# Assessment plan for the curriculum of the Master's degree programme in Industrial Engineering & Management, 2026-2027

Programme director: prof. dr. A. Vakis

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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**<br>*At the end of the programme, the graduate has…* |
|---|---|
| 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 form viewpoint of various stake-holders). |
| 3 | The skills to (re)design, implement and then evaluate such processes and products. |
| 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 | WMIE040-05 | Research Strategy, Design and Analysis | 5 | OR, P, R | Yes | End, Halfway | dr. ing. H. Kloosterman | M. Mohebbi, MSc |
| 1 | 1b | WMIE006-05 | Technology Based Entrepreneurship | 5 | AST, WE | No | End, Halfway | dr. A.J. Frederiks | prof. dr. F. Noseleit |
| 1 | 2a | WMIE021-05 | Systems Engineering | 5 | AST, P, R | Yes | End, Halfway, Start | dr. N.B. Szirbik | ir. T.M. Kousemaker |
| 1 | 2b | WMIE027-05 | Sustainable Industrial Practice | 5 | M, R, P, PR | Yes | half, end | dr. ir. G.H. Jonker | dr. M. Taheri |
| 2 | 2a.1 | WMIE025-05 | Research Methodology | 5 | OR, P, R | Yes | End, Halfway | dr. ing. H. Kloosterman | M. Mohebbi, MSc |
| 2 | var. | WMIE901-30 | Research Project | 30 | P, R, PR | Yes | | See appendix 1 | 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 |
|---|---|---|---|---|---|---|---|---|---|
| 2 | var. | WMIE901-25 | Design Project | 25 | OR, P, R, PR | Yes | | See appendix 2 | Various |
| **Elective courses** | | | | | | | | | |
| 1 | 1a | WMIE028-05 | Bioprocesses for Engineers | 5 | R, P | Yes | end | dr. ir. T.H.J.A. Sleutels | prof. dr. G.J.W. Euverink |
| 1 | 1a | WMIE038-05 | Robotics and Automation | 5 | WE, AST | No | continuous | dr. B. Haghighat | prof. dr. ir. B. Jayawardhana |
| 1 | 1a | WMIE019-05 | Optimization under Uncertainty | 5 | AST, WE | No | End | prof. dr. A.K. Cherukuri | prof. dr. C. de Persis |
| 1 | 1a | WMIE002-05 | Foundations of Logistics Systems Engineering | 5 | P, R, WE | No | End | dr. ing. A. Hübl | prof. dr. A.K. Cherukuri |
| 1 | 1b | WMIE034-05 | Advanced LCA for Sustainability | 5 | AST, P, R | No | End, Halfway, Start | dr. P. Karka | dr. ir. G.H. Jonker |
| 1 | 1b | WMIE012-05 | Simulations of Logistic Systems | 5 | AST, P, R | Yes | End, Halfway, Start | dr. A. Hübl | ir. T. M. Kousemaker |
| 1 | 1b | WMIE007-05 | Fitting Dynamical Models to Data | 5 | WE | No | end | prof. dr. ir. B. Jayawardhana | prof. dr. M. Cao |
| 1 | 1b | WMIE013-05 | Surface Engineering and Coating Technology | 5 | AST, R, WE | No | End, Halfway | prof. dr. Y. Pei | prof. dr. A.G.P. Kottapalli |
| 1 | 2a+ 2b | WMIE041-10 | Challenge-based Team Engineering Project | 5 | PR | Yes | continuous | dr. B. Haghighat | prof. dr. A. Vakis |
| 1 | 2a | WMIE003-05 | Product Design by the Finite Element Method | 5 | AST, M, RV | No | continuous | dr. N. Younas | dr. ir. R. Luppes |
| 1 | 2a | WMIE015-05 | Analysis and Control of Smart Systems | 5 | WE | No | End | prof. dr. C. de Persis | prof. dr. N. Monshizadeh Naini |

| 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 | 2a | WMIE035-05 | Optimization for Smart Systems | 5 | AST, WE | No | End, Halfway | prof. dr. C. de Persis | prof. dr. A. Vakis |
| 1 | 2b | WMIE008-05 | Food Pharma Products | 5 | P, R | No | End | 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)*
- *Peer review (RV)*
- *Midterm(M)*

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

This is the last academic year in which there are two tracks within the Master's degree programme IEM. Students starting this year will no longer choose a track. However, this year only students in the old-style curriculum will be able to graduate. Therefore, the cross table below refers to courses which are no longer mandatory but elective in the new curriculum. However, for the old-style curriculum students these courses are still mandatory. In case a course can be is substituted by a new course, the new course has been added in the table as an alternative.

The two tracks are:

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.

| | | **Learning outcomes of the degree programme** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E1 | E2 | E3 | M1 | M2 | M3 | P1 | P2 | P3 | S1 | S2 | S3 |
| **Period** | **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 | |
| **Period** | **Course** | **Core IEM courses Year 2 –compulsory courses** | | | | | | | | | | | |
| 1a.a | Research Methodology/Research Strategy, Design and Analysis | | | 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 |
| **Period** | **Course** | **PTL compulsory courses** | | | | | | | | | | | |
| 1a | Robotics for IEM/Robotics and Automation | X | X | X | | | X | X | | X | | | |
| 1b | Foundations of Logistic Systems Engineering | X | X | | X | X | | X | X | X | | | |
| 2a | Nonlinear and Dynamic Optimization/Optimization for Smart Systems | X | X | X | X | X | | | X | | | | |

| | | Learning outcomes of the degree programme | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E1 | E2 | E3 | M1 | M2 | M3 | P1 | P2 | P3 | S1 | S2 | S3 |
| 2a | Analysis and Control of Smart Systems | X | X | | | | | X | X | | | | |
| **Period** | **Course** | **SPE compulsory courses** | | | | | | | | | | | |
| 1a | Bioprocesses for Engineers | | X | X | | | X | | | | X | X | X |
| 1a | Polymer Products | | X | | | | | | | | X | X | X |
| 1b | Advanced LCA for Sustainability | X | X | X | | | | | | | | X | X |
| 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 |
|---|---|
| prof. dr. A.G.P. Kottapalli | Advanced Production Engineering |
| prof. dr. Y. Pei | Advanced Production Engineering |
| prof. dr. ir. J. Post | Advanced Production Engineering |
| dr. K. Li | Agile Sensing and Intelligence Group |
| dr. P. Boelen | Biomimetics |
| prof. dr. ir. D. Lentink | Biomimetics |
| prof. dr. ir. M.J.E.C. Maarel, van der | Bioproduct Engineering |
| prof. dr. P.J. Deuss | Chemical Technology |
| prof. dr. ir. H.J. Heeres | Chemical Technology |
| dr. ir. J.G.M. Winkelman | Chemical Technology |
| prof. dr. ir. J. Yue | Chemical Technology |
| prof. dr. A.O. Krushynska | Computational Mechanical and Materials Engineering |
| prof. dr. A. Vakis | Computational Mechanical and Materials Engineering |
| prof. dr. M.I. Acuautla Meneses | Discrete Technology and Production Automation |
| prof. dr. ir. M. Cao | Discrete Technology and Production Automation |
| prof. dr. M. Cucuzzella | Discrete Technology and Production Automation |
| prof. dr. ir. B. Jayawardhana | Discrete Technology and Production Automation |

| Supervisor | Research group |
|---|---|
| prof. dr. ir. J.M.A. Scherpen | Discrete Technology and Production Automation |
| dr. S. Ahmed | Discrete Technology and Production Automation |
| 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. A. Hübl | Engineering Systems and Design group |
| dr. ir. G.H. Jonker | Engineering Systems and Design group |
| dr. ing. H. Kloosterman | Engineering Systems and Design group |
| dr. S. Solhjoo | Engineering Systems and Design group |
| dr. N.B. Szirbik | Engineering Systems and Design group |
| dr. ir. M. Taheri | Engineering Systems and Design group |
| dr. N. Younas | Engineering Systems and Design group |
| prof. dr. M.J.H. Witjes | Faculty of Medical Sciences |
| dr. ir. A. Hommes | Green Chemical Reaction Engineering |
| dr. P. Karka | Green Chemical Reaction Engineering |
| dr. J. Xie | Green Chemical Reaction Engineering |

| Supervisor | Research group |
|---|---|
| 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. A.K. Cherukuri | Optimization and Decision Systems |
| dr. R.K. Bose | Product Technology |
| dr. ir. P.D. Druetta | Product Technology |
| prof. dr. ir. M. Duin, van | Product Technology |
| dr. D. Parisi | Product Technology |
| prof. dr. P.P. Pescarmona | Product Technology |
| 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 | Nuclear Energy |
| prof. dr. C. De Persis | Smart Manufacturing Systems |
| prof. dr. N. Monshizadeh Naini | Smart Manufacturing Systems |

| Supervisor | Research group |
|---|---|
| prof. dr. ir. P. Avgeriou | Software Engineering |
| dr. S. Trenn | Systems, Control and Applied Analysis |
| prof. dr. A.J. Groen | University of Groningen Centre of Entrepreneurship |
| dr. S.R. White | University of Groningen Centre of Entrepreneurship |
| dr. A. Grubisic-Cabo | Zernike Institute for Advanced Materials |

## Appendix 2 - First supervisors Master Design Project

| | |
|---|---|
| dr. ing. A. Hübl | Engineering Systems and Design (ESD) |
| dr. ir. G.H. Jonker | Engineering Systems and Design (ESD) |
| dr. ing. H. Kloosterman | Engineering Systems and Design (ESD) |
| ir. T.M. Kousemaker | Engineering Systems and Design (ESD) |
| dr. G.K.H. Larsen | Engineering Systems and Design (ESD) |
| dr. M. Muñoz Arias | Engineering Systems and Design (ESD) |
| dr. S. Solhjoo | Engineering Systems and Design (ESD) |
| dr. N.B. Szirbik | Engineering Systems and Design (ESD) |
| dr. ir. M. Taheri | Engineering Systems and Design (ESD) |
| prof. dr. A. Vakis | Computational Mechanical and Materials Engineering |
| dr. N. Younas | Engineering Systems and Design (ESD) |

All supervisors in appendix 1 can act as second supervisor to the Design Project.