

Assessment plan for the curriculum of the Master's degree programme in Industrial Engineering & Management, 2024-2025

Programme director: prof. A. Vakis

Date advice Board of Examiners: 20-06-2024

Date approval Faculty Board:

1. Vision on assessment

1. Ensure uniformity and fairness of assessment to increase program cohesion.
2. Design AI-proof assessment methods to reduce risks of plagiarism/ fraud, while instrumentalizing new technologies to enhance the quality of education.
3. Promote individual assessment over group assessment in the program to stimulate student growth and maturation: this is a differentiation between the Bachelor and Master IEM.
4. Increase adoption of digital formative assessment and tools to improve the efficiency of teaching and assessment.

2. Assessment guidelines

1. To inform and guide development of assessment methods and strategies regular data gathering and analysis of assessment outcomes per course unit is established to supplement information from course evaluations and focus groups.
2. Ensure course coordinators are kept abreast of new developments in AI/ LLM and how students use these in coursework, e.g., by making this a recurring topic in regular staff meetings. Use FSE assessment committee recommendations on dealing with AI/ LLM and potential plagiarism/ fraud issues that can arise from its use. In case of absence of a university-wide plan of action (i.e., in the short-term), identify one or two suitable course units where changes in assessment methods in response to this issue can be tested in pilot runs.
3. Systematic analysis of modes of assessment per course unit and distinction between individual and group work. Identify courses with heavy use of groupwork and investigate whether this is the ideal setup in the context of assessment outcomes (see guideline #1), in consultation with the course coordinator. For courses where groupwork is necessary, ensure that peer assessment is also implemented in the calculation of individual grades.
4. Investigate extent of use of written reports as main method of assessment across course units. In the context of LLM issues (see guideline #2) and depending on each case, written (and proctored) or oral exams may be better alternatives to written reports.
5. Review extent of use of formative assessment on Brightspace and provide resources and guidelines to course coordinators to enhance this aspect in their course units.
6. Engage with teaching staff on a regular basis (e.g., during staff meetings) to maintain overview of assessment issues and student performance throughout the program.

3. Learning outcomes of the degree programme

	Learning Outcome <i>At the end of the programme, the graduate has...</i>
1	The knowledge to describe complex and advanced technological processes and products in a managerial/business context.
2	The understanding to diagnose the functionality and performance of such processes and products in a multi-disciplinary way (e.g. technological, managerial and from viewpoint of various stakeholders).
3	The skills to (re)design, implement and then evaluate such processes and products. The knowledge, understanding and skills for doing research, i.e. applying industrial engineering methodologies in research.
4	The knowledge, understanding and skills for doing research, i.e. applying industrial engineering methodologies in research.
5	The knowledge, understanding and skills for life-long learning (including information retrieval and ICT-use) needed to function autonomously.
6	The skills to think critically and communicate scientifically about ideas and solutions with engineers and managers.
7	The knowledge and understanding of advanced technology, managerial/business sciences and mathematics to do research and to enter a PhD program in Industrial Engineering or a related discipline.
8	Professional skills for managerial, societal and ethical behaviour when applying technology.

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

This table shows all the course units for each year of the programme and assessment methods.

As the test moments of courses are not included in the Course Unit Assessment Overview and cannot reliably be taken from last year's schedule, the programme is unable to provide detailed information in the test moment(s) column. To ensure that the assessment moments of the compulsory courses do not all fall in the same period the programme will ask all course coordinators to fill in a spreadsheet in which they indicate in which weeks their assessment falls. This way the course coordinators can see when the assessment moments of the other courses in the programme are. In case there are several deadlines in the same week, the programme can contact the course coordinators to see whether some activities can be shifted.

The IEM programme also includes electives organised by other degree programmes that are not mentioned in the table below. For the details of those courses, please refer to the assessment plans of the programmes organising the course.

Year	Period	Course code	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
Core IEM courses									
1	1a	WMIE006-05	Technology Based Entrepreneurship	5	WE, AST	No		dr. A.J. Frederiks	dr. C. Gambirage
1	2b	WMIE027-05	Sustainable Industrial Practice	5	OR, R, P, AST	Yes		dr. ir. G.H. Jonker	dr. M. Taheri
1	2b	WMIE021-05	Systems Engineering	5	R, P, AST	Yes		dr. N. Szirbik	dr. A. Hübl
2	1a.12 a.1	WMIE025-05	Research Methodology	5	OR, R	Yes		dr. ing. H. Kloosterman	prof. dr. A. Vakis
2	var.	WMIE901-30	Research Project	30	P, R, PR	Yes		See appendix 1	Various
2	var.	WMIE901-25	Design Project	25	OR, P, R, PR	Yes		See appendix 2	Various

Year	Period	Course code	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
PTL compulsory courses									
1	1a	WMIE002-05	Foundations of Logistics Systems Engineering	5	WE, R	No		prof. dr. D. Bauso	prof. dr. A. Vakis
1	1a	WMIE005-05	Robotics for IEM	5	WE, R	No		dr. B. Haghighat	prof. dr. ir. B. Jayawardhana
1	1b	WMIE012-05	Simulations of Logistic Systems	5	AST, PR	Yes		dr. A. Hübl	ir. T. M. Kousemaker
1	2a	WMIE015-05	Analysis and Control of Smart Systems	5	WE	Yes		prof. dr. C. de Persis	prof. N. Monshizadeh Naini
SPE compulsory courses									
1	1a	WMIE028-05	Bioprocesses for Engineers	5	R, P	Yes		dr. ir. T.H.J.A. Sleutels	prof. dr. G.J.W. Euverink
1	1a	WMCE005-05	Polymer Products	5	AST, R, P	No		prof. R.K. Bose	prof. F. Picchioni
1	1b	WMIE034-05	Advanced LCA for Sustainability	5	R, AST, P			dr. P. Karka	dr. ir. G.H. Jonker
1	1b	WMCE007-05	Advanced Product Engineering	5	P, R	No		prof. F. Picchioni	prof. R.K. Bose
1	2a	WMCE006-05	Advanced Polymer Processing	5	WE, AST, P			dr. D. Parisi	dr. ir. P.D. Druetta
PTL electives									
1	1b	WMIE034-05	Advanced LCA for Sustainability	5	R, AST, P			dr. P. Karka	dr. ir. G.H. Jonker
1	1b	WMIE007-05	Fitting Dynamical Models to Data	5	WE	No		prof. dr. ir. B. Jayawardhana	prof. dr. M. Cao
1	1b	WMIE010-05	MEMS, NEMS and Nanofabrication	5	WE, MC	No		prof. dr. A.G.P. Kottapalli	prof. dr. Y. Pei

Year	Period	Course code	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
1	1b	WMIE013-05	Surface Engineering and Coating Technology	5	AST, R, WE	No		prof. dr. Y. Pei	dr. A.G.P. Kottapalli
1	1b	WMIE009-05	Game Theory with Engineering Applications	5	WE, P, R	No		prof. dr. D. Bauso	prof. dr. A. Vakis
1	2a	WMIE029-05	Engineering Design Integration	5	AST, P, R	Yes		prof. dr. ir. D. Lentink	dr. E.J. Stamhuis
1	2a	WMIE011-05	Multiscale Contact Mechanics and Tribology	5	WE, AST	No		prof. dr. A. Vakis	dr. F. Maresca
1	2a	WMIE003-05	Product Design by the Finite Element Method	5	AST	No		N. Younas	dr. ir. R. Luppés
1	2a	WMIE026-05	Optimization in Engineering Systems	5	WE, AST	No		prof. N. Monshizadeh Naini	prof. C. de Persis
1	2b	WMIE019-05	Introduction to Stochastic Programming	5	WE, AST	No		dr. A.K. Cherukuri	prof. dr. D. Bauso
SPE electives									
1	2a	WMIE029-05	Engineering Design Integration	5	AST, P, R	Yes		prof. dr. ir. D. Lentink	dr. E.J. Stamhuis
1	2a	WMIE018-05	Bioprocess Technology	5	R, P	No		dr. ir. T.H.J.A. Sleutels	prof. dr. G.J.W. Euverink
1	2b	WMIE008-05	Food Pharma Products	5	R	No		prof. dr. G.J.W. Euverink	dr. J. Krooneman

- Written Exam (WE)
- Multiple Choice (MC)
- Oral Exam (OR)
- Report (R)
- Presentation (P)
- Practical Work (PR)

- Assignment (AST)

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

There are two tracks within the Master's degree programme IEM:

1. Production Technology and Logistics (PTL)
2. Sustainable Process Engineering (SPE).

The tracks on the one hand provide students with the opportunity to gain specialist knowledge in a specific technological field, and on the other hand globally divide their future field of work.

In order to specify the learning outcomes of the programme for these tracks, we distinguish four competence area's (general academic skills are assimilated into these competence area's).

General competence area's (applicable for all tracks):

E: Industrial engineering (outcomes 1, 4, 5, 6, 7, 8)

M: Managerial and business sciences (outcomes 6, 7, 8)

Competence area per track:

P: Production Technology and Logistics (PTL) (outcomes 2, 3)

S: Sustainable Process Engineering (SPE) (outcomes 2, 3)

The specification of the learning outcomes of the programme for each competence area is as follows:

Industrial engineering (E)

In the area of industrial engineering students have:

- E1. Knowledge and understanding of (advanced) design and engineering theories.
- E2. Skills to apply engineering and technology concepts for solving theoretical (research) and practical (industrial/managerial) problems.
- E3. Skills to justify and communicate about their problem-solving approach from a multidisciplinary point of view.

Managerial and business science (M)

In the area of managerial and business sciences students have:

- M1. Sufficient knowledge and understanding of managerial and business sciences to enter PhD programs in Industrial Engineering (and related fields).
- M2. Skills to choose and apply organizational (including information), psychological, financial and marketing methods and concepts for adequately solving real-life business problems.
- M3. Skills to implement, justify and communicate about their problem-solving approach from a multidisciplinary point of view.

Production technology and logistics (P)

In the area of production technology and logistics students have:

- P1. Advanced knowledge and understanding of production technology and logistical engineering, to enter PhD programs in IEM related to production technology and logistical engineering.
- P2. Skills to analyse, (re)design, and implement (innovative) solutions for (complex) discrete products and production system problems, taking into account realistic industrial constraints (economic, safety, manufacturability, sustainability etc.).
- P3. Skills to effectively operate as employee (technologist, market analyst/developer, manager) in the discrete product engineering, production engineering and logistical engineering business; both at commercial production and support (services) level.

Sustainable Process Engineering (S)

In the area of sustainable process engineering students have:

- S1. Advanced knowledge and understanding of (bio)chemical engineering, chemical product engineering and biotechnology to enter PhD programs in (Bio)Chemical Product or Process Design and Engineering or Biotechnology.
- S2. Skills to analyse real-life industrial (bio)chemical process and product design problems and to develop solutions on the basis of the scientific fundamentals used in these disciplines.
- S3. Skills to effectively operate as employee (technologist, market analyst/developer, manager) in the (bio)chemical processing and production businesses or biotechnology businesses; both at commercial production and support (services) level.

In the tables below, an X represents a major contribution to the learning outcome, and an x a minor contribution to the learning outcome.

		Learning outcomes of the degree programme											
		E1	E2	E3	M1	M2	M3	P1	P2	P3	S1	S2	S3
Per iod	Course	Core IEM courses Year 1 –compulsory courses											
1a	Technology Based Entrepreneurship				X	X	X		X	X		X	X
2b	Sustainable Industrial Practice	X	X	X		X	X						
2b	Systems Engineering	X	X	X					X			X	
Peri od	Course	Core IEM courses Year 2 –compulsory courses											
1a.a	Research Methodology			x	x	x	x						
var	Master Research Project		X	X		X	X		X	X		X	X
var	Master Design Project		X	X		X			X	X		X	X
Peri od	Course	PTL compulsory courses											
1a	Foundations of Logistic Systems Engineering	X	X		X	X							
1a	Robotics for IEM	X	X	X	X	X	X	X	X	X			
1b	Simulation of Logistic Systems	X	X					X	X				
2a	Analysis and Control of Smart Systems	X	X					X	X				
Peri od	Course	SPE compulsory courses											
1a	Bioprocesses for Engineers		X	X			X				X	X	X
1a	Polymer Products		X								X	X	X

		Learning outcomes of the degree programme											
		E1	E2	E3	M1	M2	M3	P1	P2	P3	S1	S2	S3
1b	Advanced LCA for Sustainability												
1b	Advanced Product Engineering	X	X		X	X					X	X	X
2a	Advanced Polymer Processing	X	X	X			X		X	X		X	X

Appendix 1 - Supervisors Master Research Project

Supervisor	Research group
dr. A.G.P. Kottapalli	Advanced Production Engineering
prof. dr. Y. Pei	Advanced Production Engineering
prof. dr. ir. J. Post	Advanced Production Engineering
drs. W.A. Prins	Advanced Production Engineering
dr. E. Jurak	Bioproduct Engineering
prof. dr. M.J.E.C. Maarel, van der	Bioproduct Engineering
dr. P.J. Deuss	Chemical Technology
prof. dr. ir. H.J. Heeres	Chemical Technology
dr. ir. J.G.M. Winkelman	Chemical Technology
prof. dr. J. Yue	Chemical Technology
dr. A.O. Krushynska	Computational Mechanical and Materials Engineering
prof. dr. A. Vakis	Computational Mechanical and Materials Engineering
dr. M.I. Acuautla Meneses	Discrete Technology and Production Automation
prof. dr. ir. M. Cao	Discrete Technology and Production Automation
prof. dr. ir. B. Jayawardhana	Discrete Technology and Production Automation
prof. dr. ir. J.M.A. Scherpen	Discrete Technology and Production Automation
dr. S. Ahmed	Discrete Technology and Production Automation

Supervisor	Research group
dr. B. Haghighat	Discrete Technology and Production Automation
prof. dr. M. Ghandchi Tehrani	Dynamics and Vibration
dr. L. Cheng	Dynamics and Vibration
dr. M. Muñoz Arias	Dynamics and Vibration
prof. dr. A. Purushothaman Vellayani	Energy Conversion
dr. ing. A. Hübl	Engineering Systems and Design group
dr. ir. G.H. Jonker	Engineering Systems and Design group
prof. dr. M.J.H. Witjes	Faculty of Medical Sciences
dr. A.J. Frederiks	Innovation management & Strategy
dr. G. Portale	Macromolecular Chemistry & New Polymeric Materials
prof. dr. ir. P.R. Onck	Micromechanics
prof. dr. ir. B.J. Kooi	Nanostructured Materials and Interfaces
prof. dr. D. Bauso	Optimization and Decision Systems
dr. A.K. Cherukuri	Optimization and Decision Systems
dr. R.K. Bose	Product Technology
dr. ir. P.D. Druetta	Product Technology
prof. dr. ir. M. van Duin	Product Technology
dr. P.P. Pescarmona	Product Technology

Supervisor	Research group
prof. dr. F. Picchioni	Product Technology
dr. P. Raffa	Product Technology
prof. dr. G.J.W. Euverink	Products and Processes for Biotechnology
dr. J. Krooneman	Products and Processes for Biotechnology
dr. ir. T.H.J.A. Sleutels	Products and Processes for Biotechnology
prof. dr. N. Kalantar- Nayestanaki	Research Unit Nuclear & Hadron Physics
dr. J. Kosinka	Scientific Visualization and Computer Graphics
prof. dr. C. De Persis	Smart Manufacturing Systems
dr. N. Monshizadeh Naini	Smart Manufacturing Systems
prof. dr. ir. P. Avgeriou	Software Engineering
prof. dr. A.J. Groen	University of Groningen Centre of Entrepreneurship
dr. S.R. White	University of Groningen Centre of Entrepreneurship
dr. Antonija Grubisic-Cabo	Zernike Institute for Advanced Materials

Appendix 2 - First supervisors Master Design Project

dr. ing. A. Hübl	Engineering Systems and Design (ESD) Group
dr.ir. G.H. Jonker	Engineering Systems and Design (ESD) Group
dr. ing. H. Kloosterman	Engineering Systems and Design (ESD) Group
ir. T.M. Kousemaker	Engineering Systems and Design (ESD) Group
dr. G.K.H. Larsen	Engineering Systems and Design (ESD) Group
dr. M. Muñoz Arias	Engineering Systems and Design (ESD) Group
dr. N.B. Szirbik	Engineering Systems and Design (ESD) Group
prof. A. Vakis	Engineering and Technology Institute Groningen