely communicate the acquired knowledge to others.

The objectives of the programme result in the following learning outcomes

A. General academic skills for the master's degree programme Chemical Engineering

The graduate

A1. is able to keep up with and make use of professional literature in relevant subfields,
A2. is able to make himself/herself familiar with a subfield of the own discipline within a reasonable time span,
A3. is able to formulate a research plan based on a global problem description in a subfield of the own discipline,
A4. is able to analyze, interpret using state of the art information, and draw conclusions from research results,
A5. is able to operate effectively in a position in which knowledge and research skills within the field of the own discipline are required,
A6. is able to perform in a multidisciplinary team, transfer knowledge to others, give oral presentations, write a report or internationally accessible scientific article, and take part in a scientific discussion,
A7. is able to design, conduct and evaluate experiments and the necessary checks and balances independently,
A8. is able to relate their own results and conclusions to results already available in the literature,
A9. has sufficient understanding of the role of the own discipline in society to come to a well-considered choice and practice of profession,
A10. has an understanding of the role of the own discipline in a sustainable society.

B. Specific academic knowledge and skills for the master's degree programme Chemical Engineering.

Engineering knowledge and skills: the graduate has acquired specific knowledge and skills in the area of fundamental and applied engineering sciences. More specifically, the graduate:

B1. is able to design a realistic process including specifying the sub-steps, like drawing flow charts, describing equipment and process flows, and calculating the behavior of process equipment; as well as to provide alternatives for these separate steps,
B2. has an understanding of: (i) process-product relations, (ii) ways to minimize byproduct and waste streams, (iii) manufacturing routes for classes of molecules and products.

Academic knowledge and skills in the product and process technology: the graduate is able to design chemical products and the related process based on a multidisciplinary approach (chemical and technological aspects). More specifically, the graduate:

B3. has knowledge on product formulation, specifications, catalytic systems, analytical methods, interactions between components and relevant physical and mechanical methods for the manufacture of chemical or biotechnological products within one of the 'product sectors' bio-based products, industrial catalysis or polymeric products.

B4. is able to design a realistic product and associated process, either focussing on the product within one of the 'product sectors' bio-based products, industrial catalysis or polymeric products, or focussing on the process through advanced process technology. This includes an analysis and design of all sub-steps, including specification of product properties, product flow diagrams, a description of the process and processing equipment, as well as providing alternatives for these steps.

Appendix II Specializations of the degree programme (art. 3.6)

The degree programme has the following specializations:

- Bio-based Products
- Industrial Catalysis
- Polymeric Products
- Advanced Process Technology
- Renewable Energy

Appendix III Content of degree programme (art. 3.8)

Practicals are defined as lab practicals

Course unit	**ECTS**	**Practical**	**Entry requirements**
Research project	45	x	Passed 35 ECTS of the Master's degree programme of Chemical Engineering and completion of Scientific Integrity and Safety
Internship	20*	x	Passed 35 ECTS of the Master's degree programme of Chemical Engineering and completion of Scientific Integrity and Safety
Scientific Integrity and Safety	-		
Bio-based Products	5		
Catalysis for Engineers	5		
Interfacial Engineering	5		
Particulate Products	5	x	
Polymer Products	5		
Advanced Product Engineering	5		
One of the specializations in Sustainable Product and Process Technology (packages of 3 electives each) can be chosen: ● Advanced Process Technology ● Bio-based Products ● Industrial Catalysis ● Polymeric Products ● Renewable Energy	15	See tables below	

Electives	10	To be chosen from the courses in the specializations or from the list in Appendix IV	

*The Internship is 20 ECTS and can be extended, before the start of the project, to 25 ECTS (at the expense of one elective course) after approval of the Board of Examiners.

Advanced Process Technology	ECTS	Practical	**Entry requirements**
Advanced Process and Energy Technologies	5		
Advanced Polymer Processing	5		
One of these two courses has to be chosen:			
Product focused Process Design	5		
Microfluidics (ME)	5		

Bio-based Products	ECTS	Practical	**Entry requirements**
Food pharma products	5		
Product focused Process Design	5		
One of these two courses has to be chosen:			
Design of Industrial Catalysts	5		
Biocatalysis for Engineers	5		

Industrial Catalysis	ECTS	Practical	**Entry requirements**
Design of Industrial Catalysts	5		
Homogeneous Catalysis	5		
One of these two courses has to be chosen:			
Biocatalysis for Engineers	5		
Electrochemical Systems & Engineering	5		

Polymeric Products	**ECTS**	**Practical**	**Entry requirements**
Food pharma products	5		
Advanced Polymer Processing	5		
Circular Polymers	5		

Renewable Energy	**ECTS**	**Practical**	**Entry requirements**
Electrochemical Systems & Engineering	5		
Sustainable Electrical Energy Storage	5		
One of these three courses has to be chosen:			
Advanced Process and Energy Technologies	5		
Hydrogen, Fuels and Electrolysers (ME)	5		
Photovoltaics Science and Energy	5		

Appendix IV Electives (art. 3.9.1)

Course unit	**ECTS**	**Practical**	**Entry requirements**
Biomaterials 2	5		

Advanced Processing for Complex Materials (ME)	5		
Bioinspired Designer Materials	5		
Functional properties	5		
Analysis and Control of Smart Systems	5		
Characterisation of Materials (PH)	5		
Compressible Flows	5		
Sustainable Energy Supply (FEB)	5		
CFD for Engineers	5		
Engineered nanomaterials for industry	5		
Management of Product Innovation	5		
Sustainable Industrial Practice (IEM)	5		
Electives on individual approval of the Board of Examiners		See course unit	

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

Entry requirements are mentioned in tables appendices III and IV.

Appendix VI Admission to the degree programme (art. 2.1A.1 + art. 2.1B.1)

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 Chemical Engineering on that basis:
- BSc Chemical Engineering

Appendix VII Transitional provisions (art. 7.1)

For cohort 2021-2022 and earlier

Course	May be replaced with	Reason

Appendix VIII Additional Requirements Open degree Programmes (art. 3.10)

N/A

Appendix IX Application and decision deadlines for admission (art. 2.7.1 and 2.7.3)

Programmes starting on 1 September

Programme	Deadline of Application	Deadline of decision
Behavioural and Cognitive Neurosciences	1 May 2022	1 June 2022
Biology	1 May 2022	1 June 2022
Biomedical Engineering	1 May 2022	1 June 2022
Biomedical Sciences	1 May 2022	1 June 2022
Biomolecular Sciences	1 May 2022	1 June 2022
Chemistry	1 May 2022	1 June 2022
Ecology and Evolution	1 May 2022	1 June 2022
Energy and Environmental Sciences	1 May 2022	1 June 2022
Human-Machine Communication	1 May 2022	1 June 2022
Marine Biology	1 May 2022	1 June 2022
Mechanical Engineering	1 May 2022	1 June 2022
Medical Pharmaceutical Sciences	1 May 2022	1 June 2022
Nanoscience: for non-EU/EEA students	1 February 2022	1 June 2022
Nanoscience: for EU/EEA students	1 May 2022	1 June 2022
Science Education and Communication	1 May 2022	1 June 2022

Programmes starting on 1 September and 1 February

Programme	Deadline of Application for 1 September	Deadline of decision for 1 September	Deadline of Application for 1 February	Deadline of decision for 1 February
Applied Mathematics	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Applied Physics	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Artificial Intelligence	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Astronomy	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Chemical Engineering	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Computing Science	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Farmacie	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Industrial Engineering and Management	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Mathematics	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Physics	1 May 2022	1 June 2022	15 October 2022	15 November 2022