**Programme-specific appendix to the TER 2016-2017**
(version February 2017)

For the Master of Science programme

# Industrial Engineering and Management (IEM)

***1. Structure and content of the programme***
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d. Honours programmes

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## *1. Structure and content of the programme*

### a. Composition of the programme

The programme consists of three components:

1. A set of obligatory courses: the 'core programme' including a set of 'specialization 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.

### b. Study load and programme

The IEM Master's programme represents a study load of 120 EC.

***The exam formats (TER, article 3.2, par. 2h)***

The curriculum overview for the Master program includes the following categories:
Quarter / Subject code / Subject name / Study load in ECs / Way of testing / Prior knowledge

The assessment components are sorted by category according to subject code. The overview of assessment components is not presented in chronological order.

*Key to exam formats:*

| | |
|---|---|
| S | = written exam |
| M | = oral exam |
| PGI | = group practical exercise, including a written group report and (in so far as possible) Individual assessment of the manner in which the student participated in the group exercise |
| PS | = practical exercise(s), including a written report |
| 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 |
| BAHL | = reviewed in a manner to be determined by the graduate professor |
| 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 Blackboard in accordance with the provisions of article 4, "Rules & Regulations of the Examination Board".

Final exam: the Master's assignment
The programme concludes with the Master's assignment (or Master's project of Master's thesis), 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.

The Examination Board of the program establishes the rules governing:

a. the procedures used to determine a student's eligibility for the Master's project
b. the manner in which the student's Master's curriculum (Master's assignment and subjects) is developed and approved
c. the manner in which the student acquires the Master's assignment
d. the members of the Master's committee
e. the manner in which the Master's assignment will be completed, monitored and evaluate

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

### *Study programme*

The program starts in September and February, see 'Table ***1:*** **MSc in Industrial Engineering & Management 2016-2017'**

| **Industrial Engineering and Management** | | | **September** | | **2016-2017** | |
|---|---|---|---|---|---|---|
| **In order to graduate students' individual study programme's' must be approved by the specialization coordinator** | | | | | | |
| **Legenda:** | | | | | | |
| F = Financial Engineering and Management | | | | | | |
| P = Production and Logistic Management | | | | | | |
| H = Health Care and Technology Management | | | | | | |
| **2015-2016 first year, September** | | | | | | |
| **Quartile/ Code** | **Coursename** | **Exam** | **EC** | **Obligatory courses** | **recommended courses (electives)** | **Prior knowledge** |
| 1.1, sept | | | | | | |
| 191506103 | Statistics and probability (+) | S | 5 | F/P/H | | |
| 191860651 | Micro Economics | S | 5 | F | | |
| 191521800 | Game Theory | S | 5 | | F | |
| 191820200 | Discrete Optimization of Business Processes (1) | PSS | 2,5 | P/H | | |
| 191820210 | Simulation (1) | PSS | 2,5 | P/H | | |
| 191820160 | Purchasing * | PSS | 5 | | P/H | |
| 1.2, nov | | | | | | |
| 201300060 | Mathematical Finance | S | 5 | F | | |
| 191515101 | Introduction to Risk Theory | S | 5 | F | | |
| 201400174 | Data Science | PSS | 5 | F/P/H | | |
| 191820210 | Simulation (2) | PSS | 2,5 | P/H | | |
| 191820200 | Discrete Optimization of Business Processes (2) | PSS | 2,5 | P/H | | |
| 191820180 | Reverse Logistics & re-manufacturing | PSS | 5 | | P | |
| 201600032 | Quality Management in Healthcare | | 5 | | H | |
| 201600029 | Finance and Healthcare Purchasing * | PSS | 5 | | H | |
| 1.3, febr | | | | | | |
| 191860181 | Risk Management | PSS | 5 | F | | |
| 201300062 | Structured Products | S | 5 | F | | |
| 201600015 | Strategic technology management and Innovation | PSS | 5 | | F/P/H | |
| 191820190 | Supply Chain - & Transport Management | PSS | 5 | P | | |
| 191852630 | Reliability Engineering & Maintenance Management | PSS | 5 | | P | |
| 194121020 | Optimization of Healthcare Processes | S | 5 | H | P | |
| 192340101 | Implementation of IT in organizations | PSM | 5 | | H | |
| 1.4, apr | | | | | | |
| 201000202 | Management Control for Financial Institutions | PSS | 5 | F | | |
| 201100162 | Management of Technology for FEM | PSS | 5 | F | | |
| 194105070 | Information Systems for the Financial Services Industry | PSS | 5 | | F | |
| 191852620 | Advanced Production Planning | S | 5 | P | H | |
| 191820120 | Warehousing | PSS | 5 | P | H | |
| 194122030 | New Production Concepts | PSS | 5 | | P | |
| 192360501 | E-health strategies | S | 5 | H | | |

| second year | | | | | | Prior knowlegde |
|---|---|---|---|---|---|---|
| 2.1, sept | | | | elective or study abroad | | |
| NEW | Methods for early health technology assessment | PSS | 15 | | H | |
| | elective | PSS | 5 | | F/P | |
| 2.2, nov | | | | | | |
| 201200127 | Preparation thesis PLM | BAHL | 5 | P | | |
| 201200128 | Preparation thesis FEM | BAHL | 5 | F | | |
| 201200130 | Preparation thesis HCTM | BAHL | 5 | H | | |
| 201200138 | Special topics in Financial Engineering ** | S | 5 | F | | |
| 201400244 | Cost Management and Engineering | PSS | 5 | | F | |
| | Organization & Strategy | S | 5 | | F/P/H | |
| 2.3 + 2.4 | | | | | | |
| 194100060 | Master thesis | | 30 | F/P/H | | **80 EC incl. preparation course** |

* equalization courses only for non BSc TBK students. Other students to discuss with specialization coordinator

(+) Students who already finished this MSc course before the master have to contact the specialisation coordinator

** Students who study abroad during the second years first semester, are exempted from this obligatory course.

Contact the specialisation coordinator for approval of your study program

**WARNING** **If you consider going abroad for a semester obligatory courses should be planned carefully.**

**How to plan your program**

All students join obligatory courses in the first quartile. During this first quartile you discuss your ideas about your individual program with you specialization coordinator. Draft your plan:

1 Write down your obligatory specialization courses

2 Complete your IEM study program up to 120 EC with:

*a) equalization courses, to discuss with the specialization coordinator*

*b) other technical UT master courses (i.c. IEM)*

*c) master courses from other (inter)national technical Master program's*

3 Discuss your complete study program (and your personal motivation) with your coordinator or study counselor

4 Get a final approval from your specialization coordinator (and if necessary the Examnication Board)

Implementation of non-technical or (inter)national courses need approval from the specialization coordinator and the exam committee.

| Industrial Engineering and Management | February 2017 | | | | | |
|---|---|---|---|---|---|---|
| In order to graduate students' individual study programme's' must be approved by the specialization coordinator | | | | | | |
| | | | | | | |
| Legenda: | | | | | | |
| F = Financial Engineering and Management | | | | | | |
| P = Production and Logistic Management | | | | | | |
| H = Health Care and Technology Management | | | | | | |
| generation 2015-2016 first year, February | | | | | | |
| Quartile/ Code | Coursename | Exam | EC | Obligatory courses | Recommended courses (electives) | Prior knowledge |
| 1.1, febr | **elective or abroad** | | | **elective or study abroad** | | |
| NEW | Methods for early health technology assessment | PSS | 15 | | | |
| 191852630 | Reliability Engineering & Maintenance Management | PSS | 5 | | | |
| 201400174 | Data Science | PSS | 5 | | | |
| 192340101 | Implementation of IT in organizations | 5 | 5 | | | |
| 201600015 | Strategic Technology Management and Innovation | 5 | 5 | | | |
| 1.2, apr | **elective or abroad** | | | **elective or study abroad** | | |
| 195820500 | Infrastructure Management | | 7,5 | | | |
| 192376000 | Business Case Development for IT Projects | PSS | 5 | | | |
| 201000202 | Management Control for Financial Institutions | PSS | 5 | | | |
| 191820120 | Warehousing | PSS | 5 | | | |
| 194105070 | Information Systems for the Financial Services Industry | PSS | 5 | | | |
| 194122030 | New Production Concepts | PSS | 5 | | | |
| 1.3, sept | | | | | | |
| 191506103 | Statistics and probability (+) | S | 5 | F/P/H | | |
| 191860651 | Micro Economics | S | 5 | F | | |
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| 191820160 | Purchasing | PSS | 5 | | P/H | |
| 1.4, nov | | | | | | |
| 201300060 | Mathematical Finance | S | 5 | F | | |
| 191515101 | Introduction to Risk Theory | S | 5 | F | | |
| 201400174 | Data Science (also offered in Febr.) | PSS | 5 | F/P/H | | |
| 191820210 | Simulation (2) | PSS | 2,5 | P/H | | |
| 191820200 | Discrete Optimization of Business Processes (2) | PSS | 2,5 | P/H | | |
| 201200138 | Special topics in Financial Engineering | PSS | 5 | | F | |
| 201400244 | Cost Management and Engineering | PSS | 5 | | F | |
| 191864610 | Organization & Strategy | PSS | 5 | | F/P/H | |
| 191820180 | Reverse Logistics & re-manufacturing | PSS | 5 | | P | |
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| second year | | | | | | Prior knowlegde |
|---|---|---|---|---|---|---|
| 2.1, febr | | | | | | |
| 191860181 | Risk Management | PSS | 5 | F | | |
| 201300062 | Structured Products | S | 5 | F | | |
| 191820190 | Supply Chain - & Transport Management | PSS | 5 | P | | |
| 194121020 | Optimization of Healthcare Processes | S | 5 | H | P | |
| 192340101 | Implementation of IT in organizations | 5 | 5 | | H | |
| 194105070 | Information Systems for the Financial Services Industry | PSS | 5 | | F | |
| 2.2, apr | | | | | | |
| 201000202 | Management Control for Financial Institutions | PSS | 5 | F | | |
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| 201200128 | Preparation thesis FEM | BAHL | 5 | F | | |
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| 191820120 | Warehousing | PSS | 5 | P | H | |
| 192360501 | E-health strategies | S | 5 | H | | |
| 2.3 + 2.4 | | | | | | |
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*b) other technical UT master courses (i.c. IEM)*

*c) master courses from other (inter)national technical Master program's*

3 Discuss your complete study program (and your personal motivation) with your study counselor

4 Get a final approval from your specialization coordinator

Implementation of non-technical or (inter)national courses need approval from the specialization coordinator and the exam committee.

## *Other programme-specific characteristics*

### Content of the specializations

The Master's programme Industrial Engineering and Management differentiates the following specializations (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.

- **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.

- **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.

### *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 specialization 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 Graduation Project report. 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.

***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 program on areas they are specifically 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 specialization 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 specialization. The specialization courses and elective courses provide the opportunity to create a personal profile. This may vary from even more in-depth specialization 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.

***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 Blackboard at the start of the programme.

[1] In Dutch: Technische Bedrijfskunde, in German: Wirtschaftsingenieurwesen

***Master's assignment***

The Master's assignment (or Master's project or Master's thesis) is 30EC 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 Education director with a maximum of 50%. For more information about the execution of these rules we refer to our Blackboard 'organization' **IEM thesis portfolio**, Master Thesis Syllabus.

A single responsible instructor does not supervise the assignment; instead, a Master's committee is assembled for each assignment. The Master's project is evaluated on an individual basis. The Master's project 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 Syllabus.

### d. Honours programmes

For excellent students the University of Twente offers three different extra-curricular Master's honours programmes of 15 EC. Each of these programs has a distinctive profile, which allows the student to develop himself 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 programs and the corresponding selection procedure can be found at the UT honours programmes website http://www.utwente.nl/excellentie/en/

## *2. Aims and final attainment targets*

### a 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.

### b 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.

***Table 1:*** **Final qualifications MSc IEM**

| | |
|---|---|
| **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:<br>production and logistics;<br>information systems;<br>finance and accounting;<br>health care.<br>This implies the following competencies in the domain chosen | |
| A1 | Has a thorough overview of the structure of research and design processes and is able to<br>- identify the various steps in performed research and design<br>- properly break up own research and design activities into sub-processes<br><br>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 |
| A.2 | Has a thorough overview of quantitative and qualitative empirical research methods and is able to<br>- critically analyse performed research as to the methodological aspects<br>- select an appropriate method and justify this choice for research to be performed<br>- 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<br>- critically analyse the results of modelling activities<br>- select appropriate modelling techniques and justify this choice<br>- 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<br><br>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 |
| A5 | Has an overview of implementation methods and processes and is able to<br>- critically analyse on going or finished implementation processes<br>- plan globally an implementation process in a relatively complex case |
| A6 | Has an overview of evaluation methods and techniques and is able to<br>- critically analyse the results of performed evaluations<br>- select appropriate evaluation methods and justify this choice<br>- carry out an evaluation in relatively complex cases |
| A7 | In order to be able to meet these competencies, the graduate must have mastered level 3 of 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, and write papers about design solutions). |
| **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 “lifelong learning” |

**Level of the programme**

*Table 2: Relationship between 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 | | | | | | |

## *3. Examination and exams*

### a. Examination

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

### b. 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.

### c. Required sequence of exams / Prerequisites

Prior knowledge prerequisites in the MSc are restricted to the phase where the student starts the Master's project. See the table 1 for the prerequisites per course.

## *4. General information*

### a Admission to the programme

The admission request for the programme is assessed by an admission committee that consists of the program director of the programme, the specialisation coordinator and the program 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 programs)
2. Universities (college) for professional education (prepares students particular for more practical professions)

The admission committee has specific requirements depending on the degree.

1. Dutch Degrees of Research Universities

*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 program.**

*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 program. If necessary the application have to finish a small (15EC) pre-master program. Applicants with a " non-technical' Bachelor's degree awarded by *the University of Twente* will only be admitted If their mathematics proficiency is at pre-university level equal to the Dutch VWO Wiskunde B The application have to finish a 30EC pre-master program. The admission committee determines the content of the pre-master program. The applicant must have successfully completed the entire pre-master program within a period of 12 months from the start[2].For information concerning the admission see the Graduate site.

2. Degree by a Dutch college for higher professional education (HBO)

*a. A Bachelor's degree in a related field awarded by a Dutch University (college) for higher professional education*

Students with a Bachelor's degree in a related (technical) field awarded by a Dutch University (college) for higher professional education will be admitted to a pre-Master's programme:

- 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 specialization
- If their English proficiency is at VWO level
- If their mathematics proficiency is at pre-university level equal to the Dutch VWO Wiskunde B

All applicant will be judged on an individual basis.

*c. Another Bachelor's degree awarded by a Dutch University (college) for higher professional education*

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 a specialisation coordinator, the admission committee may grant exemptions, entirely or partly, from the domain-specific part of the pre-master program. The applicant must have successfully completed the entire pre-master program before being admitted to the Master's degree program.

3. Bachelor's degrees from a non-Dutch university

[2] Idem (as previous note)

The admissions committee assesses international applicants with a Bachelor's degree awarded by a non-Dutch Research University or University (college) for higher professional education 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 letter of motivation;
- 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.

**Premaster**

The content of the pre-master programme is described on our website http://www.utwente.nl/iem/en/pre-master/ The size of this programme is 30-EC maximum and has to be finished successfully within a period of 12 months from the start[3]. The admissions committee determines the minimum size and content of the specialization-specific part of the pre-Master's programme.
Furthermore special arrangements have been made with Saxion. Students with mathematics proficiency on pre-university level Mathematics B (equal to the Dutch VWO wiskunde B) and a program with a strong technical orientation will be admitted after successfully completing the 'doorstroomminor'. For more information visit the website www.utwente.nl/doorstroom.

## b Language of teaching and exams

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

## c International cooperation

Several student are going abroad during there study period. The programme offers students the possibility to achieve specific personal and professional objectives
Student 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.
Some examples of exchange universities are: Swinburne University of Technology – Australia, Tecnológico de Monterrey – Mexico, The University of Manchester – UK, Fachhochschule München / Munich University of Applied Sciences, Technische Universität Berlin - Germany, Università degli Studi di Bologna – Italy, Bogazici University – Turkey, etc.
For more contacts and/or information see the webpage Study Abroad.

## d 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 the UT-faculties CTW, EWI and TNW of the University of Twente. Courses from other (international) universities may also be incorporated in the programme if they are of a sufficient level and technical orientation. Studying abroad for one semester is stimulated. Students who use this flexibility need to discuss their complete study programme (and personal motivation) with their study counsellor or specialization coordinator. Some suggestions for interesting electives are mentioned in the table below.

[3] For each course of the pre-master programme no more than two examination attempts are allowed. In case the pre-master programme has not been completed successfully within 12 months from the start, the student will not be admitted to the Master's Programme.

| Code | Course names | EC | Quartile (Sept = Q1) |
|---|---|---|---|
| **FEM: obligatory courses** | | | |
| 191860651 | Micro Economics | 5 | 1 |
| 201200138 | Special topics in Financial Engineering | 5 | 2 |
| 201300060 | Mathematical Finance | 5 | 2 |
| 201300062 | Structured Products | 5 | 3 |
| 191515101 | Introduction to Risk Theory | 5 | 2 |
| 191860181 | Risk Management | 5 | 3 |
| 201000202 | Management Control for Financial Institutions | 5 | 4 |
| 201100162 | Management of Technology for FEM | 5 | 4 |
| 191506103 | *Statistics and probability* | *5* | *1* |
| *201400174* | *Data Science* | *5* | *2* |
| 201200128 | *Preparation thesis* | *5* | *2* |
| 194100060 | *Master thesis* | *30* | |
| ***FEM additional elective courses*** | | | |
| 191521800 | Game Theory | 5 | 1 |
| 201400244 | Cost Management and Engineering | 5 | 2 |
| 191864610 | Organization & Strategy | 5 | 2 |
| 194105070 | Information Systems for the Financial Services Industry | 5 | 4 |
| 191820210 | Simulation (2x2,5 EC) | 5 | 1-2 |
| **PLM: obligatory courses** | | | |
| 191820200 | Discrete Optimization of Business Processes (2x2,5 EC) | 5 | 1-2 |
| 191820210 | Simulation (2x2,5 EC) | 5 | 1-2 |
| 191820190 | Supply Chain - & Transport Management | 5 | 3 |
| 191852620 | Advanced Production Planning | 5 | 4 |
| 191820120 | Warehousing | 5 | 4 |
| 191506103 | *Statistics and probability* | *5* | *1* |
| *201400174* | *Data Science* | *5* | *2 en 3* |
| 201200127 | *Preparation thesis* | *5* | *2* |
| 194100060 | *Master thesis* | *30* | |
| ***PLM additional elective courses*** | | | |
| 191820160 | Purchasing | 5 | 1 |
| 191864610 | Organization & Strategy | 5 | 2 |
| 191102041 | Manufacturing Facility Design | 5 | 2 |
| 194121020 | Optimization of Healthcare Processes | 5 | 3 |
| 191852630 | Reliability Engineering & Maintenance Management | 5 | 3 |
| 191820180 | Reverse Logistics & re-manufacturing | **5** | **2** |
| 201200146 | Maintenance Engineering & Management | 5 | 1 |
| 194122030 | New Production Concepts | 5 | 4 |

| | | | |
|---|---|---|---|
| **HCTM: obligatory courses** | | | |
| 191820200 | Discrete Optimization of Business Processes (2x2,5 EC) | 5 | 1-2 |
| 191820210 | Simulation (2x2,5 EC) | 5 | 1-2 |
| 194121020 | Optimization of Healthcare Processes | 5 | 3 |
| 192360501 | E-health strategies | 5 | 4 |
| 191506103 | *Statistics and probability* | *5* | *1* |
| *201400174* | *Data Science* | *5* | *2* |
| 201200130 | *Preparation thesis* | *5* | *2* |
| 194100060 | *Master thesis* | *30* | |
| ***HCTM additional elective courses*** | | | |
| 201600024 | Methods for early health technology assessment | 15 | 1 |
| 201600025 | Quality management in healthcare | 5 | 2 |
| 201600026 | Health economics: maximizing societal Welfare | 5 | 2 |
| 192340101 | Implementation of IT in organizations | PSM | |
| 191864610 | Organization & Strategy | 5 | 2 |
| 191820160 | Purchasing **or** | 5 | 1 |
| 201600029 | Finance & Healthcare purchasing | 5 | 2 |
| 191820120 | Warehousing | 5 | 4 |

## Study paths; a minor in your master programme

| Course Code | Course Name | EC | Quartile (Sept = Q1) |
|---|---|---|---|
| **Information and Technology Management:** Courses offered by Master Business Information Technology | | | |
| 191863960 | Foundation of Information systems | 5 | 1 |
| 192376500 | Business Process Integration Lab | 5 | 1 |
| 201100051 | Information Services | 5 | 2 |
| 192340101 | Implementation of IT in organizations | 5 | 3 |
| 192376000 | Business Case Development for IT Projects | 5 | 4 |
| 192320501 | Electronic commerce | 5 | 3 |
| 192360021 | ICT Management | 5 | 3 |
| **Technology Venturing and Innovation Management** (Courses offered by Business Administration) | | | |
| *These courses can not be taken separately but only as a package of 25 or 30EC* | | | |
| 201600015 | Strategic Technology Management and Innovation | 5 | 3 |
| 194108040 | Business Development in Network Perspective | 5 | 2 |
| 201600012 | Management and Governance of Innovation and Creativity | 5 | 1 |
| 201600011 | International Entrepreneurship - a strategic technology perspective | 5 | 1 |
| 201600002 | Entrepreneurial Leadership & Responsible Organizational Design | 5 | 1 |
| 201000087 | Entrepreneurial Finance | 5 | 2 and 3 |
| **Maintenance: Courses offered by Master Mechanical Engineering and Industrial Engineering and Management** | | | |
| 201200146 | Maintenance Engineering & Management | 5 | 1 |
| 191820180 | Reverse Logistics & Remanufacturing | 5 | 2 |
| 201300038 | Failure Mechanisms & Life Prediction | 5 | 2 |
| 191852630 | Reliability Engineering & Maintenance Management | 5 | 3 |
| 201300039 | Structural Health & Condition Monitoring | 5 | 4 |
| | *extra* | | |
| 201400040 | Dynamics & Control (links to 201300038) | 5 | 1 |
| 191155730 | Tribology (links to 201300039) | 5 | 2 |
| 201200145 | Design for Maintenance (IO) | 5 | |
| 195820500 | Infrastructure Management | 7,5 | 4 |

**Be aware that for electives you always have to check the relevant study programmes and schedule on the website**

**e Program 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 http://www.utwente.nl/bms/en/education/regulations/ of the programme committees. Correspondence with the committee goes through mailing to the members on their Utwente.nl address.For more information contact the secretariat at 3200.

**f 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 http://www.utwente.nl/bms/en/education/regulations/. Correspondence with the Boards goes through examencommissiebms@utwente.nl. For more information contact the secretariat at 3200.

## 5. Transitional arrangements

**Transitional arrangements IEM 2016-2017**

**IEM general**
Per September 2016 some changes will be implemented in the IEM study program. Students from cohort 2014 and 2015 in general should not be affected in studying the obligatory courses by those changes. If student's face problems in their approved study planning due to rescheduled courses please contact your program coordinator or the study counselor. Exam problems are not foreseen.

**Common Course:**
194121110 Introduction to Industrial Engineering and Management (obligatory course for all specializations) will not be offered any more. Instead students can take an elective course.

**PLM specialization:**
201100163 **Management of Technology for PLM** will not be offered any more. Instead students can take an elective course.

**HCTM specialization:**
*Courses that will not be offered anymore:*
- 201000182 **Management of Technology for Health Care** (obligatory course)
- 194111210 **Medical decision making**
- 194111220 **Clinical efficacy & MTA**

The three above mentioned courses will be integrated in a new course 'Methods for early health technology assessment'(15EC) in quartile 1 of the second year.

Students who failed the exams for '201000182, '194111210'or, '194111220' earlier do have two options for re-sit:
a) enroll in the course ' Methods for early health technology assessment (15EC), and contact the lecturer about how to finish your earlier specific course,
b) Contact the lecturer from the earlier course and make agreements on how to finish your specific course.

- 193640070 **Clinical Safety and Quality Assurance.**

*Change of course codes and course names*
- Quality and Safety in Health Care becomes **201600025 Quality management in healthcare**.
- 194112110 Health & Health Systems becomes 201600026 Health Economics: Maximizing Social Welfare
- 201100002 Healthcare purchasing becomes **201600029 Finance and healthcare purchasing**.

The content of these courses will change up to 30% which means that no transitional arrangements are

necessary. Students who failed the courses earlier, enroll in the new course and do have to be aware of the changes.

## *6 Additional subject*

**a: 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 study units of the master examination 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 project or 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 „cum laude" if the conditions mentioned in paragraph 2 above have not been fully met. The rules applied by the Examination Board can be found in the Rules & Regulations of the Examination Board.

**b: 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. 1. 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 Student Mobility System (SMS).
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 lodging 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 conceded, the student has not yet successfully completed the final thesis or no 'green light' has been given by the supervisors for the colloquium that rounds off the project.
f. After termination of the project as meant in par. 6.b.b., 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.