



# University of Pretoria Yearbook 2021

## BEng Metallurgical Engineering (12130005)

**Department** Materials Science and Metallurgical Engineering

**Minimum duration of study** 4 years

**Total credits** 584

**NQF level** 08

### Programme information

All fields of study of the BEng degree have been accredited by the Engineering Council of South Africa (ECSA), and comply with the academic requirements for registration as a professional engineer. The programmes are designed in accordance with the outcomes-based model as required by the South African Qualifications Authority (SAQA). The learning outcomes and contents of the programmes have been compiled in accordance with the latest accreditation standards (PE-60 and PE-61) of ECSA, which also comply with the SAQA requirements, and which are summarised as follows:

#### Learning outcomes of the BEng degree:

A graduate in engineering should be able to apply the following skills on an advanced level:

- Engineering problem solving.
- Application of specialist and fundamental knowledge, with specific reference to mathematics, basic sciences and engineering sciences.
- Engineering design and synthesis.
- Investigation, experimentation and data analysis.
- Engineering methods, skills, tools and information technology.
- Professional and general communication.
- Awareness and knowledge of the impact of engineering activity on society and the physical environment.
- Work in teams and in multidisciplinary environments.
  - An awareness and ability for lifelong learning.
  - An awareness and knowledge of principles of professional ethics and practice.
- Awareness and knowledge of engineering management principles and economic decision-making.

#### Learning contents of the BEng programmes:

Six essential knowledge areas are included in the syllabi of the programmes. The typical representation of each knowledge area as a percentage of the total contents of an undergraduate programme is given in brackets ( ) in the list below. This percentage varies for the different study directions, but conforms in all instances to the minimum knowledge area content as stipulated by ECSA.

Knowledge areas:

- Mathematics, including numerical methods and statistics (13%)
- Basic sciences: the natural sciences essential to the programme (15%)
- Engineering sciences (40%)



- d. Engineering design and synthesis (16%)
- e. Computing and information technology (5%)
- f. Complementary studies: communication, economy, management, innovation, environmental impact, ethics, engineering practice (11%).

## Admission requirements

- The closing date is an administrative admission guideline for non-selection programmes. Once a non-selection programme is full and has reached the institutional targets, then that programme will be closed for further admissions, irrespective of the closing date. However, if the institutional targets have not been met by the closing date, then that programme will remain open for admissions until the institutional targets are met.
- The following persons will be considered for admission: Candidates who are in possession of a certificate that is deemed by the University to be equivalent to the required National Senior Certificate (NSC) with university endorsement; candidates who are graduates from another tertiary institution or have been granted the status of a graduate of such an institution, and candidates who are graduates of another faculty at the University of Pretoria.
- Life Orientation is excluded when calculating the APS.
- Grade 11 results are used for the conditional admission of prospective students.
- A valid qualification with admission to degree studies is required.
- Minimum subject and achievement requirements, as set out below, are required.
- Conditional admission to the four-year programmes in the School of Engineering is guaranteed only if a prospective student complies with ALL the requirements as indicated in the table.
- Admission to ENGAGE in the School of Engineering will be determined by the NSC results, achievement levels of 5 for Mathematics and 5 for Physical Sciences, and an achievement level of 5 for English, together with an APS of 30.
- Students may apply directly to be considered for the ENGAGE programme.
- All lectures at the University of Pretoria are presented in English only.

**Note:** The Engineering Council of South Africa (ECSA) accredits our programmes and our degrees meet the requirements for Professional Engineers in SA.

### **Transferring students**

#### **Candidates previously registered for the BSc - Extended programme**

The Admissions Committee of the faculty considers applications of candidates who were previously registered for the BSc - Extended programme, on grounds of their NSC results as well as academic merit. Such students will only be considered for the four-year programme if they have passed all the prescribed modules and obtained a minimum of 65% in the Mathematics, Physics and Chemistry modules, respectively.

#### **Candidates previously registered at UP or at another university**

The faculty's Admissions Committee considers applications of candidates who have already completed the final NSC examination and/or were previously registered at UP or at another university, on grounds of their NSC results as well as academic merit. Candidates who were dismissed from other faculties or universities will not be considered.

#### **Candidates previously registered at a teacher's college or university of technology**

The faculty's Admissions Committee considers the application of these candidates on the grounds of their NSC results as well as academic merit.

#### **Qualifications from countries other than South Africa**



- Citizens from countries other than South Africa and South African citizens with foreign qualifications must comply with all the other admission requirements and the prerequisites for subjects/modules.
- In addition to meeting the admission requirements, it may be expected from candidates to write the **TOEFL, IELTS or SAT**, if required.
- Candidates must have completed the National Senior Certificate with admission to degree studies or a certificate of conditional exemption on the basis of a candidate's foreign qualifications, the so-called "Immigrant" or "Foreign Conditional Exemption". The only condition for the "Foreign Conditional Exemption" that is accepted is: 'completion of the degree course'. The exemption certificate is obtainable from Universities South Africa (USAf). Detailed information is available on the website at [click here](#).

**University of Pretoria website:** [click here](#)

### Minimum requirements

#### Achievement level

#### English Home

#### Language or

#### English First

#### Additional

#### Language

		Mathematics		Physical Sciences		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	>65%	C	>65%	C	<b>33</b>

\* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. Students in the Cambridge system must offer both Physics AND Chemistry with performance at the level specified for NSC Physical Sciences in the table above.

\* International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission. Students in the IB system must offer both Physics AND Chemistry with performance at the level specified for NSC Physical Sciences in the table above.

### ENGAGE Programme minimum requirements

#### Achievement level

#### English Home

#### Language or

#### English First

#### Additional

#### Language

		Mathematics		Physical Sciences		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	<b>30</b>

## Other programme-specific information

With a few exceptions, most modules offered at the School of Engineering are semester modules having credit values of either 8 or 16.

A student may be permitted by the Dean, on recommendation of the relevant head of department, to register for an equivalent module in an alternate semester, although the module is normally offered to the student's group in another semester, and providing that no timetable clashes occur.

### Please note:

1. All students are required to successfully complete JCP 203, Community-based project 203, as part of the



requirements for the BEng degree. A student may register for the module during any of the years of study of the programme, but preferably not during the first or the final year of study.

2. Students registered for Chemical Engineering who have passed CBI 311 or CBI 410, receive credit for CBI 310.
3. Mechanical Engineering: For the Aeronautical Option, the themes of both the Design and the Project must be aeronautical-related.
4. Offering of electives depends on the availability of resources and industry support.

## Promotion to next study year

### **Promotion to the second semester of the first year and to the second year of study (Eng. 14)**

- a. A new first-year student who has failed in all the prescribed modules of the programme at the end of the first semester, is excluded from studies in the School of Engineering. A student who is registered for the Engineering Augmented Degree Programme and has passed only 8 credits will also be excluded.
- b. A student who complies with all the requirements of the first year of study, is promoted to the second year of study.
- c. A student who has not passed at least 70% of the credits of the first year of study after the November examinations, must reapply for admission should he/she intend to proceed with his/her studies. Application on the prescribed form must be submitted to the Student Administration of the School of Engineering not later than 11 January. Late applications will be accepted only in exceptional circumstances after approval by the Dean. Should first-year students be readmitted, conditions of readmission will be determined by the Admissions Committee.
- d. Students who have not passed all the prescribed modules at first year level (level 100), as well as students who are readmitted in terms of Faculty Regulations must register for the outstanding first-year level (level-100) modules.
- e. A student who is repeating his or her first year, may, on recommendation of the relevant heads of department and with the approval of the Dean, be permitted to enroll for modules of the second-year of study in addition to the first-year modules which he or she failed, providing that he or she complies with the prerequisites for the second-year modules and no timetable clashes occur. Students on the ENGAGE programme may, following the same procedure, be permitted to enrol for level-200 modules in addition to the level-100 modules which he/she failed providing that he/she complies with the prerequisites for the modules at 200-level and no timetable clashes occur. On recommendation of the relevant head of department and with special permission from the Dean, permission may be granted to exceed the prescribed number of credits. The total number of credits which may be approved may not exceed the normal number of credits per semester by more than 16 credits.
- f. Students in Computer, Electrical and Electronic Engineering, who fail a first-year module for the second time, forfeit the privilege of registering for any modules of an advanced year of study.

### **Please note:**

- i. From the second year of study each student should be in possession of an approved calculator. It is assumed that each student will have easy access to a laptop computer.
- ii. Students who intend transferring to Mining Engineering, must familiarise themselves with the stipulations set out in the syllabi of PWP 121 Workshop practice 121.

### **Promotion to the third year of study of the Four-year Programme, as well as to the third and the**



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**fourth years of study of the ENGAGE Programme. In case of the fourth year of study of the ENGAGE Programme, the words "first", "second" and "third" must be substituted with the words "second", "third" and "fourth" respectively. (Eng. 15)**

- a. A student who complies with all the requirements of the second year of study, is promoted to the third year of study.
- b. A student must pass all the prescribed modules at first year level (level 100) before he or she is admitted to any module at third year level (level 300).
- c. A student who is repeating his or her second year must register for all the second-year modules still outstanding. Such a student may, on recommendation of the relevant head of department and with the approval of the Dean, be permitted to enroll for modules of the third year of study in addition to the second-year modules which he or she failed, providing that he or she complies with the prerequisites for the third-year modules and no timetable clashes occur. On recommendation of the relevant head of department, and with special permission from the Dean, permission may be granted to exceed the prescribed number of credits. The total number of credits which may be approved may not exceed the normal number of credits per semester by more than 16 credits.
- d. Students in Computer, Electrical and Electronic Engineering who fail a second-year module for the second time forfeit the privilege of registering for any modules of the third year of study.
- e. Students who intend transferring to Mining Engineering must familiarise themselves with the stipulations set out in the syllabi of PWP 120 Workshop practice 120, as well as PPY 317 Practical training 317.

**Promotion to the fourth year of study of the Four-year Programme, as well as to the fifth year of study of the ENGAGE Programme. In case of the fifth year of study of the ENGAGE Programme, the words "second", "third" and "fourth" must be substituted with the words "third", "fourth" and "fifth" respectively. (Eng. 16)**

- a. A student who complies with all the requirements of the third year of study is promoted to the fourth year of study. A student who does not comply with all the requirements but who is able to register for all outstanding modules in order to complete the degree programme, may at registration be promoted to the fourth year of study.
- b. A student must pass all the prescribed modules of the second year of study, before he or she is admitted to any module of the fourth year of study.
- c. A student who has not passed all the prescribed modules of the third year of study, must register for the outstanding modules. A student may be admitted by the Dean, on the recommendation of the relevant head of department, to modules of the fourth year of study, in addition to the outstanding third-year modules, provided that he or she complies with the prerequisites of the fourth-year modules and no timetable clashes occur. The total number of credits per semester for which a student registers may not exceed the normal number of credits per semester by more than 16 credits. In exceptional cases, the Dean may, on recommendation of the relevant head of department, permit a student to exceed the above limit.
- d. Students in Computer, Electrical and Electronic Engineering who fail a third-year module for the second time, forfeit the privilege of registering for any modules of the fourth year of study.

## Pass with distinction

- a. A student graduates with distinction if:
  - i. no module of the third or fourth year of study of the four year programme or of the fourth or fifth year of the



- ENGAGE programme was repeated and a weighted average of at least 75% was obtained in one year in all the modules of the final year of study; and
- ii. the degree programme was completed within the prescribed four years for the four year programme and within the prescribed five years of the ENGAGE programme.
- b. Exceptional cases to the above will be considered by the Dean.



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## Curriculum: Year 1

**Minimum credits: 134**

### Fundamental modules

Academic orientation 112 (UPO 112) - Credits: 0.00

### Core modules

General chemistry 171 (CHM 171) - Credits: 16.00

Electricity and electronics 122 (EBN 122) - Credits: 16.00

Physics 176 (FSK 176) - Credits: 16.00

Humanities and social sciences 110 (HAS 110) - Credits: 8.00

Humanities and social sciences 120 (HAS 120) - Credits: 8.00

Graphical communication 110 (MGC 110) - Credits: 16.00

Materials science 113 (NMC 113) - Credits: 16.00

Statics 122 (SWK 122) - Credits: 16.00

Calculus 158 (WTW 158) - Credits: 16.00

Mathematics 164 (WTW 164) - Credits: 16.00

Workshop practice 121 (WWP 121) - Credits: 6.00



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## Curriculum: Year 2

**Minimum credits: 168**

### Core modules

Engineering statistics 220 (BES 220) - Credits: 8.00

Electrical engineering 221 (EIR 221) - Credits: 16.00

Mineralogy 210 (GMI 210) - Credits: 16.00

Community-based project 203 (JCP 203) - Credits: 8.00

Programming and information technology 213 (MPR 213) - Credits: 16.00

Dynamics 210 (MSD 210) - Credits: 16.00

Professional and technical communication 210 (NJJ 210) - Credits: 8.00

Materials science 223 (NMC 223) - Credits: 16.00

Process thermodynamics 220 (NPT 220) - Credits: 16.00

Metallurgical calculations 210 (NTC 210) - Credits: 8.00

Mathematics 238 (WTW 238) - Credits: 16.00

Differential equations 256 (WTW 256) - Credits: 8.00

Calculus 258 (WTW 258) - Credits: 8.00

Numerical methods 263 (WTW 263) - Credits: 8.00





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## Curriculum: Year 3

**Minimum credits: 152**

Students who failed NEC310 and NEX320 in 2019 will be allowed to repeat it in 2020 for the final time.

### Core modules

- Engineering management 310 (BSS 310) - Credits: 8.00
- Engineering activity and group work 320 (MIA 320) - Credits: 8.00
- Hydrometallurgy 322 (NHM 322) - Credits: 16.00
- Materials science 313 (NMC 313) - Credits: 16.00
- Mechanical metallurgy 320 (NMM 320) - Credits: 16.00
- Minerals processing 310 (NMP 310) - Credits: 16.00
- Process heat transfer and control 312 (NPB 312) - Credits: 16.00
- Pyrometallurgy 321 (NPM 321) - Credits: 16.00
- Industrial training 316 (NPY 316) - Credits: 16.00
- Metallurgical fluid mechanics 310 (NTV 310) - Credits: 8.00
- Refractory materials 321 (NVM 321) - Credits: 8.00



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## Curriculum: Final year

### Minimum credits: 144

Students who failed NPB412 in 2019 will be allowed to repeat it in 2020 for the final time.

### Core modules

Engineering professionalism 410 (IPI 410) - Credits: 8.00

Hydrometallurgy 412 (NHM 412) - Credits: 16.00

Minerals processing 411 (NMP 411) - Credits: 16.00

Process design 421 (NOP 421) - Credits: 32.00

Metals processing 411 (NPW 411) - Credits: 16.00

Industrial training 416 (NPY 416) - Credits: 16.00

Research project 400 (NSC 400) - Credits: 40.00

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The information published here is subject to change and may be amended after the publication of this information. The [General Regulations \(G Regulations\)](#) apply to all faculties of the University of Pretoria. It is expected of students to familiarise themselves well with these regulations as well as with the information contained in the [General Rules](#) section. Ignorance concerning these regulations and rules will not be accepted as an excuse for any transgression.