Assessment plan master's degree programme Chemistry 2022-2023

Introduction

This assessment plan is a systematic description of the type of assessment used in the various modules of the master's degree programme Chemistry. This assessment plan fits within the assessment policy of the Faculty of Science and Engineering[1], and the protocol used by the Board of Examiners of the degree programme[2].

The assessment plan is based on:

- the learning outcomes of the degree programme (Appendix 1);
- the Teaching and Examination regulations of the degree programme;
- the description of the various modules of the degree programme in the digital course catalogue *Ocasys*, including:
  - Objective of the module;
  - Course content;
  - Lecturers and examiners;
  - Assessment method used;
  - Lecture format.

The assessment plan contains two parts:

1. An overview of the examiners and assessment types used for all modules in the master's degree programme Chemistry.

   The following types of assessments are distinguished in this scheme:
   - Written examination (WE)
   - Multiple choice (MC)
   - Interim Test (IT)
   - Oral examination (OE)
   - Assignment (AST)
   - Report (R)
   - Assessment of Practical work, including laboratory and computer work (PR)
   - Presentation (P)
   - Mandatory Attendance (Att)

2. Matrices describing the relation between the various modules of the master's degree programme Chemistry and the learning outcomes of the degree programme.

[1] FSE Quality Assurance Manual 2018-2019

[2] Quality Assurance Guide for the Board of Examiners 2015

Part 1: Examiners and assessment type of course units in the degree programme

(examiner in bold is first examiner)

Course unit	Examiners	Assessment type
Core programme		
Research Project	See list of examiners	R, P, PR
Second Research Project	**See list of examiners** / W.R. Browne	R, P, PR
Colloquium	See list of examiners	R, P
Final Examination	See list of examiners	OE
Structure Determination with Spectroscopic Methods	**T. Canrinus** / M. Tromp	WE, AST
Reaction Mechanisms	**T. Kudernac** / S. Otto	WE
Scientific Integrity	**program director**	Att
Courses available for specializations		
Structure at Macro, Micro and Nano Scale (PH)	**L.J.A. Koster** / B.J. Kooi	WE, AST
Bioinspired designer materials	**M. Kamperman** / G. Portale	WE, P
Physical Methods for Chemical analysis	**M. Tromp** / W.R. Browne	OE, AST
Supramolecular Chemistry	**S. Otto** / M.M. Lerch	WE, P, PR
Sustainable electric energy storage	**M. Tromp** / W.R. Browne	OE, AST
Biocatalysis and Green Chemistry	**M.W. Fraaije** / K.U. Loos	WE, P, R
Organic Synthesis: Methods and Strategy 1	**S. Harutyunyan** / B.L. Feringa	WE
Chemical Catalysis	**S. Harutyunyan** / P.P. Pescarmona	WE
Protein and Enzyme Engineering (MBB)	**G. Maglia** / M.W. Fraaije	P, PR, AST
Advances in Chemical Biology	**M.D. Witte** / M.T.C. Walvoort	WE, P
Synthetic Biology & Systems Chemistry	**M. Heinemann** / S. Otto	WE, P, PR
Practical Physical Chemistry of Polymers	**M. Kamperman** / D. Maniar	OE, R, PR
Stereochemistry	**T. Kudernac** / B. L. Feringa	WE, R
Photovoltaics Science and Energy	**L.J.A. Koster** / J.C. Hummelen	WE, R, P
Organometallic Chemistry	**E. Otten** / J.E.M.N. Klein	WE, AST
Computational Chemistry	**R.W.A. Havenith** / J. Slawinska	OE, R, P
Organic Synthesis: Methods and Strategy 2	**M.T.C. Walvoort** / A.J. Minnaard	WE
Polymer Physics	**G. Portale**/ K.U. Loos	WE, R, P
Photochemistry and Photoredox catalysis	**S.B. Beil** / W.R. Browne	OE, AST
Molecular Dynamics (MMB)	See Assessment plan MMB	
Biomaterials 2 (BME)	See Assessment plan BME	
Interfacial Engineering (CE)	See Assessment plan CE	
Bio-based Products (CE)	See Assessment plan CE	
Polymer Products (CE)	See Assessment plan CE	
Design of Industrial Catalysts (CE)	See Assessment plan CE	
Product Focused Process Design (CE)	See Assessment plan CE	
Skills in Science Communication (EC)	See Assessment plan EC	
Astrochemistry (AST)	See Assessment plan AST	
Biophysical Imaging & Manipulation Techniques (PH)	See Assessment plan PH	
Track Erasmus Mundus Theoretical Chemistry and Computing Modelling		
Molecular Dynamics (MBB)	**S.J. Marrink** / A.H. de Vries	WE, PR, P
Molecular Quantum Mechanics 1	**R.W.A. Havenith** / J.E.M.N. Klein	WE
Molecular Quantum Mechanics 2	**S.S. Faraji** / R.W.A. Havenith	WE, AST
Topics in chemistry with Python	**S.S. Faraji** / W.R. Browne	R, P, AST
Track Science Business and Policy		
Introduction Science and Business	**S. Grooters** / G.J.W. Euverink	WE, R, AST
Introduction Science and Policy	**S. Grooters** / J. Zevenberg	WE, R, AST
Internship Business and Policy	**S. Grooters** / all SBP staff	AST

Examiners for individual projects:

Beil, S.B.*
Bianchi, F.
Blake, G.R.
Borschevsky, A.*
Bozorg, M.*
Browne, W.R.
Canrinus, T.R.
Chiechi, R.C.
Eisink, N.N.H.M.
Even, J.
Faraji, S.S.
Feringa, B.L. (exempt)
Fraaije, M.W.
Hage, R.*
Harutyunyan, S.
Havenith, R.W.A.
Heinemann, M.
Hofman, A.H.*
Incarnato, D.*
Kamperman, M.
Katsonis, N.H.
Klein, J.E.M.N.
Kudernac, T
Lerch, M*
Loos, K.U.
Maglia, G.
Marrink, S.J.
Mayer, C.
Maniar, D.*
Minnaard, A.J.
Noheda Pinuaga, B.
Otten, E.
Otto, S.
Poolman, B.
Portale, G.
Protesescu, L.*
Reintjens, N.R.M.*
Rijn, P. van
Roelfes, J.G.
Roos, W.H.
Slotboom, D.J.
Szymanski, W.C.
Thunnissen, A.M.W.H.
Tromp, M.
Tych, K.M.
Vries, A.H. de
Walvoort, M.T.C.
Witte, M.D.

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

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

Part 2: Relation between the learning outcomes and the curriculum

x: learning outcomes achieved in a particular course unit of the curriculum
(for the learning outcomes see Appendix 1)

	General										CH		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**
Core programme													
Research project	x	x	x	x	x	x	x	x	x	x	x	x	
Second research project	x	x	x	x	x	x	x	x	x	x	x	x	x
Colloquium	x	x		x	x	x		x			x	x	x
Final examination		x			x	x					x		
Structure determination with spectroscopic methods		x		x	x		x				x		
Reaction mechanisms		x		x	x						x		
Scientific Integrity									x	x			
Courses available for specializations													
Bioinspired designer Materials	x	x		x		x					x		
Physical methods for chemical analysis		x		x	x						x		
Sustainable electric energy storage	x	x		x					x	x	x	x	
Supramolecular Chemistry	x	x									x		x
Biocatalysis and green chemistry	x	x				x		x		x	x	x	x
Organic synthesis: methods and strategy 1		x			x						x		
Chemical catalysis	x	x									x		x
Sustainability for engineers	x	x	x	x		x			x	x	x	x	x
Protein and enzyme engineering	x	x		x	x	x	x	x			x		x
Advanced protein cristallography	x	x		x	x	x	x				x		x
Advances in chemical biology		x			x	x					x		
Synthetic biology and systems chemistry	x	x		x		x		x			x		x
Practical Physical Chemistry of Polymers	x	x	x	x	x	x	x				x		x
Stereochemistry	x	x		x	x	x			x		x		
Photovoltaics Science and Energy	x	x		x		x			x	x	x	x	
Organometallic chemistry		x			x						x		
Computational chemistry	x	x			x	x		x			x		x
Organic synthesis: methods and strategy 2		x			x						x		
Polymer physics	x	x				x					x		
Erasmus Mundus TCCM													
Molecular dynamics	x	x		x		x		x					x
Molecular quantum mechanics 1		x			x			x			x		
Molecular quantum mechanics 2		x			x			x			x		
Topics in chemistry with Pyton	x	x	x	x			x			x	x		
Science, Business and Policy													
Introduction Science and Business					x	x			x	x			x
Introduction Science and Policy					x	x			x	x			x
Internship Business and Policy	x	x			x	x			x	x			x

Appendix 1: Learning outcomes of the master's degree programme Chemistry

The objectives of the master's degree programme Chemistry 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 Chemistry
The graduate:

1. is able to keep up with and make use of professional literature in relevant subfields,
2. is able to make themself familiar with a subfield of their own discipline within a reasonable time span,
3. is able to formulate a research plan based on a problem description in a subfield of their 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 their 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 their own discipline in a sustainable society.

Specific academic knowledge and skills for the master's degree programme Chemistry.
The graduate:

1. has advanced knowledge of aspects of the coherent fields of knowledge within chemistry, such as:

- synthesis, characterization and properties of materials; the relation between chemical and physical properties of materials on the one hand and the nature of the chemical bonding, and molecular and crystal symmetry on the other hand.
- reactions and interactions of molecules and the application of this insight in synthetic chemistry and catalysis as well as knowledge about sustainable chemistry.
- behavior and design of biochemical systems and their function properties. Synthetic biology as well as protein engineering.

2. is able to judge whether the properties of created products and possible side or waste products can result in undesired side effects in the short or long term,
3. is able to work at academic level on a research problem in an area of chemistry, which is not his/her own main field of study,
4. Science, Business and Policy specialization: is prepared for a professional career in management and policy.