

Programme-specific appendix to the EER 2018-2019

For the Master of Science programme

Industrial Engineering and Management (IEM)

(update: 10-9-2018/bp/vs8)

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1 Structure and content of the programme MSc Industrial Engineering and Management (IEM)

1.1 COMPOSITION OF THE PROGRAMME

The programme consists of three components:

1. A set of obligatory courses: the 'core programme' including a set of 'Specialisation and orientation courses'
2. Additional elective courses to fill up the total study load to 90 EC
3. A final (Master's) assignment of 30 EC.

This structure applies to all IEM students.

1.2 STUDY LOAD AND PROGRAMME

The IEM Master's programme represents a study load of 120 EC. All MSc IEM courses are 5 European Credits with exception of the 'MSc Thesis' which is 30 European Credits.

1.3 THE EXAM FORMATS (TER, ARTICLE 3.2, SECTION 2H)

The curriculum overview for the Master programme includes the following categories: Quarter /

Subject code/ Subject name / Study load in ECs / Way of testing

The assessment components are sorted by category according to subject code. Per course a maximum of two exams are offered. Exams and re-sit are published in the Education timetable (<https://rooster.utwente.nl/>). The overview of assessment components is not presented in chronological order.

Key to exam formats:

S = written exam

O = oral exam

PSS = practical exercise(s), including a written and/or oral report, and a written exam; the student may sit the written exam only after satisfactorily completing the practical exercises and the written and/or oral report

PSM = similar to PSS, however, an oral exam will be sat

BAM = reviewed in accordance with the procedures laid down in the regulations applicable to the Master's assignment.

The student's work must be eligible for review. More specific details are available via OSIRIS and/or made known in a timely manner by the examiner on Canvas in accordance with the provisions of Article 4, "Rules & Regulations of the Examination Board".

1.4 FINAL EXAM: THE MASTER'S ASSIGNMENT

The programme concludes with the Master's assignment, as part of which the student demonstrates his ability in the integrated application of the knowledge and skills gained from the curriculum of the programme. The Master's assignment represents 30 EC and will be finalized with a public colloquium; the colloquium can only be held if all master's programme courses are finished successfully.

The Examination Board of the programme establishes the rules according to the Law on Higher Education, governing:

- approval of the results of the examinations
- declare a student to have passed
- award a student a degree certificate and Diploma Supplement
- award a student a degree certificate of designation 'with distinction' if all requirements are met.

An appeal against a decision taken in accordance with these regulations may be lodged to the Examination Board of the programme.

1.5 STUDY PROGRAMME

The programme starts in September and February. See Table 1 for the programme structure 2018-2019. For detailed information about the content of the Specialisation and orientations, see Section 2.

MSc Industrial Engineering and Management Programme 2018-2019																
MSc IEM Structure						EC		Specialisations				Orientations				
Mandatory IEM						45		PLM	Production and Logistics Management				Service Logistics and Maintenance Management			
Mandatory per Specialisation						15							Supply Chain and Transportation Management			
Mandatory per Orientation						15							Manufacturing Logistics			
<i>(Recommended)</i> Electives						45							Operations Management in Healthcare			
Total EC's						120		HCTM	Health Care Technology and Management				Health Care Technology and Management			
QRT	Quartile							FEM	Financial Engineering and Management				Financial Engineering and Management			
All courses are 5 EC (except the Master Thesis). Course content can be found in the Course Catalogue, see: Course Catalogue																
	Programme IEM / Specialisations	Qrt	Test			PLM (EC)			HCTM (EC)			FEM (EC)				
201700020	IEM research orientation	1+3	PSS			5			5			5				
201400174	Data Science	2+3	PSS			5			5			5				
201200127	Preparations Thesis	--	PSS			5			5			5				
194100060	Thesis	--	BAM			30			30			30				
201800003	Operations Research Techniques 1	1+3	PSS			5			5							
201800004	Operations Research Techniques 2	4	PSS			5			5							
191820210	Simulation	1	PSS			5			5							
191506103	Statistics & Probability	1	S									5				
191860651	Micro Economics	1	S									5				
201300060	Mathematical Finance	2	S									5				
	Mandatory pr Orientation: ≥ three courses					15			15			15				
	<i>(recommended)</i> Electives					45			45			45				
	Total					120			120			120				

Table 1: MSc Industrial Engineering & Management 2018-2019 - structure

The below mentioned Table 2 represents the mandatory courses per 'Specialisation and Orientation'

Extra information on:

- mandatory courses per Specialisation and orientations
- elective courses per Specialisation and orientations
- fill in forms for pre-arranged individual study Programmes per Specialisation and orientations can be found on the IEM canvas course.

IEM Orientations															
Course Code	Service Logistics and Maintenance Management	Qrt	Test	Course code	Supply Chain and Transportation Management	Qrt	Test	Course code	Manufacturing Logistics	Qrt	Test	Course code	Operations Management in Healthcare	Qrt	Test
Mandatory per specialisation															
201700020	IEM research orientation	1+3	PSS	201700020	IEM research orientation	1+3	PSS	201700020	IEM research orientation	1+3	PSS	201700020	IEM research orientation	1+3	PSS
201400174	Data Science	2+3	PSS	201400174	Data Science	2+3	PSS	201400174	Data Science	2+3	PSS	201400174	Data Science	2+3	PSS
201200127	Preparations Thesis	--	PSS	201200127	Preparations Thesis	--	PSS	201200127	Preparations Thesis	--	PSS	201200127	Preparations Thesis	--	PSS
194100060	Thesis	--	PSS	194100060	Thesis	--	PSS	194100060	Thesis	--	PSS	194100060	Thesis	--	PSS
201800003	Operations Research Techniques 1	1+3	PSS	201800003	Operations Research Techniques 1	1+3	PSS	201800003	Operations Research Techniques 1	1+3	PSS	201800003	Operations Research Techniques 1	1+3	PSS
201800004	Operations Research Techniques 2	4	PSS	201800004	Operations Research Techniques 2	4	PSS	201800004	Operations Research Techniques 2	4	PSS	201800004	Operations Research Techniques 2	4	PSS
191820210	Simulation	1	PSS	191820210	Simulation	1	PSS	191820210	Simulation	1	PSS	191820210	Simulation	1	PSS
Mandatory per orientation															
201800008	After-Sales Service Logistics	2	PSS	201800010	Transportation and Logistics Management	3	PSS	201800007	Planning & Scheduling	4	PSS	201800007	Planning & Scheduling	4	PSS
191852630	Reliability Engineering & Maintenance Mngt	3	PSS	201800009	Advanced Inventory Management	2	PSS	201800009	Advanced Inventory Management	2	PSS	191506103	Statistics & Probability	1	S
201800009	Advanced Inventory Management	2	PSS	201800008	After-Sales Service Logistics	2	PSS	191820120	Warehousing	4	PSS	194121020	Optimization of Healthcare Processes	3	PSS

* 191530881 *Stochastic Models for Operations Management* can be used as 'mandatory equalization course', in case a (non BSc IEM) student is deficient.

IEM Orientations							
Course Code	Health Care and Technology Management	Qrt	Test	Course Code	Financial Engineering	Qrt	Test
Mandatory per specialisation							
201700020	IEM research orientation	1+3	PSS	201700020	IEM research orientation	1+3	PSS
201400174	Data Science	2+3	PSS	201400174	Data Science	2+3	PSS
201200130	Preparations Thesis	--	PSS	201200128	Preparations Thesis	--	PSS
194100060	Thesis	--	PSS	194100060	Thesis	--	PSS
201800003	Operations Research Techniques 1	1+3	PSS	191506103	Statistics & Probability	1	S
201800004	Operations Research Techniques 2	4	PSS	191860651	Micro Economics	1	S
191820210	Simulation	1	PSS	201300060	Mathematical Finance	2	S
Mandatory per orientation							
201700196	Advanced Health Economic Modeling	3	PSS	191515101	Introduction to Risk Theory	2	S
201700197	Decision Making in HC	4	PSS	191860181	Risk Management	3	S
201800005	Statistical Learning in Healthcare	1	PSS	201300062	Structured Products	3	S

Table 2: MSc IEM Mandatory courses per 'Specialisation and Orientation'

1.6 PREMASTER PROGRAMMES (BRIDGING PROGRAMMES - TRANSFER MINOR)

A premaster programme can be taken as a separate pre-Master's programme, or as a special premaster ("doorstroomminor") agreed upon with a Dutch University of Applied Sciences (HBO). Students with a technical programme from a Research University, admitted to one of the premaster Programmes, have to take up to 15 EC of courses. Students with a technical study programme from a University of Applied Science or students with a Social Science programme from a Research University, admitted to one of the premaster Programmes, have to take up to 30 EC of courses. The courses depend on the chosen specialisation. Students with mathematics proficiency on pre-university level mathematics B (equal to the Dutch VWO wiskunde B) and a programme with a strong related technical orientation will be admitted after successfully completing the premaster programme. For more information visit the website <https://www.utwente.nl/en/education/master/>.

The entire premaster programme has to be completely finished within one academic year. No more than two attempts are permitted to successfully finish the corresponding exam. If a student fails to successfully complete the entire programme within these two attempts per unit, this student will not be admitted to the Master's programme. Below the premaster programmes are listed per specialisation.

Research University: Technical Programmes

Research University Technical Programmes			
PLM/HCTM Technical programs			
Course Code	Course Name	EC	Quartile
191530420	Statistics & probability for premaster IEM	5	1
201500012	OR models for premaster IEM	10	1
		15	
FEM Technical programmes			
Course Code	Course Name	EC	Quartile
191530420	Statistics & probability for premaster IEM	5	1
201500020	Financial Engineering for premaster IEM	10	1
		15	

Research University: Social Science Programmes and University of Applied Science (HBO)

Applied Science and Research University Social Science (obligatory Mathematics B (VWO) on pre-university level).

Applied Science and Research University Social Science					
Production and Logistics Management / Health Care and Technology Management					
First Quartile (Sept-Oct)			Second quartile (Nov-Febr)		
Course code	Course name	EC	Course code	Course name	EC
191512001	Calculus A	4	191530420	Statistics & probability for premaster IEM	5
201500014	Academic skills for premaster IEM	1	201500014	Academic skills for premaster IEM	4
201500012	OR models for premaster IEM	10	201500015	Excel/VBA	3
			201400317	Operations Strategy*	3
			201500019	Project OM for premaster IEM (3 EC)	
		15			15
					30

Financial Engineering and Management (FEM)					
Course code	Course name	EC	Course code	Course name	EC
191512001	Calculus A	4	191530420	Statistics & probability for premaster IEM	5
201500014	Academic skills for premaster IEM	1	201500014	Academic skills for premaster IEM	4
201500020	Financial Engineering for premaster IEM	10	201500015	Excel/VBA	3
			201400317	Operations Strategy*	3
			201500019	Project OM for premaster IEM (3 EC)	
		15			15
* students with prior knowledge on this topic will have to do Project OM for premaster IEM instead					
					30

In the education catalogue Osiris you can find the course descriptions.

2 Other programme-specific characteristics

2.1 CONTENT OF THE SPECIALISATIONS

The Master's programme Industrial Engineering and Management differentiates the following specialisations (tracks).

- **Production and Logistics Management (PLM)**

This track focuses on the design and management of logistics processes and processes in the supply chain, from procurement of the raw materials to delivering the end product to the customer (and back: reverse logistics). The courses explore the theory and practice of these processes, covering topics such as design and planning of manufacturing processes, warehousing, distribution logistics, transportation, project management, and maintenance projects, and include the use of software tools for the simulation of business processes. Most courses are based on the application of Operations Research techniques in solving problems in production and logistics. Next to the industrial sector, attention is also paid to application of these methods in solving operational problems in service organizations, with an emphasis on hospitals (in collaboration with the HCTM track). The application of procurement strategies to the public sector is another topic of interest.

This PLM Specialisation offers four orientation. An orientation represents a scientific research area. Within this specialisation students choose one orientation during the first quartile of their study. The specialisation and chosen orientation leads them through the programme through mandatory courses and the topic of the Masters assignment.

- **Financial Engineering and Management (FEM)**

The FEM track applies methods taught in the IEM Master's programme to the area of banking, insurance, and pensions. It also introduces concepts from the financial world into more traditional production areas. The increasing complexity of financial contracts, the growing overlap between providers of financial products (such as the merging of banks and insurance companies), and the emerging markets for "new" products (such as electricity, milk quota or emission rights) have resulted in a demand for quantitative instruments for risk management. This track teaches how to analyse and manage financial risks using financial products and modifying business processes.

This FEM specialisation offers one orientation. An orientation represents a scientific research area. Within this specialisation students don't have to choose an orientation during the first quartile of their study, although they will get acquainted with all IEM orientations. The specialisation itself leads them through the programme through mandatory courses and the topic of the Masters assignment.

▪ **Health Care Technology and Management (HCTM)**

The HCTM track focuses on managing organizations in the health care sector. Health care processes are analysed and optimized in the context of health care organizations, such as a hospital. The track pays explicit attention to the specific health care context of these organizations, including systems for reimbursement and insurance in health care, and new developments in health care technology. The track introduces quantitative and qualitative methods to support health care management in its optimization of health care delivery to patients. These methods facilitate the effective introduction and application of new health care technology, and the efficient planning of health care processes.

This HCTM specialisation offers one orientation. An orientation represents a scientific research area. Within this specialisation students don't have to choose an orientation during the first quartile of their study, although they will get acquainted with all IEM orientations. The specialisation itself leads them through the programme through mandatory courses and the topic of the Masters assignment.

2.2 COHERENCE AND DIDACTICAL CONCEPT

In the MSc IEM programme, students learn to work on more complex challenges in Industrial Engineering and Management. MSc IEM graduates are specialized in a particular field of IEM and are also able to translate domain problems into scientific questions and vice versa, and to undertake scientific research in this domain. The Specialisation is achieved by following specific tracks.

We have chosen to use a wide variety of teaching methods. Different competences and knowledge domains require diverse teaching and study approaches, and a variation in study activities enhances the motivation of students.

The structure of the first 1.5 year of the MSc programme is focused on teaching and learning activities. For example, students experience lecture classes, tutoring in small groups, individual assignments, and group work on real cases. Students are stimulated to gather new knowledge and to take initiatives to follow their own curiosity and interests. The last semester contains the graduation project of 30 EC. A student spends the complete final semester on research and writing the Master's Thesis. Most often, this work on a real issue has an applied nature: undertaking a project, conducting research, and writing a report in a company/organization. It is a challenging and difficult project: the student applies his knowledge and skills in an environment with high professional standards. It is also scientific: it is required to make use of scientific knowledge, and to provide well-founded support for solutions and recommendations. The student works as a professional in the environment of the organization.

2.3 PROFILE OF THE PROGRAMME

The Industrial Engineering and Management programme is aimed at educating students to highly qualified industrial engineers and managers.

Industrial Engineering and Management (IEM)¹ is about improving operational processes, in which multiple (sometimes competing) objectives need to be considered such as: improve quality and service, manage risks, increase productivity, and reduce cost). Industrial Engineering & Management uses modeling and quantitative analysis, is grounded in an understanding of the technology that is used in processes, considers human behavior and has an open mind for the environment of the organization for example: competitors, market structures, regulation, or government policy).

IEM is applied in a variety of fields such as: manufacturing, finance, logistics, telecommunications, healthcare). IEM does not only apply to products, but also to services, processes, and projects. Customers may be consumers or other companies in the private sector. IEM is also relevant for the public sector (such as: health care, taxation and social insurances, defense, water management and financing and project management of infrastructure projects). We respect this broadness of IEM applications by giving students considerable freedom in focusing their programme on areas they are specifically

¹ In Dutch: Technische Bedrijfskunde, in German: Wirtschaftsingenieurwesen

interested in.

In the MSc IEM programme, students learn to work on more complex challenges in Industrial Engineering and Management and with less professional guidance compared with the BSc TBK programme. MSc IEM graduates are specialized in a particular field of IEM and are also able to translate domain problems towards scientific questions and vice versa, to undertake scientific research in this domain.

The MSc programme consists of a set of 'core courses', including Specialisation courses', 'elective courses' and the final assignment. In the *core courses* some topics are covered which every IEM graduate should master, and in depth courses of his Specialisation. The Specialisation courses and elective courses provide the opportunity to create a personal profile. This may vary from even more in-depth Specialisation in a certain scientific domain to a more broad professionalization in e.g. design methodologies, modeling techniques, IEM in health care etc. The elective courses offered may vary, depending on the available staff expertise and the research activities of the various departments. Various clusters and electives are offered. From the available courses and electives, every student makes up a personal IEM examination programme. To guarantee a proper covering of the final qualifications, such an individual programme has to be approved by, or on behalf of, the Examination Board.

2.4 CONTENT OF PRACTICAL EXERCISES

A practical exercise is an academic unit or a component of an academic unit in which the emphasis is on the activity of the student, such as:

- preparing a literature review, paper or design project, thesis, Article, or position paper, or delivering a public presentation;
- a design or research assignment, tests and experiments, practical exercises, skills practice;
- work placement, fieldwork or excursions;
- participation in other required learning activities aimed at achieving the desired skills.

Practical exercises are generally part of an academic unit for which there is a responsible examiner. The structure of the practical exercise(s) is described in general terms in OSIRIS, and in more detail on Canvas at the start of the programme.

2.5 MASTER'S ASSIGNMENT (THESIS)

The Master's assignment is 30 EC and has to be finished (green light for colloquium) within the nominal study time (20 weeks). Extension of the nominal study time is only allowed after approval of the supervisor and programme director with a maximum of 50%. For more information about the execution of these rules we refer to our Canvas site '194100060 Master Thesis IEM', Master Thesis Guide.

A Master's committee, consisting of at least two examiners, is assembled for each assignment. The Master's assignment is evaluated on an individual basis. The Master's assignment tests the student's competence in the integrated application of the knowledge, comprehension and skills covered in the study units. The Examination Board prescribes an evaluation checklist to help ensure the quality of the evaluation. More practical information on the Master's assignment is found in the Master's Thesis Guide.

2.6 HONOURS PROGRAMMES

For excellent students the University of Twente offers three different extra-curricular Master's honours programmes of 15 EC. Each of these Programmes has a distinctive profile, which allows the student to develop in one of three roles: as an organizer, designer or researcher. These programmes are:

- MSc Change Leaders
- MSc Design Honours
- MSc Research Honours

More information about these Programmes and the corresponding selection procedure can be found at the UT honours programmes website <http://www.utwente.nl/excellentie/en/>

3 Aims and final attainment targets

3.1 AIMS OF THE PROGRAMME

The graduates of the MSc IEM programme are able to analyse problems and define required improvements for the design and control of operational processes (the IEM domain) at an academic level. Moreover, they are able to implement such improvements. The MSc graduates are able to perform these activities in complex situation.

3.2 FINAL ATTAINMENT TARGETS

The first group of qualifications (A) is related to the professional academic activities of an IEM graduate; the second group (B) reflects the general academic level. See below for the Final Qualifications MSc IEM

IEM Final Qualifications	
A. Professional academic qualifications	
Generally:	
The graduates of the MSc programme are able to analyze problems and define required improvements for the design and control of operational processes (the IEM domain) at an academic level. Moreover, they are able to implement such improvements. The difference between BSc and MSc is, that BSc graduates are able to perform these activities in relatively simple cases, whereas MSc graduates are able to act adequately in more complex situations.	
This involves defining problems and research questions; describing intended results, scope of research and design efforts, available resources; determining the constraints for feasible solutions, from different perspectives (such as: organizational, legal, financial, ethical, professional norms) and for different stakeholders (such as: employees, shareholders, suppliers, local community, regulators); defining criteria for evaluating alternative solutions.	
MSc final qualifications	
So, the graduate is able to quickly identify, thoroughly comprehend, critically assess, correctly apply, and creatively integrate existing scientific knowledge that can be used for analyzing problems and designing solutions, in one of the domains of:	
* production and logistics;	
* finance and accounting;	
* health care	
A1	Has a thorough overview of the <u>structure of research and design</u> processes and is able to * identify the various steps in performed research and design * properly break up own research and design activities into sub-processes <i>These processes are intertwined: Research is needed for producing knowledge that is used for designing solutions in a specific context. Such knowledge is produced in a purposeful and methodical way (using scientific research methods). It may or may not be generalizable knowledge.</i>
A2	Has an overview of quantitative and qualitative <u>empirical research methods</u> and is able to * critically analyze performed research as to the methodological aspects * select an appropriate method and justify this choice for research to be performed * apply this method in relatively complex cases
A3	Has a thorough overview of quantitative <u>modeling techniques</u> for operational processes in this domain, and is able to * critically analyze the results of modeling activities * select appropriate modeling techniques and justify this choice * apply these techniques in relatively complex cases.
A4	Is able to <u>integrate</u> existing knowledge, modeling techniques, and research results for designing, validating, and selecting solutions in relatively complex cases. <i>This is challenging, because existing knowledge may not fully apply to a specific situation, models are always stylized, empirical research always has limitations, and some aspects have been left out of scope from the beginning anyway.</i>
A5	Has an overview of <u>implementation methods</u> and processes and is able to * critically analyze ongoing or finished implementation processes * plan globally an implementation process in a relatively complex case
A6	Has an overview of <u>evaluation methods and techniques</u> and is able to * critically analyze the results of performed evaluations * select appropriate evaluation methods and justify this choice * carry out an evaluation in relatively complex cases
A7	In order to be able to meet these competencies, the graduate must have mastered a set of core disciplines in the specialization domain.
A8	Is able to contribute to the development of the academic profession by identifying generic consequences and implications from professional cases (for example, general presentations, write papers about design solutions).
B. General academic qualifications	
B1	Is able to work autonomously and self-reliant
B2	Is able to work in multidisciplinary teams
B3	Is able to communicate properly (in oral and written form) with various stakeholders
B4	Is able to conduct a bibliographic search and knows how to reference correctly
B5	Is able to reflect on professional behaviour and ethical and societal aspects of work
B6	Is able to reflect on and direct personal and professional development
B7	Is able to manage and concretize effectively his own learning process in the context of "life long learning"

3.2 LEVEL OF THE PROGRAMME

Below you find the Relationship between the Final Qualifications and the Criteria for Academic Bachelor's and Master's Curricula of the 3TU

	Competent in one or more scientific disciplines	Competent in doing research	Competent in designing	A scientific approach	Basic intellectual skills	Competent in co-operating and communicating	Takes account of the temporal and social context
A1		x	x				
A2		x			x		
A3				x	x		
A4			x	x			
A5							
A6			x				
A7	x				x		
A8							
B1						x	
B2						x	
B3						x	
B4				x			
B5							x
B6							x
B7	x						

4 Examination and exams

4.1 EXAMINATION

The programme has one examination, the Master's examination end of the second year. The Master's examination is completed successfully if the exams of the units of study, including the Master's Thesis Assignment, have been completed successfully.

4.2 EXAM FORMATS AND THE NUMBER AND SEQUENCE OF EXAMS AND PRACTICAL EXERCISES

A unit of study is completed with an exam. An exam can comprise one of the following formats:

- a written exam
- an oral exam
- a series of tests
- the assessment of practical exercises as meant in Art. 1 (Glossary)
- a combination of the above

The exam formats of each of the courses offered in the programme is shown in table 1.

4.3 REQUIRED SEQUENCE OF EXAMS / PREREQUISITES

Prior knowledge prerequisites in the MSc are restricted to the phase where the student starts the Master's Thesis Assignment (80 EC incl. preparation course).

5 General information

5.1 ADMISSION TO THE PROGRAMME

The admission request for the programme is assessed by an admission committee that consists of the programme director of the programme, the specialisation coordinator and the programme coordinator.

In addition to the general criteria, Industrial Engineering & Management distinguishes two types of (inter)national education;

1. Research Universities (primarily responsible for research-oriented Programmes)
2. Universities of applied sciences (prepares students particular for the practical professions)

The admission committee has specific requirements depending on the degree. All applicant will be judged on an individual basis.

1. Degree of a (Dutch) Research University

a. *A Bachelor's degree in Industrial Engineering & Management or related awarded by a Dutch university*
Applicants with a Bachelor's degree in Industrial Engineering & Management awarded by a Dutch university will be admitted to the programme.

b. *Another Bachelor's degree awarded by the University of Twente*

Applicants with technical Bachelor's degree other than IEM awarded by *the University of Twente* will be admitted to the programme. If necessary the applicant will have to finish a 15 EC pre-master programme.

Applicants with a non-technical Bachelor's degree awarded by *the University of Twente* will only be admitted if their prior educational profile is related to this programme and their mathematics proficiency is at pre-university level equal to the Dutch 'VWO Wiskunde B'.

The student will have to finish a 30 EC pre-master programme. The admission committee determines the content of the pre-master programme. The applicant must have successfully completed the entire pre-master programme within a period of 12 months from the start² and within two exam attempts per premaster course.

2. Degree of a (Dutch) University of Applied Science (HBO)

a. *A Bachelor's degree in a related field awarded by a Dutch University of Applied Science*

Students with a Bachelor's degree in a related (technical) field awarded by a Dutch University of Applied Science be admitted to a pre-Master's programme:

- If their mathematics proficiency is at pre-university level equal to the Dutch 'VWO Wiskunde B'.
- If their prior educational profile is suitable
- If their 'General Personal Average Score' is clearly above average
- If they express a clear motivation in English for the programme and their chosen specialisation
- If their English proficiency is at VWO level

b. *Another Bachelor's degree awarded by a (Dutch) University of applied science*

Applicants with mathematics proficiency on VWO level Mathematics B and a degree in a non-related field are judged on an individual basis. In specific cases and on the recommendation of the specialisation coordinator, the admission committee may grant exemptions, entirely or partly, from the domain-specific part of the pre-master programme. The applicant must have successfully completed the pre-master programme before being admitted to the Master's degree programme.

3. International Bachelor's degree

The admissions committee assesses international applicants with a Bachelor's degree awarded by a non-Dutch Research University or University of applied science on an individual basis. The assessment of the applicant's skills is based on:

- a NUFFIC credential evaluation;
-

- a Bachelor's degree in a related field
- a Motivation letter;
- an academic IELTS overall band score of at least 6.5 (see also www.ielts.org) or a TOEFL internet-based (TOEFL-iBT) score of at least 90
- mathematics proficiency is at VWO level (Wiskunde B)
- any additional information required by the admissions committee.

The assessment of all applicants' skills is based on academic background and the possibility for students to finish the Master programme in 2 years.

5.2 LANGUAGE OF TEACHING AND EXAMS

The language of teaching and exams in the Master's programme is English.

5.3 INTERNATIONAL COOPERATION

Several students are going abroad during their study period. The programme offers students the possibility to achieve specific personal and professional objectives.

Students can use our international exchange programme contacts from all over the world, to find their most suitable fit to gain the required knowledge and experiences. Arrangements for study abroad at non-partner universities are subject to special procedures and requirements as specified on the UT study abroad website, www.utwente.nl/en/study-abroad. Detailed information on Faculty level can be found on the website [Study Abroad](#) and the BMS Canvas Study Abroad page.

5.4 ELECTIVE OPTIONS AND REQUIREMENTS RELATED TO ELECTIVES AND STUDENT'S INDIVIDUAL CHOICES

Students can use the elective courses to get a better understanding of a specific topic or a broader field. As electives students can join other IEM Master's courses, or Master's courses offered by other MSc technical programmes of the University of Twente. Exchange courses from other (international) universities may also be incorporated in the programme if they are of a sufficient level and technical orientation with no overlap in the IEM programme courses. Exchange courses need approval by the programme director with mandate of the Examination Board.

Studying abroad for one semester (in the second year of – nominal - study) is stimulated. Students who use this flexibility need to discuss their complete study programme (and personal motivation) with their study counsellor or specialisation coordinator.

Studying abroad needs time for preparation and planning, so that all mandatory courses are part of students' individual study programme. In case of special circumstance or due to unavoidable overlap in schedules, the specialisation coordinator can approve to leave out one orientation mandatory course.

If a student follows a part of their elective courses abroad and for this reason is unable to do a mandatory course that is scheduled during the time abroad, this student can ask for approval of replacing this mandatory course by a comparable one at the host University. On behalf of the programme director, the specialisation coordinator has to approve the individual study programme.

Some suggestions for interesting electives are mentioned below.

IEM Orientations															
Course Code	Service Logistics and Maintenance Management	Qrt	Test	Course code	Supply Chain and Transportation Management	Qrt	Test	Course code	Manufacturing Logistics	Qrt	Test	Course code	Operations Management in Healthcare	Qrt	Test
Recommended electives per orientation															
201800007	Planning & Scheduling	4	PSS	201800007	Planning & Scheduling	4	PSS	201800010	Transportation and Logistics Management	3	PSS	191820120	Warehousing	4	PSS
201200146	Maintenance Engineering & Management	1	PSS	191820120	Warehousing	4	PSS	191820160	Purchasing	1	PSS	194122030	New Production Concepts	4	PSS
191506103	Statistics & Probability	1	S	201100006	Traffic Management	4	PSS	194121020	Optimization of Healthcare Processes	3	PSS	201700196	Advanced Health Economic Modeling	3	PSS
191820120	Warehousing	4	PSS	201100005	Traffic Operations	1	PSS	194122030	New production Concepts	4	PSS	201600025	Finance and Healthcare Purchasing	2	PSS

IEM Orientations							
Course Code	Health Care and Technology Management	Qrt		Course Code	Financial Engineering	Qrt	Test
Recommended electives per orientation							
194121020	Optimization of Healthcare Processes	3	PSS	201000202	Management control for Financial Institutions	4	PSS
191506103	Statistics & Probability	1	S	201100162	Management of Technology for FEM	4	PSS
201600032	Quality Management in Healthcare	2	PSS	201200138	Special Topics in Financial Engineering	2	PSS
191820120	Warehousing	4	PSS	201400244	Cost Management and Engineering	2	PSS

Table 3: MSc IEM Recommended electives per 'Specialisation and Orientation'

Additionally, students can study a specified package of courses for a total of 30 EC on specific topics. Courses of these packages that are already mandatory courses (for a specific student) do not count for the package. Finalizing a package will be mentioned on the 'Diploma Supplement' as 'Additional Specialisation'. At most one Additional Specialisation can be mentioned on the Diploma Supplement. Examples of packages are shown below.

30 EC packages - Additional Specialisations for Engineering Students										
Additional Specialisations: Industrial Engineering and Management										
Course Code	Logistics Management Engineering	Qrt		Course Code	Health Care Engineering	Qrt		Course Code	Financial Engineering and Management	Qrt
Mandatory courses (for Prior Knowledge, see comments and the Course Catalogue)										
201800003	Operations Research Techniques 1 (ORT1)	1+3		201800003	Operations Research Techniques 1 (ORT1)	1+3		191506103	Statistics & Probability	1
191820210	Simulation	1		191820210	Simulation	1		201300060	Mathematical Finance	2
Elective courses										
201800004	Operations Research Techniques 2 (ORT2)	4		201800004	Operations Research Techniques 2 (ORT2)	4		191860651	Micro Economics	1
201800007	Planning & scheduling	4		201700196	Advanced Health Economic Modeling	3		191515101	Introduction to Risk Theory	2
191820120	Warehousing	4		201700197	Decision Making in HC	4		191860181	Risk Management	3
191506103	Statistics & Probability	1		201800005	Statistical Learning in Healthcare	1		201000202	Management Control for Financial Institutions	4
201800010	Transportation and logistics Management	3		194121020	Optimization of Healthcare Processes	3		201300062	Structured Products	3
201800008	After-Sales Service Logistics	2		191506103	Statistics & Probability	1		201100162	Management of Technology for FEM	4
191852630	Reliability Engineering & Maintenance Mngt	3		201700089	Sustainable Business Development	1		191521800	Game Theory	1
201800009	Advanced Inventory Management	2		201600032	Quality Management in Healthcare	1		201400244	Cost Management and Engineering	2
201700089	Sustainable Business Development	1		191820120	Warehousing	4		201200138	Special Topics for Financial Engineers	2
194121020	Optimization of Healthcare Processes	3		201600015	Strategic Technology Mngmt & Inn	3				
1) Basics OR, a programming language, i.e Delphi, Excel/BVA. MATLAB is sufficient only if you are familiar with programming options (scripts, functions and applications) of the program.Extra material available on CANVAS										
2) Basic statistics (probability distribution functions, standard deviation, mean, confidence intervals, etc.). Basic computer programming (if-then constructs, for-loops, local and global variables, functions, procedures, etc.).										

30 EC packages - Additional Specialisations for Engineering Students

Please: pay attention to the required prior knowledge. See →

[Course Catalogue](#)

An additional specialisation gives you the chance to personalise your study programme.

One of the below mentioned 30EC packages, with each 5EC courses, can be registered on your diploma supplement after completion.

- Choose the Package and Courses you will take and check the required prior knowledge; **Specialisation or Orientation mandatory courses are not allowed as packages courses**
- Add the chosen Courses to your Study Form;
- Check if your Additional Specialisation adds up to a 30EC package
- Check if your Study Programme adds up to 120 EC
- Discuss your programme with your Specialisation Coordinator for approval (with a confirmation email to BOZ (BOZ-TBK-CES@utwente.nl)

Packages only for IEM students									
Mechanical Engineering			Civil Engineering and Management			Industrial Design Engineering			
Course Code	Maintenance	Qrt	Course Code	Transport Engineering	Qrt	Course Code	Management and Design	Qrt	
201200146	Maintenance Engineering and Management	1	201800063	Traffic Management	4	192850910	Packaging Design and Management	1	
201500235	Design for Maintenance Operations (IDE)	3	201800065	Traffic Forecasting and Analysis	2	192850840	Source of Innovation	1	
201300038	Failure Mechanisms & Life Prediction	2	201800068	Network Modelling	2	192850740	Product Life cycle	2	
201300039	Structural Health & Condition Monitoring	4	201800060	Sustainable Transport	4	192850840	Scenario Based Product Design	3	
201800034	Infrastructure Asset Management	4	201800064	Traffic Operations	1	201200137	Design History	3	
201800008	After-Sales Service Logistics	2	201800070	Public Transport Modeling	3	192850750	Product Life cycle Management	3	
191852630	Reliability Engineering & Maintenance Mngt	3	201800045	Construction Supply Chain and Digitization	1	201700008	Design and Behaviour Change	4	
201800009	Advanced Inventory Management	2	201800054	Network Equilibrium Analysis	4				
201200145	Maintenance Eng. & Design-for-Main. - CS	-							
201800168	Infrastructure Maintenance Machines	4							
Business & IT			Social Science: Business Administration						
Course Code	Information Systems & Management	Qrt	Course Code	Technology Venturing and Innovation Management	Qrt				
201400277	Enterprise Architecture	2	201500083	Change Management and Consultancy in a Global Context	1				
192376500	Business Process Integration Lab	1	201600012	Management and Governance of Innovation and Creativity	1				
201100051	Information Services	2	201600011	International Entrepreneurship:a strategic technology perspective	1				
192340101	Implementation of IT in organizations	3	201600002	Entrepreneurial Leadership & Responsible Organizational Design	1				
192360021	Electronic commerce	3	194108040	Business Development in Network Perspective	2				
192360021	ICT Management	3	201000087	Entrepreneurial Finance	3				
192376000	Business Case Development for IT Projects	4	201600155	Global Strategy and Business Development	3				
201100052	Global Project Management	4	201600015	Strategic Technology Management and Innovation	3				

Table 4: MSc IEM Additional specialisation

5.5 PROGRAMME COMMITTEE (OLC)

Members of the Programme Committee (OLC) are appointed by the Dean of the faculty every (two) year(s) (faculty regulations Article 13). The most recent composition of the committee can be found at the webpage <https://www.utwente.nl/en/iem/organization-and-contact/#other-bms-ut-committeescontacts>. Correspondence with the committee goes through mailing to the members on their Utwente.nl address. For more information contact the secretariat at 3200.

5.6 EXAMINATION BOARD

Members of the Examination Board are appointed by the Dean of the faculty every (two) year(s) (faculty regulations Article 12). The recent composition of the Board can also be found at the <https://www.utwente.nl/en/bms/examboard/>. Correspondence with the EB is only possible via submitting a request using the web application form.

6 Transitional arrangements

Transitional arrangements IEM

IEM general

Per September 2018 changes will be implemented in the IEM study programme. Students from cohort 2016 and 2017 should not be affected in studying the mandatory courses by those changes. If students face problems in their approved study planning due to rescheduled or replaced courses, please contact your specialisation coordinator or the study counselor. Exam problems are not foreseen.

Simulation

This course was stretched over 2 quartiles. Per academic year 2018-2019 the course is scheduled in one quartile (quartile 1). The content remains mainly the same, so no transitional arrangements are necessary. In case you enrolled in this course in earlier years but did not pass this course, please contact the lecturer.

Discrete Optimization of Business Processes (DOBP)

In 2018-2019 two exams will be offered (quartiles 2 and 3) to students who enrolled in this course in earlier years but did not pass it.

The main content of the course 'Discrete Optimization of Business Processes' (DOBP) is part of the new courses 'Operations Research Techniques 1' (ORT1). So if you passed DOBP you are not allowed to do ORT1.

Reverse Logistics and Re-Manufacturing (RLRM)

The course content of 'Reverse Logistics and Re-Manufacturing' is gradually changed over two years, so transitional arrangements are not necessary. Per academic year 2018-2019 this course is named 'After-Sales Service Logistics'

Supply Chain and Transportation Management (SCTM)

The course content of 'Supply Chain and Transportation Management' is gradually changed over two year, so transitional arrangements are not necessary. Per 2019 this course is named 'Advanced Inventory Management'.

Advanced Production Planning (APP)

In 2018-2019 two exams will be offered (quartiles 1 and 2) to students who enrolled in this course in earlier years but did not pass it.

The course content of APP is divided over two new courses: Planning and Scheduling (P&S) and Operations Techniques 2 (ORT2). If you already finalized Advanced Production Planning you are not allowed to do P&S or ORT2.

7 Additional subject

7.1 GRADUATION WITH DISTINCTION

1. Industrial Engineering and Management has a regulation for graduating with distinction for the first-degree Master's programme. If upon sitting the Master's examination, the student has given evidence of exceptional capability, 'cum laude' (with distinction) will be recorded on the degree certificate.
2. A student is considered to have exceptional capability if each of the following conditions is met:
 - a. the average mark awarded for the courses of the master examination (excluding the Master's Thesis) is at least 8.0;
 - b. in the determination of this average, the units that were not evaluated with a numerical mark or for which an exemption was granted are not considered
 - c. no study unit was evaluated as not passing, and no more than one unit was evaluated with a mark of 6;
 - d. the mark for the final unit (Master's thesis) is at least an 8;
 - e. for the first degree programmes, a two-year Master's programme must have been completed within 30 months.
3. In exceptional cases the Examination Board may grant the designation of „with distinction“ if the conditions, as mentioned in Article 7.2, have not been fully met. The rules applied by the Examination Board can be found in the Rules & Guidelines of the Examination Board.

7.2 SPECIAL REGULATIONS ON THE MASTER THESIS

- a. The Master's project (or thesis) constitutes a special form of practical exercise as meant in Art. 1 (Glossary). Its duration is formally limited by the number of 30 ECs (1 EC = 28 hours) reserved for the project in the respective Master's programme, translated into a corresponding number of weeks: 20. At the end of the period thus established, the project is evaluated using a special Master's thesis evaluation form. The project is concluded by a colloquium, where the student presents and defends the results.
- b. During the preparation course the student draws up a time schedule for his individual project, based on the maximum duration as indicated in par. a. This schedule has to be approved by the primary supervisor (and examiner) of the project. The start of the project is indicated on the registration form of the project in the university's Mobility Online System (MOS).
- c. In case of major problems or unsatisfactory performance by the student or the supervisors during the project, the programme director will decide on the continuation of the project. The student can contest the programme director's decision by submitting an objection with the Examination Board.
- d. Should the student, in spite of a demonstrably adequate level and quality of the supervision received, not succeed in completing the final thesis within the agreed period of time, he will be granted extra time to do so. The extra time to be granted will be bound by a limit of 50% of the maximum duration of the project. The project's supervisors will give clear indications of the elements of the student's work that need to be remediated and the lines along which this may be done.
- e. The programme director will terminate the Master's project if, after the extra time expired, the student has not yet successfully completed the final thesis or no 'green light' has been given by the supervisors for the colloquium for finalizing the project.
- f. After termination of the project as meant in part 7.2.e. The student must file a motivated request to the Examination Board if he wants to start a new Master's project.
- g. Additional stipulations concerning the Master's project are included in the Rules & Regulations of the Examination Board.

7.3 REGULATIONS REGARDING ORDER, CALAMITIES AND ACADEMIC OFFENCES (FRAUD).

The Education and Examination Regulation (EER) includes handling of cases of alleged fraud, which is also covered in the Rules and Guidelines of the Examination Board. At the programme level, students are instructed about fraud and plagiarism in several ways. For written exams, IEM works with external observers and examiners. For written assignment work, IEM lecturers can use a digital fraud scanner.

Though formally re-using one's own work is not considered fraud, submitting work from earlier years is not allowed in the iem programme. For general rules about calamities and academic offences, like fraud, we refer to the education and examination regulations for master's programmes 2018-2019; appendix: regulations regarding order, calamities and academic offences (fraud).
