Appendices for the Bachelor's degree programme in Industrial Engineering and Management (2019-2020)

General remark
Due to upcoming changes in the IEM Bachelor curriculum, the third year of the Bachelor IEM described in TER only applies to cohort 2017-2018. The third year of the Bachelor programme IEM for cohorts 2018-2019 and 2019-2020 will be included in the TER of 2020-2021.

Appendix I Learning outcomes of the Bachelor's degree programme (Article 3.1.1)

Holders of a Bachelor's degree in Industrial Engineering and Management have:

1. The required knowledge to describe elementary technological products and processes within a business context.
2. The required understanding to determine and assess the functionality and performance of these products and processes in a multidisciplinary way (e.g. from technological and business perspectives as well as those of a variety of stakeholders).
3. The required skills to design, redesign, implement and subsequently validate these products and processes.
4. The required knowledge, understanding and skills for 'Life-Long Learning' (including finding information and using IT applications) to function largely autonomously.
5. The required knowledge and understanding of technology, business studies, mathematics and natural sciences to successfully complete a Master's degree programme in Industrial Engineering.
6. An academic attitude, i.e. the required knowledge, understanding and skills to conduct elementary academic research.
7. The required skills to communicate effectively about ideas and solutions with both engineers and managers.
8. Basic knowledge in the field of leadership, socially and ethically responsible behaviour in order to apply technology.

Appendix II Majors and Minors of the degree programme (Article 3.7.4)

The degree programme comprises a Major with two tracks:

- PTL - Production Technology and Logistics
- PPT - Process and Product Technology (the name of this major will be changed to SPE - Sustainable Process Engineering. In this TER, the track will be referred to as PPT (SPE))

Appendix III Course units in the propaedeutic phase

- **List of course units; Article 4.1.1**
- **Compulsory order of examinations; Article 9.2**

Course unit name	***ECTS***	***Practical***	***Entry requirements***
Global Supply Chain	5	Yes	
Programming, Modelling and Simulation	5	Yes	
Calculus 1	5	Yes	
Organizational Behaviour and Group Dynamics	5	Yes	
System Dynamics	5	Yes	
Linear Algebra	5	Yes	
Management Accounting	5	Yes	
Materials and Molecules	5	Yes	
Calculus 2	5	Yes	
B2B Marketing	5	Yes	
Dynamics of Engineering Systems	5	Yes	
Statistics and Stochastics	5	Yes	

Appendix IV Course units in the post-propaedeutic phase

- **List of course units; Article 7.1.1**
- **Compulsory order of examinations; Article 9.2**

Course unit name	ECTS	Practical	Entry requirements
2nd year: joint programme	**30**		
Nederlands Bedrijfsrecht (voor IEM) Or International Business Law (for IEM)	5	Yes	
Operations Research	5	Yes	
Fluid Dynamics	5	Yes	
Outlining & Implementing Innovation Strategy	5	Yes	
Research and Design Methodology	5	Yes	
Production Planning and Quality Control	5	Yes	
2nd year: PTL track	**30**		
Signals and Systems (for IEM and BMT)	5	Yes	
Modelling and Analysis of Complex Networks	5	Yes	
Mechanics (for IEM)	5		
Control Engineering	5	Yes	
Production Techniques	5	Yes	
Computer Aided Design & Manufacturing	5	Yes	
2nd year: PPT (SPE) track	**30**		
Technical Thermodynamics (IEM)	5		
Industrial Biotechnology	5	Yes	
Reactor Engineering	5	Yes	
Process Design and Equipment	5	Yes	
Gas-Liquid Mass Transfer	5	Yes	
Transport Phenomena 2	5	Yes	
3rd year: joint programme	**25**		
Research and Design Methodology	5	Yes	Propaedeutic exam
Design Science	5	Yes	140 ECTS of Bachelor's IEM programme (including propaedeutic phase and Business System Design (until cohort 2014/2015) or Research and Design Methodology (cohort 2015/2016) must have been completed).
Integration Project	15	Yes	140 ECTS of Bachelor's IEM programme (including propaedeutic phase and Business System Design (until cohort 2014/2015) or Research and Design Methodology (cohort 2015/2016-2016/2017) must have been completed). From Cohort 2016-2017 Design Science must be completed.
3rd year: PTL track	**35**		
Control Engineering	5	Yes	Propaedeutic exam
Numerical Methods	5	Yes	Propaedeutic exam
Mechatronics	5	Yes	Propaedeutic exam
Computer Aided Design &	5	Yes	Propaedeutic exam

Manufacturing			
Digital and Hybrid Control Systems	5		Propaedeutic exam
Design and Construction (IEM)	5	Yes	Propaedeutic exam
Elective	5	Var.	
3rd year: PPT (SPE) track	**30**		
General Process Equipment	5	Yes	Propaedeutic exam
Special Process Equipment	5	Yes	Propaedeutic exam
Product Technology (IEM)	5	Yes	Propaedeutic exam
Mass Transfer and Reactions in Gas-liquid Reactors	5		Propaedeutic exam
Electives	15	Var.	

PTL electives list

Course code	Course name	Practical	ECTS
NAPMS-12	Principles of Measurement Systems *		5
NAGO-11	Waves and Optics *		5
NAGE-10	Geo-Energy*/**		5
NAEUG-12	Energy from Gas*/**		5
EBB117A05	Entrepreneurial Marketing***		5
EBB119A05	Technology-based Offerings***		5
EBB118B10	Entrepreneurship Project***		10
EBB124A05	Introduction to Entrepreneurship***		5
WBEC19000	Introduction to Science Communication*		5
WBEC19001	Oriëntatie op Onderwijs in de Bètawetenschappen*		5

PPT (SPE) electives list

Course code	Course name	Practical	ECTS
CHEVM1-11	Physical properties of Materials 1*		5
WBIE18006	Capita Selecta PPT		
WBIE13003	Molecular Biotechnology	Yes	5
NAGE-10	Geo-Energy*/**		5
NAEUG-12	Energy from Gas*/**		5
EBB117A05	Entrepreneurial Marketing*		5
EBB119A05	Technology-based Offerings*		5
EBB118B10	Entrepreneurship Project*		10
EBB124A05	Introduction to Entrepreneurship*		5
WBEC19000	Introduction to Science Communication*		5
WBEC19001	Oriëntatie op Onderwijs in de Bètawetenschappen*		5
WBCH17002	Chemical Process Development and Design *		5

*For information on the electives of other degree programmes see the teaching and examination regulations of the corresponding programme.

** It is only allowed to choose one of the Energy-courses.

***Only as part of the (shortened) Minor Innovation & Entrepreneurship. The (shortened) Minor Innovation & Entrepreneurship is organized by the Faculty of Economics and Business (FEB) and the University of Groningen Centre of Entrepreneurship (UGCE) and is open for BSc IEM students who completed their first year. The minor has a limited number of places and students have to apply for these places.
The shortened Minor consists of Entrepreneurial marketing (5 ECTS), Technology-based offerings (5 ECTS), Introduction to Entrepreneurship (5 ECTS) and Entrepreneurship Project (10 ECTS). Together with Outlining and Implementing Innovation Strategy students have then followed the complete Minor. There is a limited number of ECTS available for electives dependent of the track. The other ECTS of this Minor will be extra-curricular.

Appendix V Entry requirements (Article 2.1, article 2.2)

A. Deficient VWO-diploma

1. The following requirements apply to the entrance examination as defined in Article 7.28.3 of the Act:

Bacheloropleiding *Bachelor's degree programme*	**N+T**	**N+G**	**E+M**	**C+M**
Biologie *Biology*	Biologie	Natuurkunde	Wiskunde A of B Natuurkunde Scheikunde Biologie	Wiskunde A of B Natuurkunde Scheikunde Biologie
Farmacie *Pharmacy*	V	Natuurkunde	Natuurkunde Scheikunde	Wiskunde A of B Natuurkunde Scheikunde
Life Science and Technology **Scheikunde** *Chemistry* **Scheikundige Technologie** *Chemical Engineering*	V	Wiskunde B Natuurkunde	Wiskunde B Natuurkunde Scheikunde	Wiskunde B Natuurkunde Scheikunde
Biomedische Technologie (in oprichting) *Biomedical Engineering*	V	Wiskunde B Natuurkunde	Wiskunde B Natuurkunde	Wiskunde B Natuurkunde
Informatica *Computing Science* **Technische Bedrijfskunde** *Industrial Engineering and Management* **(Technische) Wiskunde** *(Applied) Mathematics*	V	Wiskunde B	Wiskunde B	Wiskunde B
Kunstmatige Intelligentie *Artificial Intelligence*	V	V	V	Wiskunde A of B
(Technische) Natuurkunde *(Applied) Physics* **Sterrenkunde** *Astronomy*	V	Wiskunde B Natuurkunde	Wiskunde B Natuurkunde	Wiskunde B Natuurkunde

2. The Admissions Board Bachelor's programmes FSE will determine whether deficiencies have been compensated satisfactorily.

B. HBO (university of applied sciences) or academic propaedeutic certificate

1. The following requirements apply to the entrance examination as defined in Article 7.28.3 of the Act:

Bachelor's degree programme	**Subjects at VWO (pre-university) level**
B Biology	wia or wib + na+sk+bio
B Pharmacy	wia or wib + na+sk
B Life Science and Technology	wib+na+sk
B Computing Science	wib
B Artificial Intelligence	wia or wib
B Physics	wib+na
B Chemistry	wib+na+sk
B Astronomy	wib+na
B Mathematics	wib
B Chemical Engineering	wib+na+sk
B Industrial Engineering and Management Science	wib
B Applied Physics	wib+na
B Applied Mathematics	wib

wia = Mathematics A; wib = Mathematics B; na = Physics; sk = Chemistry; bio = Biology

2. In addition, candidates are required to be competent in English:

Score -> **Test**	**Overall**	**Reading**	**Listening**	**Speaking**	**Writing**
IELTS (Academic)	6.5	6.5	6.5	6.5	6.5
TOEFL IBT (internet-based)	90	21	21	21	24
Cambridge English	CAE or CPE Certificate with a minimum score of 180				
English language test – TC UG	n/a	B2	B2	B2	C1

3. The Admissions Board Bachelor programmes FSE will determine whether deficiencies have been compensated satisfactorily.

C. Foreign qualifications (EEA)

1. Any certificate that grants access to a university in a European country will also grant access to Dutch universities.

2. In the entrance examination, as referred to in art. 7.28, paragraph 3 of the Act, per country and educational institution specific training conditions are mentioned. These are standardized. The entrance examination is, in accordance with the Admissions Board Bachelor's programmes FSE, carried out by the Admissions Office. If for a specific diploma no standardisation has taken place then the requirements as formulated for candidates with a HBO (university of applied science) propaedeutic certificate will apply to these candidates in the entrance examination as defined in Article 7.28.3 of the Act (see A).

3. In addition, candidates are required to be competent in English:

Score -> **Test**	**Overall**	**Reading**	**Listening**	**Speaking**	**Writing**
IELTS (Academic)	6.5	6.5	6.5	6.5	6.5
TOEFL IBT (internet-based)	90	21	21	21	24
Cambridge English	CAE or CPE Certificate with a minimum score of 180				
English language test – TC UG	n/a	B2	B2	B2	C1

4. The Admissions Board Bachelor's programmes FSE will determine whether deficiencies have been compensated satisfactorily.

D. Foreign qualifications (non-EEA)

1. A non-European certificate that according to NUFFIC and/or NARIC standards is equivalent to a Dutch VWO certificate will grant access to university in the Netherlands.

2. In the entrance examination, as referred to in art. 7.28, paragraph 3 of the Act, per country and educational institution specific training conditions are mentioned. These are standardized. The entrance examination is, in accordance with the Admissions Board Bachelor's programmes FSE, carried out by the Admissions Office. If for a specific diploma no standardisation has taken place then the requirements as formulated for candidates with a HBO (university of applied science) propaedeutic certificate will apply to these candidates in the entrance examination as defined in Article 7.28.3 of the Act (see A).

3. In addition, candidates are required to be competent in English:

Score -> Test	Overall	Reading	Listening	Speaking	Writing
IELTS (Academic)	6.5	6.5	6.5	6.5	6.5
TOEFL IBT (internet-based)	90	21	21	21	24
Cambridge English	CAE or CPE Certificate with a minimum score of 180				
English language test – TC UG	n/a	B2	B2	B2	C1

4. The Admissions Board Bachelor's programmes FSE will determine whether deficiencies have been compensated satisfactorily.

E. Entrance examination (Colloquium Doctum)

1. The following requirements apply to the entrance examination as defined in Article 7.29 of the Act:

Degree programme	Nature and Health VWO level	or	Nature and Technology VWO level
B Biology	en, wia or b, sk, bio, na		en, wib, na, sk, bio
B Pharmacy	en, wia or b, sk, bio, na		en, wib, na, sk
B Life Science and Technology	en, wib, sk, bio, na		en, wib, na, sk
B Computing Science	en, wib, sk, bio		en, wib, na, sk
B Artificial Intelligence	en, wia or b, sk, bio		en, wib, na, sk
B Physics	en, wib, sk, bio, na		en, wib, na, sk
B Chemistry	en, wib, sk, bio, na		en, wib, na, sk
B Astronomy	en, wib, sk, bio, na		en, wib, na, sk
B Mathematics	en, wib, sk, bio		en, wib, na, sk
B Chemical Engineering	en, wib, sk, bio, na		en, wib, na, sk
B Industrial Engineering and Management Science	en, wib, sk, bio		en, wib, na, sk
B Applied Physics	en, wib, sk, bio, na		en, wib, na, sk
B Applied Mathematics	en, wib, sk, bio		en, wib, na, sk

en = English; wia = Mathematics A; wib = Mathematics B; na = Physics; sk = Chemistry; bio = Biology

2. In addition, candidates are required to be competent in English:

Score -> Test	Overall	Reading	Listening	Speaking	Writing
IELTS (Academic)	6.5	6.5	6.5	6.5	6.5
TOEFL IBT (internet-based)	90	21	21	21	24
Cambridge English	CAE or CPE Certificate with a minimum score of 180				
English language test – TC UG	n/a	B2	B2	B2	C1

3. The Admissions Board Bachelor's programmes FSE will determine whether deficiencies have been compensated satisfactorily.

Appendix VI Clustering of Bachelor's degree programmes Article 5.3.4, Article 5.6.1

Degree programme CROHO code	Name of degree programme	Clustered with CROHO code	Name of degree programme
56286	B Life Science and Technology	56860 56157 56226	B Biology B Pharmacy B Biomedical Engineering (in formation)
56860	B Biology	56286 56157 56226	B Life Science and Technology B Pharmacy B Biomedical Engineering (in formation)
56157	B Pharmacy	56860 56286 56226	B Biology B Life Science and Technology B Biomedical Engineering (in formation)
56226	B Biomedical Engineering (in formation)	56860 56286 56157	B Biology B Life Science and Technology B Pharmacy
56980	B Mathematics	56965 50206 56962 50205	B Applied Mathematics B Physics B Applied Physics B Astronomy
56965	B Applied Mathematics	56980 50206 56962 50205	B Mathematics B Physics B Applied Physics B Astronomy
50206	B Physics	56962 50205 56965 56980	B Applied Physics B Astronomy B Applied Mathematics B Mathematics
56962	B Applied Physics	50206 50205 56965 56980	B Physics B Astronomy B Applied Mathematics B Mathematics
50205	B Astronomy	56962 56965	B Applied Physics B Applied Mathematics

		50206 56980	B Physics B Mathematics
56857	B Chemistry	56960	B Chemical Engineering
56960	B Chemical Engineering	56857	B Chemistry

Appendix VII Admission to the post-propaedeutic phase Article 5.2.1

The following candidates will be admitted to the post-propaedeutic phase:

a. Students who have been issued a positive study advice from the degree programme in question
b. Students who have been issued a positive study advice from one of the degree programmes:

Appendix VIII Contact hours propaedeutic phase Article 3.6

Degree programme year 1	
Structure contact hours	**Contact hours per year**
Lectures	310
Tutorial	180
Tutoring	12
Supervision during an internship	
Examinations	210
Practicals	50

Appendix IX University Minors of the faculty of Science and Engineering (Article 8.5.1)

1. Neurosciences Minor (taught in English):
- Neuroscience (15 ECTS)
- Behavioural Neuroscience (15 ECTS)

Future Planet Innovation (taught in English):
- Global Challenges (10 ECTS)
- Sustainability in perspective (5 ECTS)
- Sustainable contributions to society (15 ECTS)

Astronomy through Space and Time Minor (taught in English):
- The Evolving Universe (5 ECTS)
- Cosmic Origins (5 ECTS)
- Astrobiology (5 ECTS)

Einstein's physics: Space-time and parallel worlds (taught in English):
- Einstein's Universe (5 ECTS)
- Quantum World (5 ECTS)
- Building blocks of matter (5 ECTS)

2. The Programme Committee for the Bachelor's degree programmes in Biology and Life Science and Technology also has authority in the field of the Minor "Neurosciences" and/or its course units.

The Programme Committee for the Master's degree programme in Energy and Environmental Sciences also has authority in the field of the Minor "Future Planet Innovation" and/or its course units.

The Programme Committee for the Bachelor's degree programme in Astronomy also has authority in the field of the Minor "Astronomy through Space and Time" and/or its course units.

The Programme Committee for the Bachelor's degree programmes in Physics and Applied Physics also has authority in the field of the Minor "Einstein's physics: Space-time and parallel worlds" and/or its course units.

3. The Board of Examiners for the Bachelor's degree programmes in Biology and Life Science and Technology and the Master's degree programmes in Biology, Ecology and Evolution, Marine Biology and Molecular Biology and Biotechnology also has authority in the field of the Neurosciences Minor and/or its course units.

The Board of Examiners for the Master's degree programme in Energy and Environmental Sciences also has authority in the field of the "Future Planet Innovation" Minor and/or its course units.

The Board of Examiners for the Bachelor's degree programme in Astronomy also has authority in the field of the Astronomy through Space and Time Minor and/or its course units.

The Board of Examiners for the Bachelor's degree programmes in Physics and Applied Physics also has authority in the field of the Physics Minor "Einstein's physics: Space-time and parallel worlds" and/or its course units.

4. These Teaching and Examination Regulations also apply in their entirety to the Minors in Neurosciences, Future Planet Innovation, Astronomy through Space and Time and Einstein's physics: Space-time and parallel worlds and/or their course units.

Appendix X Transitional arrangement (article 12.1 TER Bachelor IEM 2019-2020)

Transitional arrangement for the Bachelor's IEM

Discontinued course units				**Substitute course units**				
Course unit code	*Course unit name*	*ECTS*	*Final exam period*	*Course unit code*	*Course unit name*	*ECTS*	*Explanation*	*Equivalent* Yes/No*
EBP033A05	Marketing for E&BE	5	2019-2020	WPIE18001	B2B Marketing	5	Course is now hosted by IEM instead of FEB. New course is taught in year 1 and tailored to IEM students.*/**	No
WBIE17003	Physical Transport Phenomena (IEM)	5	-		Fluid Dynamics	5	The name of the course is changed to better suit the content. The content of the course will not change. Students from earlier cohorts can follow the new course.*	Yes
NAMATK-09	Materials Science and Engineering	5	2019-2020	-	-	-	Content will be distributed over several new courses. There will be two final exam opportunities in 2019-2020 for students from cohorts ≤2017-2018.	-
WBIE18001	Applied Manufacturing Research	5	2019-2020	-	-	-	The course is discontinued. There will be two final exam opportunities in 2019-2020 for students from cohorts ≤2017-2018.	-
WBIE16000	Industrial Polymers	5	-	-	-	-	This course shifts from year 2 to year 3 (elective) and will therefore not be taught in 2019-2020. There will be two exam opportunities in 2019-2020 for students from cohorts ≤2017-2018.	-
TBBSY-12	Biological Systems	5	2019-2020	-	-	-	Course is discontinued. Content will be distributed over several new courses. There will be two final exam opportunities in 2019-2020 for students from cohorts ≤2017-2018.	-
TBSTMO-11	Structures and Molecules	5	2019-2020	-	-	-	Course is discontinued. Content will be distributed over several new courses. There will be two final exam opportunities in 2019-2020 for students from cohorts ≤2017-2018.	-
WBEC15000	Onderwijs en Communicatie***	5	-	WBEC19000/ WBEC19001	Introduction to Science Communication/ Oriëntatie op Onderwijs in de Bètawetenschappen	5/5	Elective Course is discontinued. Two new courses are available from 2019-2020 (see list of electives).	No/No
CHEFR-10	Single-Phase Reactors	5	2019-2020	-	-	-	Course content will be partially transferred to IEM specific course. Course will continue to exist for Chemistry/Chemical	-

							Engineering. IEM students from cohorts ≤2017-2018. are allowed to join the exams in 2019-2020.	

* It is also possible to substitute equivalent course units in the other direction. This can apply to students with a large backlog who want to fall under the new OER.
** Students from cohort ≤2017-2018 who only need to take the exam can take the exam at FEB in 2019-2020. Students who need to follow the course need to follow the new course.
***For information on the electives of other degree programmes see the teaching and examination regulations of the corresponding programme.