Assessment plan for the curriculum of theMaster's degree programme in Chemical Engineering, 2024-2025

Programme director : P.J. Deuss

Date advice Board of Examiners : 16-7-2024

Date approval Faculty Board :

1. Vision on assessment

1. The programme assesses the students' knowledge, skills and understanding in the field of chemical engineering to design technological processes and products.
2. The programme uses formative and summative assessments and a variety of assessment methods such as written exams, open book exams, oral exams, presentations, assignments, reports and practical work.
3. The programme assesses the students on their critical thinking, operating in small teams and scientific communication orally and in writing.
4. The programme assesses retention and synthesis of knowledge obtained in various courses, thus setting the foundation for lifelong learning.

2. Assessment guidelines

1. The chosen assessment methods should be aligned with the learning objectives and class activities.
2. Grading should be reliable and transparent (e.g. use and sharing of grading schemes and rubrics).
3. Individual grades from group assignments should be determined using peer assessment methods or by oral presentation/exam or by assessing the individual contributions to the work.
4. Summative assessment is performed onsite and should be used to demonstrate learning objectives of individual course units but can be extended to key prior knowledge for these.
5. Formative assessment should be used in courses where possible and set up to stimulate students to respond adequately to critical feedback.
6. Exam viewing sessions are offered and feedback on assessed parts of the course will be provided.
7. Clear guidelines on the use of AI tools will be provided for each course unit as applicable.

3. Learning outcomes of the master's degree programme Chemical Engineering

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 knowledge in a wide 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:

General academic skills for the master's degree programme Chemical Engineering
The graduate :

1. is able to keep up with and make use of professional literature in relevant subfields,
2. is able to make himself/herself familiar with a subfield of the own discipline within a reasonable time span,
3. is able to formulate a research plan based on a global problem description in a subfield of the own discipline,
4. is able to analyze, interpret using state of the art information, and draw conclusions from research results,
5. is able to operate effectively in a position in which knowledge and research skills within the field of the own discipline are required,
6. 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,
7. is able to design, conduct and evaluate experiments and the necessary checks and balances independently,
8. is able to relate his/her own results and conclusions to results already available in the literature,
9. has sufficient understanding of the role of the own discipline in society to come to a well-considered choice and practice of profession,
10. has an understanding of the role of the own discipline in a sustainable society.

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

- the graduate has acquired specific knowledge and skills in the area of **fundamental and applied engineering sciences**. More specifically, the graduate
    1. 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,
    2. 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 processes** based on a multidisciplinary approach (chemical and technological aspects). More specifically, the graduate
    3. 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.

4. is able to design a realistic chemical product and associated process. This includes an analysis and design of all sub-steps, including specification of product properties, product flow diagrams, a description of process and processing equipment, as well as to provide alternatives for these steps.

4. Overview of assessment methods, test moments for course units, and examiners

(WE: Written Exam, MC: Multiple Choice, OE: Oral Exam, R: Report, P: Practica Work, AST: Assignment)

Period	Course Code	Course Name	EC	Assessment	Formatief Function?	First examiner	Second examiner
1a	WMBE001-05	Biomaterials 2	5	See assessment plan BE			
1a	WMCE002-05	Catalysis for Engineers	5	WE		H.J. Heeres	J. Xie
1a	WMCE005-05	Polymer Products	5	R,P,AST	Yes	R.K. Bose	F. Picchioni
1a	WMCE020-00	Scientific Integrity and Safety	0	AST		P.J. Deuss	P. P. Pescarmona
1a	WMME029-05	Electrochemical Systems and Engineering	5	See assessment plan ME			
1b	EBM202A05	Sustainable Energy Supply	5	See assessment plan FEB			
1b	WMCE003-05	Interfacial Engineering	5	WE,AST		P. Raffa	D. Parisi
1b	WMCE007-05	Advanced Product Engineering	5	R,P		F. Picchioni	R.K. Bose
1b	WMCE021-05	Processes and Products for a Sust. Carbon Cycle	5	R,P,AST	Yes	P.J. Deuss	J. Xie
1b	WMCH009-05	Bioinspired Designer Materials	5	WE,P		M.M.G. Kamperman	G. Portale
1b	WMCH011-05	Photovoltaics Science and Energy	5	WE,R,P		L.J.A. Koster	G. Portale
1b	WMIE034-05	Advanced LCA for Sustainability	5	See assessment plan IEM			
1b	WMME007-05	Advanced Processing for Complex Materials	5	See assessment plan ME			
1b	WMME020-05	Microfluidics	5	See assessment plan ME			
1b	WMPH051-05	Properties of Functional Materials	5	See assessment plan PH			
2a	WMCE006-05	Advanced Polymer Processing	5	WE,PR,AST		D. Parisi	P.D. Druetta
2a	WMCE008-05	Compressible Flows	5	WE,R,PR,AST	Yes	P.D. Druetta	D. Parisi
2a	WMCE009-05	Design of Industrial Catalysts	5	WE,R,P	Yes	P.P. Pescarmona	V. Kyriakou
2a	WMCE010-05	Homogeneous Catalysis	5	WE,AST	Yes	P.J. Deuss	H.J. Heeres
2a	WMCE011-05	Product Focused Process Design	5	OE,R		A. Hommes	J.G.M. Winkelman
2a	WMCE017-05	Circular Polymers	5	WE,P	Yes	R. Duchateau	F. Picchioni
2a	WMCH029-05	Sustainable Electric Energy Storage	5	OE,AST		M. Tromp	W.R.Browne
2a	WMPH021-05	Characterisation of Materials	5	See assessment plan PH			
2b	EBB652B05	Management of Product Innovation	5	See assessment plan FEB			

2b	WMCE012-05	Advanced Process and Energy Technologies	5	MC,R,P		J. Yue	V. Kyriakou
2b	WMCE013-05	CFD for Engineers	5	WE,R,PR,AST	Yes	P.D. Druetta	D. Parisi
2b	WMCE014-20	Internship	20	R,P,PR		Individual supervisor	Individual supervisor
2b	WMCE015-05	Biocatalysis for Engineers	5	,R,P,		E. Jurak	J.G.M. Winkelman
2b	WMCE016-05	Engineered Nanomaterials for Industry	5	P,AST		L. Protesescu	P. P. Pescarmona
2b	WMIE008-05	Food Pharma Products	5	See assessment plan IEM			
2b	WMIE027-05	Sustainable Industrial Practice	5	See assessment plan IEM			
2b	WMME019-05	Hydrogen, Fuels and Electrolysers	5	See assessment plan ME			
all	WMCE901-45	Research Project in Chemical Engineering	45	R,P,PR,AST	Yes	Individual supervisor	Individual supervisor

Examiners for individual projects

Acuautla Meneses, M.I.
Bose, R.K.
Deuss, P.J.
Duchateau, R.*
Druetta, P.D.
Euverink, G.J.W.
Heeres, H.J.
Hommes, A.
Jurak, E.
Kamperman, M.M.G.
Karka, P.
Kottapalli, A.G.P
Kyriakou, V
Li, X.
Morales Hernández, D.M.
Parisi, D.
Pescarmona, P.P.
Picchioni, F.
Protesescu, L.*
Raffa, P.
Winkelman, J.G.M.
Xie, J.
Yue, J.

* Examiners without UTQ, should be accompanied by a certified examiner

An examiner for the Master Research Project of the master Chemistry can act as a second supervisor for the Master Research Project of the master Chemical Engineering.

5. Relationship between course units and details of the learning outcomes

(X : the learning outcome is explicitly assessed in the course.)

	Course	Compulsory courses													
Learning outcomes		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
all	Master Research Project	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2b	Internship	x	x	x	x	x	x	x	x	x	x	x	x	x	x
1a	Catalysis for Engineers		x		x	x				x	x	x	x	x	x
1a	Polymer Products	x	x		x	x	x			x	x		x	x	x
1a, 2a	Scientific Integrity and Safety									x	x				
1a	Electrochemical Systems & Engineering	x	x	x	x					x	x			x	x
1b	Interfacial Engineering		x		x								x	x	x
1b	Advanced Product Engineering	x	x		x	x	x						x	x	x
1b	Processes and Products for a Sust. Carbon Cycle	x			x		x		x	x	x		x	x	
	Course	**Specialisation courses**													
Learning outcomes		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
	Advanced process technology														
2a	Advanced Polymer Processing	x	x		x	x			x			x	x	x	x
2a	Product Focused Process Design	x	x				x			x		x		x	x
2b	Advanced Process and Energy Technologies	x	x		x				x		x	x	x	x	x
	Bio-based products and processes														
2a	Design of Industrial Catalysts	x	x		x	x	x		x	x	x		x	x	x
2a	Product Focused Process Design	x	x				x			x		x		x	x
2b	Biocatalysis for Engineers	x	x	x	x		x		x	x	x	x	x	x	x
	Industrial catalysts														
2a	Design of Industrial Catalysts	x	x		x	x	x		x	x	x		x	x	x
2a	Homogeneous Catalysis	x	x										x	x	
2b	Biocatalysis for Engineers	x	x	x	x		x		x	x	x	x	x	x	x
2b	Engineered nanomaterials for industry	x	x		x		x		x	x			x	x	x

	Polymeric products														
2a	Advanced Polymer Processing	x	x		x	x			x			x	x	x	x
2a	Circular Polymers	x	x			x	x				x		x	x	x
	Renewable Energy														
2a	Design of Industrial Catalysts	x	x		x	x	x		x	x	x		x	x	x
2b	Advanced Process and Energy Technologies	x	x		x				x		x	x	x	x	x
	Course	**Electives**													
Learning outcomes		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
2a	Compressible Flows	x	x		x		x	x				x			
2b	CFD for Engineers	x	x		x		x	x	x			x			