



university of
 groningen

faculty of science
 and engineering

industrial engineering and
 management

**Appendices for the Bachelor's degree
 programme(s) in Industrial Engineering and
 Management (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 3.6.4)

The degree programme has the following Majors referred to as tracks:

- PTL - Production Technology and Logistics
- SPE - Sustainable Process Engineering (previously known as Process and Product Technology, PPT)



Appendix III Course units in the propaedeutic phase

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

<i>Course unit name</i>	<i>ECTS</i>	<i>Practical</i>	<i>Entry requirements</i>
Global Supply Chain	5	See Ocasys	
Programming, Modelling and Simulation	5	See Ocasys	
Calculus 1 (for IEM)	5	See Ocasys	
Organizational Behaviour and Group Dynamics	5	See Ocasys	
System Dynamics	5	See Ocasys	
Linear Algebra (for IEM)	5	See Ocasys	
Management Accounting	5	See Ocasys	
Materials and Molecules	5	See Ocasys	
Calculus 2 (for IEM)	5	See Ocasys	
Industrial Marketing	5	See Ocasys	
Dynamics of Engineering Systems	5	See Ocasys	
Statistics and Stochastics	5	See Ocasys	



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) <i>or</i> International Business Law (for IEM)	5	See Ocasys	
Operations Research	5	See Ocasys	
Fluid Dynamics	5	See Ocasys	
Outlining & Implementing Innovation Strategy	5	See Ocasys	
Research and Design Methodology	5	See Ocasys	
Production Planning and Quality Control	5	See Ocasys	
2nd year: PTL track	30		
Signals and Systems (for IEM)	5	See Ocasys	
Modelling and Analysis of Complex Networks	5	See Ocasys	
Mechanics (for IEM)	5	See Ocasys	
Control Engineering	5	See Ocasys	
Production Techniques	5	See Ocasys	
Computer Aided Design and Manufacturing	5	See Ocasys	
2nd year: SPE track	30		
Technical Thermodynamics (IEM)	5	See Ocasys	
Industrial Biotechnology (for IEM)	5	See Ocasys	
Reactor Engineering	5	See Ocasys	
Process Design and Equipment	5	See Ocasys	
Gas-Liquid Mass Transfer	5	See Ocasys	
Transport Phenomena 2	5	See Ocasys	
3rd year: joint programme	20		
Design Science	5	See Ocasys	140 ECTS of Bachelor's IEM programme (including propaedeutic phase) and Research and Design Methodology) must have been completed.
Bachelor Integration Project	15	See Ocasys	140 ECTS of Bachelor's IEM programme (including propaedeutic phase), Research and Design Methodology and Design Science must have been completed.
3rd year: PTL track	40		
Materials Selection for Engineering Design <i>or</i> Digital and Hybrid Control Systems	5	See Ocasys	
Design and Construction (IEM)	5	See Ocasys	
Optional Module Package	30	See Ocasys	



3rd year: SPE track	40		
Product Technology (IEM)	5	See Ocasys	
Capita Selecta SPE	5	See Ocasys	
Optional Module package	30	See Ocasys	

Year three Optional Module Packages

In semester 1 both tracks have the option to choose between several optional module packages of 30 ECTS of optional modules. Three different types of packages have been defined:

Package 1: IEM specialization

The IEM specialization package consists of sets of 5 compulsory IEM courses (25 ECTS) and 1 elective course (5 ECTS) from the list of FEB electives

PTL compulsory courses 25 ECTS:

Course name	Practical	ECTS	Entry requirements
Nanoscience and nanotechnology	See Ocasys	5	
Numerical methods	See Ocasys	5	
Principles of Measurement systems**	See Ocasys	5	
Mechatronics	See Ocasys	5	
Entrepreneurship for Engineers*	See Ocasys	5	

*Not allowed in combination with (courses from) [Minor Innovation & Entrepreneurship](#)

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

SPE compulsory courses 25 ECTS:

Course name	Pactical	ECTS	Entry requirements
Nanoscience and nanotechnology	See Ocasys	5	
Industrial Organic Chemistry and Catalysis **	See Ocasys	5	
Industrial Organic Chemistry and Catalysis Practical**	See Ocasys	5	
Chemical Process Development and Design**	See Ocasys	5	
Entrepreneurship for Engineers*	See Ocasys	5	

*Not allowed in combination with (courses from) [Minor Innovation & Entrepreneurship](#)

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



FEB electives list*

Course name	Course code	ECTS
Information Systems Management	EBB632A05	5
Statistical Inference	EBB075A05	5
Globalization - Topics and Methods	EBB093A05	5
Health Economics	EBB120A05	5
Junior Business Research and Consulting	EBB123A05	5
Finance and Risk Management for IB	EBB631B05	5
Macroeconomics for EOR	EBB027B05	5

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

Package 2: FSE, FEB, UCG or UG Minor

This package consist of 30 ECTS in courses from an approved minor. Minors of 15 ECTS can be combined to 30 ECTS. The following Minors are approved for both tracks:

FSE Minors*
<u>Mini-minor Einstein's physics: space-time and parallel Worlds</u> (15 ECTS, Semester 1a)
<u>Mini-minor Astronomy through space and time</u> (15 ECTS, Semester 1b)
<u>Minor Modelling in the Life Sciences</u>
<u>Minor Neurosciences</u>
<u>Minor Future Planet Innovation</u>
UCG Minors available to BSc IEM students*
<u>Minor Innovation & Entrepreneurship</u> Note: this minor can only be chosen without the course EBB107A05 Innovation management B&M due to overlap with IEM courses. It therefor has a total of 25 ECTS. The additional 5 ECTS must be chosen from the following list of courses from the IEM specialization Packages: WBIE045-05 Nanoscience and Nanotechnology (PTL and SPE) WBIE049-05 Numerical Methods (for IEM) (PTL students only) WBIE011-05 Mechatronics (PTL students only) WBPH029-05 Principles of Measurement Systems (PTL students only) WBCE003-05 Industrial Organic Chemistry and Catalysis (SPE students only) WBCE007-05 Chemical Process Development and Design (SPE students only)
FEB Minors available to BSc IEM students*
<u>Minor Finance</u>
University of Groningen Minors*



Minor Energy (Faculty of Economics and Business)

Minor Philosophy (Faculty of Philosophy)

Minor Education** (FSE in cooperation with other Faculties)

Minor Rhetorics (Faculty of Arts)

Minor Data Wise (Faculty of Behavioural and Social Sciences)

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

**This minor can result in a qualification “Tweedegraads docent wiskunde” as soon as the proposal for this qualification has been approved. The proposal for this qualification is currently under review.

Package 3: Studying abroad

Pre-defined sets of courses at pre-approved universities will be available as optional modules. The packages will contain a set of IEM-oriented courses with a study -load of 30 ECTS or equivalent.

All packages will be pre-approved by the Bachelor IEM management to guarantee a good level and absence of overlap with the IEM BSc programme.



Appendix V Entry requirements (Article 2.1, article 2.2)

A. (Deficient) VWO-diploma

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

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



- 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

- 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 Biomedical Engineering	wib + na
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

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

Score ->	Overall	Reading	Listening	Speaking	Writing
Test					
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

Applicants with a Dutch VWO or equivalent diploma are exempt for an English language test as are native English speakers.

- 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 ->	Overall	Reading	Listening	Speaking	Writing
Test					
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

Applicants with a Dutch VWO or equivalent diploma are exempt for an English language test as are native English speakers.

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 ->	Overall	Reading	Listening	Speaking	Writing
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Test					
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

Applicants with a Dutch VWO or equivalent diploma are exempt for an English language test as are native English speakers.

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

E. Entrance examination (Colloquium Doctum)

- 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

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

Score ->	Overall	Reading	Listening	Speaking	Writing
Test					
IELTS (Academic)	6.5	6.5	6.5	6.5	6.5
TOEFL IBT (internet-	90	21	21	21	24



based)					
Cambridge English	CAE or CPE Certificate with a minimum score of 180				
English language test – TC UG	n/a	B2	B2	B2	C1

Applicants with a Dutch VWO or equivalent diploma are exempt for an English language test as are native English speakers.

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



Appendix VI Clustering of Bachelor's degree programmes (Articles 2.9.4, 5.3.3, 5.3.4, 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 6.1.1)

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:

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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)

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)

Future Planet Innovation (taught in English): (not offered in the academic year 2020-2021)

- *Global Challenges (10 ECTS)*
- *Sustainability in perspective (5 ECTS)*
- *Sustainable contributions to society (15 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 (not offered in the academic year 2020-2021), 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 2020-2021)

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
WBIE17001	Industrial (Bio) Technology	5	On request in 2020-2021	-	-	-	Course has been removed from the programme, content was partially redistributed over other courses	-
WBIE18006	Capita Selecta PPT	5	-	WBIE046-05	Capita Selecta SPE	5	Course has been renamed to better fit the content	Yes*
CHTGPE05E	General Proces Equipment	5	-	-	-	-	Course has been removed from the programme, content was partially redistributed over other courses**	-
CHSPETM-09	Special Proces Equipment	5	-	-	-	-	Course has been removed from the programme, content was partially redistributed over other courses**	-
WBIE17004	Mass Transfer and Reactions in Gas-liquid Reactors	5	-	WBIE036-05	Gas-Liquid Mass Transfer	5	Course has been renamed to better fit the content	Yes*
WPIE18001	B2B Marketing	5	-	WBIE050-05	Industrial Marketing	5	Course has been renamed to better fit the content	Yes*
NAGE-10	Geo-Energy****	5	-	-	-	-	Elective has been removed from the programme ***	-
WBEC19000	Introduction to Science Communication****	5	-	-	-	-	Elective has been removed from the programme **	-
WBEC19001	Oriëntatie op Onderwijs in de Bètawetenschappen****	5	-	-	-	-	Elective has been removed from the programme **	-
NAGO-11	Waves and Optics****	5	-	-	-	-	Elective has been removed from the programme **	-
NAEUG-12	Energy from Gas****	5	-	-	-	-	Elective has been removed from the programme **	-
CHEVM1-11	Physical Properties of Materials 1****	5	-	-	-	-	Elective has been removed from the programme **	-
WBIE13003	Molecular Biotechnology****	5	2020-2021	-	-	-	Elective has been removed from the programme **	-

* 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.

**This course is removed from the IEM BSc programme, but is still taught in 2020-2021 as part of a different degree programme. Students from cohort <2018-2019 can still participate in the course in 2020-2021.

***This course is removed from the IEM BSc programme and will not be taught in 2020-2021. Transitional Arrangements are included in the TER of the corresponding degree Programme.

****As a replacement to these electives, students from cohort <2018-2019 can also choose the following new courses as electives:

WBIE045-05 Nanoscience and Nanotechnology

WBIE047-05 Entrepreneurship for Engineers - not allowed in combination with (courses from) the minor Innovation and Entrepreneurship



Additional Transitional arrangement for the Bachelor's IEM

Discontinued course units				Substitute course units				
<i>Course unit code</i>	<i>Course unit name</i>	<i>ECTS</i>	<i>Final exam period</i>	<i>Course unit code</i>	<i>Course unit name</i>	<i>ECTS</i>	<i>Explanation</i>	<i>Equivalent* Yes/No</i>
NAFSYS05E	Physical Systems	5	2018-2019	WPMA18004+ WPIE18003	Calculus 2 (for IEM)+ Dynamics of Engineering Systems	10	The new curriculum contains no single course that contain the learning objectives of Physical Systems. The combination of these two courses functions as a substitution.	No
NAMATK-09	Materials Science and Engineering	5	2019-2020	NAMATK-12	Materials Science	5	To facilitate students who could not pass the course with an exam only, the course Materials Science is appointed as substitution.	Yes*
CHEFR-10	Single-Phase Reactors	5	-	WBIE19003/ WBIE029-05	Reactor Engineering	5	Addendum to TER Appendices BSc IEM 2019-2020: new course is sufficiently equivalent to old course to count as a full substitution.	Yes*

* 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.