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Programme-Specific Annex to the EER 2019-2020

For the Master of Science programme

Industrial Engineering and Management Science (M-IEM)

September 2019

Contents

1 Structure and content of the programme

1.1 Programme content

The Master programme Industrial Engineering and Management (M-IEM) consists of three components (see Table 1):

- A set of obligatory courses: the 'core programme' including a set of specialisation and orientation courses;
- Additional elective courses;
- A Master thesis assignment.

The programme starts in September and February. For detailed information about the content of the specialisations and orientations, see Table 2 and Section 1.3.1. All courses are 5 EC (except for the Master Thesis). All course content can be found with the course code in the Course Catalogue of Osiris on this website: https://osiris.utwente.nl/student/OnderwijsCatalogusZoekCursus.do

Table 1

Structure of the MSc Industrial Engineering and Management programme 2019-2020

MSc Industrial Engineering and Management Programme 2019-2020				
M-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
Electives	**45**			Operations Management in Healthcare
Total ECs	**120**	**HCTM**	Health Care Technology and Management	Health Care Technology and Management
		FEM	Financial Engineering and Management	Financial Engineering and Management

Programme IEM / Specialisations	**PLM (EC)**	**HCTM (EC)**	**FEM (EC)**
IEM Research Orientation	5	5	5
Data Science	5	5	5
Preparation Thesis	5	5	5
Master Thesis	30	30	30
Operations Research Techniques 1	5	5	
Operations Research Techniques 2	5	5	
Simulation	5	5	
Statistics & Probability			5
Micro Economics			5
Mathematical Finance			5
Three mandatory courses related to the orientation	15	15	15
Electives	45	45	45
Total	**120**	**120**	**120**

Table 2

Overview of the mandatory courses per specialisation and research orientation including the following categories: course code, course name, the quartile in which the course is offered (Q) and the test format.

IEM Production and Logistic Management research orientations															
Code	**Service Logistics and Maintenance Management**	**Q**	**Test**	**Code**	**Supply Chain and Transportation Management**	**Q**	**Test**	**Code**	**Manufacturing Logistics**	**Q**	**Test**	**Code**	**Operations Management in Healthcare**	**Q**	**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	Preparation Thesis	--	PSS	201200127	Preparation Thesis	--	PSS	201200127	Preparation Thesis	--	PSS	201200127	Preparation Thesis	--	PSS
194100060	Master Thesis	--	PSS	194100060	Master Thesis	--	PSS	194100060	Master Thesis	--	PSS	194100060	Master 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 Eng. & Maintenance Mngt	3	PSS	201800009	Advanced Inventory Mngt	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

IEM HCTM and FEM specialisation							
Code	**Health Care and Technology Management**	**Q**	**Test**	**Code**	**Financial Engineering**	**Q**	**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	Preparation Thesis	--	PSS	201200128	Preparation Thesis	--	PSS
194100060	Master Thesis	--	PSS	194100060	Master 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 Modelling	3	PSS	191515101	Introduction to Risk Theory	2	S
201700197	Decision Making in Health Care	4	PSS	191860181	Risk Management	3	S
201800005	Statistical Learning in Health Care	1	PSS	201300062	Structured Products	3	S

Key to test 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.

Stochastic Models for Operations Management (191530881) is:
- mandatory for PLM and HCTM students who did a pre-master;
- possibly mandatory for international students in case of a deficiency.

Statistics & Probability (191506103) may be mandatory for international students.

As shown in Table 2, most Master courses are assessed with the use of practical exercises. A practical exercise is a unit of study, or a component of a unit of study, in which the emphasis is on the activity of the student. Examples of such practical exercises are: preparing a literature review, paper or design project, delivering a public presentation, participating in a workshop on the international classroom and writing a thesis or paper. The structure of the practical exercise(s) is described in general terms in OSIRIS.

1.2 Study load

The M-IEM programme represents a study load of 120 EC. All MSc IEM courses are 5 European Credits (1EC = 28 hour) with exception of the Master thesis, which is 30 EC.

1.3 Programme-specific characteristics

1.3.1 Profile of the programme

The IEM programme is aimed at educating students to highly qualified industrial engineers and managers. IEM is about improving operational processes, in which multiple (sometimes conflicting) objectives need to be considered such as: improving quality and service, managing risks, increasing productivity, and reducing cost. Modelling and quantitative analysis are used, grounded in an understanding of the technology that is used in processes. Human behaviour is an important factor as well as an open mind for the environment of the organisation, including competitors, market structures, regulation and government policy.

IEM is applied in a variety of fields such as manufacturing, finance, logistics, telecommunications and health care. The IEM scope does not only involve 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 organisations, financial institutions, social insurance organisations, Defence and governmental water management and infrastructure projects. IEM students are prepared for these various contexts by giving them considerable freedom in focusing their programme on areas they are specifically interested in.

In the M-IEM programme, students learn to work on more complex challenges in the field of Industrial Engineering and Management and with less professional guidance compared with the B-IEM programme. M-IEM graduates are specialised 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.

1.3.2 Content of the specialisations

The M-IEM differentiates the following specialisations:

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

This specialisation 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 organisations, 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 orientations (see Table 1). 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 with mandatory courses and the topic of the Master thesis.

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

The FEM specialisation focuses on designing methods for the financial sector. 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.

The FEM specialisation offers one orientation. Within this specialisation students do not have to choose an orientation, although they will get acquainted with all IEM orientations. The specialisation itself leads them through the programme with mandatory courses and the topic of the Master thesis.

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

The HCTM specialisation focuses on managing organisations in the health care sector. Health care processes are analysed and optimised in the context of health care organisations, such as hospitals. The track pays explicit attention to the specific health care context of these organisations, 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 optimisation 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.

The HCTM specialisation offers one orientation. Within this specialisation students do not have to choose an orientation, although they will get acquainted with all IEM orientations. The specialisation itself leads them through the programme with mandatory courses and the topic of the Master thesis.

1.3.3 Coherence and didactical concept

A wide variety of teaching methods is used in this programme. 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 M-IEM 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 life 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 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/organisation. 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 organisation.

1.4 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 organiser, 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/

1.5 Pre-Master's programmes (bridging programmes – transfer minor)

Students who are not directly admissible (see Section 4.1) but have 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 pre-Master's programme. A pre-Master's programme can be taken as a separate pre-Master's programme, or as a special pre-Master's minor ('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 pre-Master's 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 pre-Master's programmes, have to take up to 30 EC of courses. The courses depend on the chosen specialisation (see Table 3 and Table 4). For more information visit the website https://www.utwente.nl/en/education/master/.

Table 3

Pre-Master's programmes per specialisation for students from technical programmes of a Research University, offered in the first quartile (Sept-Oct).

Research University, technical programmes		
Pre-Master's for PLM and HCTM		
Code	**Course Name**	**EC**
191530420	Statistics & probability for premaster IEM	5
201500012	OR models for premaster IEM	10
Total EC		**15**
Pre-Master's for FEM		
Code	**Course Name**	**EC**
191530420	Statistics & probability for premaster IEM	5

201500020	Financial Engineering for premaster IEM	10
Total EC		**15**

Table 4

Pre-Master's programmes, per specialisation, for students from social science programmes of a Research University or from a programme of a University of Applied Science (HBO).

Research Universities, social science programmes, or Applied Science (HBO) programmes					
Pre-Master's for PLM and HCTM					
First quartile (Sept-Oct)			***Second quartile (Nov-Febr)***		
Code	**Course name**	**EC**	**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
		15			15
Total EC					**30**
Pre-Master's for FEM					
Code	**Course name**	**EC**	**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
		15			15
Total EC					**30**
* Students with prior knowledge on this topic will have to do Project OM for premaster IEM (course code 201500019) instead.					

The entire pre-Master's programme has to be completely finished within one academic year. No more than two attempts are permitted per course, to successfully finish the corresponding tests. If a student fails to successfully complete the entire programme under these conditions, the student will not be admitted to the IEM Master programme.

2 Goals and final qualifications

2.1 Aim of the programme

The graduates of the M-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 graduates are able to perform these activities in complex situations.

2.2 Intended learning outcomes (ILOs)

The ILOs (or the so called Final Qualifications) of the M-IEM programme correspond to the requirements formulated by colleagues in the Netherlands and abroad, and by professional practice. We distinguish

two groups of competences: domain-specific and general competences, with a specific operationalization on general competences: reflection, working in (multidisciplinary) teams and preparation of student's lifelong learning, ethics, philosophy of science and Corporate Social Responsibility. Table 5 outlines the ILOs.

Table 5
Intended Learning Outcomes of the Master Industrial Engineering and Management programme.

	A. Professional Academic Qualifications
	The graduate is able to quickly identify, thoroughly comprehend, critically assess, correctly apply, and creatively integrate existing scientific knowledge that can be used for analysing 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 structure of research and design 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 *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.*
A2	Has an overview of quantitative and qualitative empirical research methods and is able to • Critically analyse 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 modelling techniques for operational processes in this domain, and is able to • Critically analyse the results of modelling activities • Select appropriate modelling techniques and justify this choice • Apply these techniques in relatively complex cases.
A4	Is able to integrate existing knowledge, modelling techniques, and research results for designing, validating, and selecting solutions in relatively complex cases. *This is challenging, because existing knowledge may not fully apply to a specific situation, models are always stylised, empirical research always has limitations, and some aspects have been left out of scope from the beginning anyway.*
A5	Has an overview of implementation methods and processes and is able to • Critically analyse ongoing or finished implementation processes • Plan globally an implementation process in a relatively complex case
A6	Has an overview of evaluation methods and techniques and is able to • Critically analyse 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 specialisation 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 concretise effectively his own learning process in the context of "lifelong learning"

3 Exam and interim examinations

3.1 Exam

The Master's examination is completed successfully if all the exams of the units of study, including the Master thesis, have been completed successfully.

3.1.1 Final examination: the Master thesis

The programme concludes with the final assignment: the Master thesis. The student demonstrates his abilities in the integrated application of the knowledge and skills gained from the curriculum of the programme. A Master's committee, consisting of at least two examiners, is assembled for each thesis assignment. The Master thesis is evaluated on an individual basis. The Examination Board prescribes an evaluation checklist to help ensure the quality of the evaluation.

The Master thesis 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%. More information on the Master thesis can be found in Section 6.2 and in the 'MSc Thesis and Graduation Guide' on the IEM Programme Information Canvas site.

3.2 Assessment formats

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 Section 1.1.1;
- A combination of the above.

The exam formats of the mandatory courses offered in the programme are shown in Table 2.

3.3 Required sequence of exams / prerequisites

Individual courses may require prior knowledge, this is stated in the course descriptions in Osiris. Further prerequisites in the IEM programme are restricted to the graduation phase:

- Prerequisite for the Master Thesis course (start execution of the project): 80EC, including the Preparation Thesis course.
- Prerequisites for green light for colloquium: 90EC, including all courses of the approved individual study programme (and excluding the Master thesis course).

4 General information

4.1 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 for admission, IEM distinguishes two types of (inter)national education:

- Research Universities (primarily responsible for research-oriented programmes);
- Universities of Applied Sciences (prepare students particularly for the practical professions).

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

4.1.1 Degree of a (Dutch) Research University

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.

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. The applicant will have to finish a 15 EC pre-Master's programme, unless the admission committee decides otherwise. When required, the applicant must have successfully completed the pre-Master's programme before being admitted to the Master IEM programme.

Applicants with a non-technical Bachelor's degree awarded by the University of Twente: Applicants 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'. Additionally, the applicant will have to finish a 30 EC pre-Master's programme. The admission committee determines the content of the pre-Master programme. The applicant must have successfully completed the pre-Master's programme before being admitted to the Master IEM programme.

4.1.2 Degree of a (Dutch) University of Applied Science (HBO)

A Bachelor's degree in a related field awarded by a Dutch University of Applied Science*:* Applicants with a Bachelor's degree in a related (technical) field awarded by a Dutch University for Applied Science can 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.

Additionally, the applicant will have to finish a 30 EC pre-Master's programme. The admission committee determines the content of the pre-Master's programme. The applicant must have successfully completed the pre-Master's programme before being admitted to the Master IEM programme.

Other 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's programme. The applicant must have successfully completed the pre-Master's programme before being admitted to the Master IEM programme.

4.1.3 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 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.

4.2 Language of teaching and exams

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

4.3 International agreements

Student can study abroad during their study period (see Section 4.4.1). 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 https://www.utwente.nl/en/bms/education/study-abroad/y and the BMS Study Abroad Canvas site.

4.4 Elective programme space

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 courses, or courses offered by other MSc technical programmes of the University of Twente or other Research Universities, provided that they are of a

sufficient level, have a technical orientation and have no overlap with the IEM programme courses. Exceptions:

- **Stochastic Models for Operations Management (191530881) is not allowed** for students with an UT IEM-BSc background;
- **Stochastic Models in Production Logistics (191531830)** is not allowed, the related course Applied Queueing Models 201800171 is allowed;
- **Design of Production and Inventory Systems (191124720)** is not allowed.

Some suggestions for interesting electives from UT programmes are mentioned in Table 6.

Table 6
Suggested elective courses per research orientation

PLM recommended electives							
Code	**Service Logistics and Maintenance Management**	**Q**	**Test**	**Code**	**Supply Chain and Transportation Management**	**Q**	**Test**
201800007	Planning & Scheduling	4	PSS	201800007	Planning & Scheduling	4	PSS
201200146	Maintenance Engineering & Management	1	PSS	191820120	Warehousing	4	PSS
191506103	Statistics & Probability	1	S	201100006	Traffic Management	4	PSS
191820120	Warehousing	4	PSS	201100005	Traffic Operations	1	PSS
Code	**Manufacturing Logistics**	**Q**	**Test**	**Code**	**Operations Management in Health Care**	**Q**	**Test**
201800010	Transportation and Logistics Management	3	PSS	191820120	Warehousing	4	PSS
191820160	Purchasing Management	1	PSS	194122030	New Production Concepts	4	PSS
194121020	Optimization of Healthcare Processes	3	PSS	201700196	Advanced Health Economic Modelling	3	PSS
194122030	New production Concepts	4	PSS	201600025	Finance and Healthcare Purchasing	2	PSS
HCTM and FEM recommended electives							
Code	**Health Care and Technology Management**	**Q**	**Test**	**Code**	**Financial Engineering**	**Q**	**Test**
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

4.4.1 Electives abroad

Students can choose to fill in part of their elective space abroad. Exchange courses from international Universities may be incorporated in the programme if they are of a sufficient level and technical orientation with no overlap in the IEM programme courses (see Section 4.3). Exchange courses need

approval by the programme director with mandate of the Examination Board. On behalf of the programme director, the specialisation coordinator has to approve the individual study programme. If a student follows a part of their elective courses abroad and, due to unavoidable overlap in schedules, is unable to do a mandatory course, the specialisation coordinator can approve to replace an orientation mandatory course (preferably by a comparable course at the host University).

4.4.2 Additional Specialisations

Instead of choosing freely, students can take a specified package of courses for a total of 30 EC on specific topics. A student cannot choose a course for his package if this course is already mandatory in his study programme. Finalizing a package will be mentioned on the diploma supplement as 'Additional Specialisation' with the name of the specialisation added. At most one Additional Specialisation can be mentioned on the diploma supplement. The three IEM specialisations are available as an Additional Specialisation for all Engineering students (see Table 7). The other six packages have been compiled in cooperation with other UT-programmes and are only available to M-IEM students (see Table 8). Students who are interested in doing an Additional Specialisation have to contact the programme coordinator and take the following steps:

- Choose the package and courses and check the required prior knowledge. Courses that are mandatory for the students IEM specialisation and/or orientation are not allowed as package courses;
- Add the chosen courses to the study programme (forms are available on the IEM Programme Information Canvas site). Make sure the Additional Specialisation adds up to a **30EC** package;
- Add other electives so the study programme adds up to 120 EC;
- Discuss the study programme with the specialisation coordinator for approval (with a confirmation email to the programme coordinator).

Table 7

Additional Specialisations of Industrial Engineering and Management (packages may be subject to change, consult the IEM Programme Information Canvas site *for the most recent version).*

Additional Specialisations for Engineering students					
Code	**Logistics Management Engineering**	**Q**	**Code**	**Healthcare Engineering**	**Q**
Mandatory courses					
201800003	Operations Research Techniques 1*	1+3	201800003	Operations Research Techniques 1*	1+3
191820210	Simulation **	1	191820210	Simulation **	1
Elective courses					
201800004	Operations Research Techniques 2	4	201800004	Operations Research Techniques 2	4
201800007	Planning & scheduling	4	201700196	Advanced Health Economic Modelling	3
191820120	Warehousing	4	201700197	Decision Making in HC	4
191506103	Statistics & Probability	1	201800005	Statistical Learning in Health Care	1
201800010	Transportation and logistics Management	3	194121020	Optimization of Healthcare Processes	3
201800008	After-Sales Service Logistics	2	191506103	Statistics & Probability	1
191852630	Reliability Engineering & Maintenance Mngt	3	201700089	Sustainable Business Development	1
201800009	Advanced Inventory Management	2	201600032	Quality Management in Healthcare	2

201700089	Sustainable Business Development	1	191820120	Warehousing	4
194121020	Optimization of Healthcare Processes	3	201600015	Strategic Technology Mngmt & Inn	3
Code	**Financial Engineering**	**Q**			
Mandatory courses					
191506103	Statistics & Probability	1			
201300060	Mathematical Finance	2			
Elective courses					
191860651	Micro Economics	1			
191515101	Introduction to Risk Theory	2			
191860181	Risk Management	3			
201000202	Management Control for Financial Institutions	4			
201300062	Structured Products	3			
201100162	Management of Technology for FEM	4			
191521800	Game Theory	1			
201400244	Cost Management and Engineering	2			
201200138	Special Topics for Financial Engineers	2			

* Operations Research Techniques 1 prior knowledge requirements: 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

** Simulation prior knowledge requirements: 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.).

Table 8

Additional Specialisations of other UT-programmes, only for IEM students, cohort 2018 and later. The name that will be registered on the diploma supplement is noted in Italics (packages may be subject to change, consult the IEM Programme Information Canvas site *for the most recent version).*

Additional Specialisations for IEM students					
Civil Engineering and Management					
Code	***Transport Engineering***	**Q**	**Code**	***Water Management***	**Q**
201800065	Traffic Management	4	c.s.	'Introduction Water Management' *	1+2
201800063	Traffic Forecasting and Analysis	2	201800017	Water Footprint Assessment	1
201800060	Sustainable Transport	4	201800030	Water and Energy	2
201800064	Traffic Operations	1	201800021	Water Management and Governance	3
201800070	Public Transport Modelling	3	201800033	Water and Climate	4
201800045	Construction Supply Chain and Digitization	1	201800022	Urban Water Management	4
201800054	Network Equilibrium Analysis	3	201800018	Hydrology **	1
* Capita Selecta: *Only and mandatory for students with no CEM-background*			201800019	Hydrological Modelling and Forecasting	2
*** Prior Knowledge for Hydrological Modelling and Forecasting*			201800020	Regional Flood Management	3
Mechanical Engineering			**Social Science: Business Administration*** **		
Code	***Maintenance***	**Q**	**Code**	***Technology Venturing and Innovation Management***	**Q**
201200146	Maintenance Engineering and Mngmt	1	201500083	Change Management and Consultancy in a Global Context	1
201500235	Design for Maintenance Operations (IDE)	3	201600012	Management and Governance of Innovation and Creativity	1
201300038	Failure Mechanisms & Life Prediction	2	201600011	International Entrepreneurship	1

201300039	Structural Health & Condition Monitoring	4	201600002	Entrepreneurial Leadership & Responsible Organisational Design	1
201800034	Infrastructure Asset Management	4	201000087	Entrepreneurial Finance	3
201800008	After-Sales Service Logistics	2	201600155	Global Strategy and Business Development	3
191852630	Reliability Eng. & Maintenance Mngmt	3	201600015	Strategic Technology Management and Innovation	3
201800009	Advanced Inventory Management	2	**** only permitted as part of a 30EC package as BA courses are otherwise prohibited in an IEM study programme*		
201800168	Infrastructure Maintenance Machines	4			
Industrial Design Engineering			**Business & IT**		
Code	***Management and Design***	**Q**	**Code**	***Information Systems & Management***	**Q**
192850910	Packaging Design and Management	1	201400277	Enterprise Architecture	2
192850840	Source of Innovation	1	192376500	Business Process Integration Lab	2
192850740	Product Life cycle	2	201100051	Information Services	2
192850810	Scenario Based Product Design	3	192340101	Implementation of IT in organisations	3
201200137	Design History	3	192320501	Electronic commerce	2
192850750	Product Life Cycle Management	3	192360021	ICT Management	3
201700008	Design and Behaviour Change	4	192376000	Business Case Development for IT Projects	4

4.5 Composition of the Programme Committee

For the BSc and MSc programme Industrial Engineering and Management a programme committee (PC) is appointed by the Faculty Board. The committee is the advisory board for the programme director. The PC consists of students and lectures from the programmes on an equal basis. The members of the committee can be found on the website, https://www.utwente.nl/en/iem/programme-committee/

Tasks of the PC are:

- Advising (the programme director) on stimulating and ensuring the quality of the degree programme (WHW art 9.18);
- Advising on teaching and examination regulations (EER);
- Assessing the manner in which the EER is carried out;
- Advising (invited or not invited) on teaching and education issues related to both BSc and MSc programme.

For detailed information we refer to Art. 9.18 of the Higher Education and Research Act.

4.6 Composition of the Examination Board

The Examination Board (EB) Management Science is the body that determines in an objective and expert manner whether a student meets the conditions set under the EER concerning the knowledge, comprehension and skills required to obtain a degree for the M-IEM programme. The EB's main tasks are described in the common elements of this EER. The members of the EB, appointed by the Dean, and contact details can be found on the website: https://www.utwente.nl/en/bms/examboard/.

4.6.1 Fraud/plagiarism

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.

Although formally re-using one's own work is not considered fraud, submitting work from earlier years is not allowed in the M-IEM programme. When fraud is detected the Examination Board will assess and rule on the case.

5 Transitional arrangements

Discrete Optimisation of Business Processes (DOBP): The main content of the course ' Discrete Optimisation of Business Processes' (DOBP) is part of the new courses 'Operations Research Techniques 1' (ORT1). If DOBP has been completed successfully, doing ORT1 is not allowed. No exams will be offered for DOBP in 2019-2020. Students for whom DOBP is mandatory and did not pass the course need to take ORT1 and follow the current course schedule.

Advanced Production Planning (APP): The course content of APP has been divided over two new courses: Planning and Scheduling (P&S) and Operations Techniques 2 (ORT2). P&S and ORT2 have too much overlap with APP. Therefore, if APP has been completed successfully, doing P&S or ORT2 is not allowed. No exams will be offered for APP in 2019-2020. Students for whom APP is mandatory and did not pass the course need to take P&S and ORT2 and follow the current course schedule.

6 Additional subjects

6.1 Graduation with distinction (Cum Laude)

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.

A student is considered to have exceptional capability if each of the following conditions is met:

- The average mark awarded for the courses of the master examination (excluding the Master's Thesis) is at least 8.0;
- In the determination of this average, the units not evaluated with a numerical mark or for which an exemption was granted are not considered
- No study unit was evaluated as not passing, and no more than one unit was evaluated with a mark of 6;
- The mark for the final unit (Master thesis) is at least an 8;
- The two-year Master's programme has been completed within 30 months.

In exceptional cases the Examination Board may grant the designation of 'with distinction' if the conditions, as mentioned above, have not been fully met. The rules applied by the Examination Board can be found in the Rules & Regulations of the Examination Board.

6.2 Special regulations on the Master thesis

The Master thesis constitutes a special form of practical exercise. During the Preparation thesis course the student draws up a time schedule for his individual project, based on the maximum duration (see Section 3.1.1). This schedule has to be approved by the first supervisor. The start of the project is indicated on the registration form of the project in the university's Mobility Online System (MOS). The Master thesis is concluded by a colloquium, in which the student presents and defends the results.

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 file an appeal at the Examination Board against the decision of the programme director.

Should the student, in spite of a demonstrably adequate level and quality of the supervision received, not succeed in completing the Master 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 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.

The programme director will terminate the project if, after the extra time expired, the student has not yet successfully completed the Master thesis or no 'green light' has been given by the supervisors for the colloquium for finalising the Master thesis.

After termination of the project the student must file a motivated request to the Examination Board if he wants to start a new project.

Additional stipulations concerning the Master thesis are included in the Rules and Guidelines of the Examination Board.