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Appendices for the Bachelor's degree programme(s) in Industrial Engineering and Management (2021-2022)

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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.

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Appendix II Majors 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

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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	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	

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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**		
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	
Sustainable Engineering Design	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 ***or*** 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	Practical	ECTS	Entry requirements
Special Process Equipment	See Ocasys	5	
Circular Economy for Process Industry	See Ocasys	10	
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 consists 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*
Mini-minor Einstein's physics: space-time and parallel Worlds (15 ECTS, Semester 1a)
Mini-minor Astronomy through space and time (15 ECTS, Semester 1b)
Minor Neurosciences
Minor Future Planet Innovation
UCG Minors available to BSc IEM students*
Minor Innovation & Entrepreneurship Note: this minor can only be chosen without the course EBB107A05 Innovation management B&M due to overlap with IEM courses. It therefore 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 students) 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) WBCE012-05 Special Process Equipment (SPE students only)
FEB Minors available to BSc IEM students*
Minor Finance
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"

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.

Package 4: Customly composed minor package

The following criteria will be used by the Board of Examiners to evaluate minor packages which deviate from the TER.

Guidelines to approve:

1. The proposed minor package is a valuable addition to the study program of the bachelor degree Industrial Engineering and Management.

Conditions for a minor package:

1. The proposed minor package has no overlap with the curriculum of the bachelor degree Industrial Engineering and Management.

2. The proposed minor package has sufficient technical, engineering and/or business character.

3. The proposed minor package contains no first year courses which are not of sufficient level.

4. The proposed minor package contains a coherent set of course units.

5. There is enough information provided about the proposed minor package to evaluate the proposal.

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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 *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 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

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

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 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

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 -> **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

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.

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

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.

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

56960	B Chemical Engineering	56857	B Chemistry

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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 3.5

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 Additional Requirements Open degree Programmes (Art. 7.3)

In exceptional circumstances students wishing to pursue an open degree programme may file a request with the Board of Examiners. The Board of Examiners will evaluate whether the proposed curriculum meets the learning outcomes of the degree programme and can determine further conditions in their rules and regulations.

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Appendix XI Transitional arrangement (article 12.1 TER Bachelor IEM 2021-2022)

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?*
WBCE003-05	*Industrial Organic Chemistry and Catalysis*	*5*	*2021-2022*	*WBCE003-05*	*Industrial Organic Chemistry and Catalysis*	*5*	*Course has been removed from the IEM programme but is offered in Chemical Engineering.*	*Yes*
WBCE009-05	*Industrial organic chemistry and catalysis practical*	*5*	*2021-2022*	*WBCE009-05*	*Industrial organic chemistry and catalysis practical*	*5*	*Course has been removed from the IEM programme but is offered in Chemical Engineering.*	*Yes*
WBIE002-05	*Nederlands Bedrijfsrecht voor IEM*	*5*	*2021-2022*	*WBIE052-05*	*Sustainable Engineering Design*	*-*	*Course has been removed from the curriculum.*	*No*
WBIE006-05	*International Business Law for IEM*	*5*	*2021-2022*	*WBIE052-05*	*Sustainable Engineering Design*	*-*	*Course has been removed from the curriculum*	*No*