University of Pretoria Yearbook 2019

Faculty of Engineering, Built Environment and Information Technology

Welcome to the Faculty of Engineering, Built Environment and Information Technology

The Faculty is a leading source of locally relevant and internationally competitive programmes in Engineering, the Built Environment and Information Technology, at both undergraduate and graduate levels. It attracts high-quality students and staff, and offers extended programmes to facilitate inclusiveness. It is well resourced in terms of teaching and research facilities, and houses several research institutes. The Faculty maintains close links with industry that supports both the teaching and research programmes. The multidisciplinary nature of the Faculty facilitates interaction across disciplines in both teaching and research activities.

Faculty regulations and information

The rules for the degrees published in this Yearbook are subject to change and may be amended after the publication of this information.

The General Regulations (referred to as G.1-G.56) and General Rules apply to all faculties of the University of Pretoria. It is expected of all students to familiarise themselves well with these regulations and rules as well as all faculty-specific and programme-specific regulations and information as stipulated in the online yearbook. Ignorance concerning these regulations will not be accepted as an excuse for any transgression.

Please read the faculty regulations in conjunction with the General Regulations.

Academic literacy
It is expected of all new undergraduate students who wish to study at the University to sit for an academic literacy test. Certain modules which address shortcomings in this respect, are included in the undergraduate curriculum. In addition, modules which have the purpose of developing specific language and communication skills in the context of the requirements of the engineering profession are also included in the curriculum.

Change of field of study
Transfer from one field of study to another may only take place with the Dean’s approval, after consultation with the relevant Head of Department.

Examinations
Examinations, projects and research reports/mini-dissertations

i. An examination in a module may be written and/or oral. Projects and research reports/mini-dissertations are prepared and examined as stipulated in the study guide of the module, in accordance with the regulations and procedures as described below.
ii. The examinations for modules of the first semester are held in May/June, while all other examinations (third and fourth-quarter modules, second semester modules and year modules) are held in October/November.

Examination admission
A minimum semester/year mark of 40% is required in order to be admitted to the final examination in a specific module, with the exception of first-semester modules at first-year level where a minimum semester mark of 30%

is required for admission to an examination. In addition, all other examination admission requirements, applicable to the relevant module, must have been met.

Special examinations (including the aegrotat)
Refer to G.12.5.

i. A medical certificate stating that a student appeared ill or declared him/herself unfit to write the examination **will not be accepted**.
ii. The doctor must be consulted **on or before the date** on which the examination was scheduled.

Ancillary examinations
Refer to G.12.3.
Please note: No ancillary or special examinations are granted in any design modules (all ONT modules) in the Department of Architecture.

Other special examinations
Refer also to G.12.6.

i. The Dean may, on the recommendation of the relevant head of department, grant a special examination in a module to a student who failed that module in the final year of study, and consequently does not comply with degree requirements.
ii. In the schools of **Built Environment** and **Information Technology**: A student may at most, be admitted to either one special examination in a year module or two special examinations in semester modules or four special examinations in quarter modules.
iii. In the **School of Engineering**: A student may be granted at the most two such special examinations. To be taken into consideration for a special examination, a student should have obtained a minimum final mark of 40% and should also have complied with all other examination admission requirements which are applicable to the relevant module.
iv. A student must apply in writing to the Dean before consideration will be given for admission to a special examination. The relevant head of department decides when the special examination will take place and may prescribe work that must be satisfactorily completed before a student may write the examination.
v. During calculation of the final mark the semester mark is retained and the final mark is calculated as the weighted average of the special examination mark and the semester mark, in accordance with the formula as published in the study guide of the specific module. The candidate should also comply with the subminimum requirements. The highest final mark that may be awarded is 50%.
vi. No special examinations will be allowed for modules with a project or design component.

Please note:

- In the **School for the Built Environment**, the pass mark required for a special examination is 50%, a higher mark is not allocated and the semester/year mark is not taken into consideration.
- **School of Information Technology**: If a test or examination clash occurs between modules within the prescribed curriculum, an adjustment of the test date and/or time will only be considered if the student completes an official application form at the department's administration office and submits a copy and supporting documentation to the relevant lecturer at least seven (7) days prior to the scheduled test. A module from a higher year level receives preference to that of a lower year level within the prescribed curriculum.
- In the **School of Engineering**: no special examinations will be allowed for modules with a project or design component in any discipline of engineering. No other special examinations are granted in the School of Engineering.

Re-marking of examination scripts
Refer to G.14.

Supplementary examinations in the School of Engineering
Refer to G.12.4.
In the School of Engineering a supplementary examination is only granted in instances where:

i. A final mark of between 45% and 49% was achieved;
ii. A final mark of between 40% and 44% was achieved and where the candidate also achieved either a semester mark or an examination mark of 50% or higher;
iii. A pass mark has been obtained, but the required subminimum in the examination section of the module or divisions thereof has not been obtained.
iv. A final mark of between 40% and 49% has been obtained in first-year modules in the first semester.

Calculation of the final supplementary examination mark:

i. The semester mark is retained and the final mark is calculated as the weighted average of the supplementary examination mark and the semester mark, in accordance with the formula as published in the study manual of the specific module, with the proviso that the maximum final mark awarded may be no more than 50%. The only exception to this rule is in the case of first-year modules at first-semester level, where the semester mark is not considered, and where the supplementary examination mark is taken as the final mark, with the proviso that the maximum final mark awarded may be no more than 50%.
ii. All other pass requirements, as published in the study manual of each specific module, remain so and are applicable during the determination of the final result of a supplementary examination in the module.

Special supplementary examinations will not be arranged for students who were not able to write the supplementary examinations during scheduled times, as given in the examinations timetable.

Supplementary examinations in the School for the Built Environment
Refer to G.12.4.
Except for first-semester modules in the first year where supplementary examinations are compulsory between 40% and 49%, a supplementary examination is only granted in instances where:

i. a final mark of between 45% and 49% was obtained;
ii. a final mark of between 40% and 44% was obtained and where the candidate also obtained either a semester mark or an examination mark of 50% or higher;
iii. a pass mark has been obtained, but the required subminimum in the examination section of the module or divisions thereof has not been obtained.

G.12.4(i) to (iii) do not apply to third-year modules of any of the programmes in the Department of Architecture. No supplementary examinations are granted in any year of study for the design module (ONT modules).

Supplementary examinations in the School of Information Technology
Refer to G.12.4.
In the School of Information Technology all supplementary examinations are considered and granted in accordance with the stipulations of G Regulation G.12.4, and is calculated as follows:

i. The semester mark is retained and the final mark is calculated as the weighted average of the supplementary examination mark and the semester mark, in accordance with the formula as published in the study manual of the specific module, with the proviso that the maximum final mark awarded may be no more than 50%. The only exception to this rule is in the case of first-year modules at first-semester level, where the semester mark is not considered, and where the supplementary examination mark is taken as the final mark, with the proviso that the maximum final mark awarded may be no more than 50%.
ii. All other pass requirements, as published in the study manual of each specific module, remain so and are applicable during the determination of the final result of a supplementary examination in the module.

Special supplementary examinations will not be arranged for students who were not able to write the supplementary examinations during scheduled times, as provided in the examinations timetable.

Pass requirements

Refer also to G.11.1(a) and G.12.2.2

a. In order to pass a module, a student must obtain an examination mark of at least 40% and a final mark of at least 50% except if stated otherwise in the study guide. A student passes a module with distinction if a final mark of at least 75% is obtained. The final mark is compiled from the semester/year mark and the examination mark.

Please note: In the School of Engineering, borderline cases (e.g. a mark of 49% or 74%) must be reconsidered by both the internal and external examiners, for determination of the possible merit of an upward adjustment of the mark. Marks may not be adjusted downwards, except when obvious marking and adding errors were detected. The pass mark is a minimum final mark of 50% and a student fails the module if a lower mark (e.g. 49%) was obtained.

b. Calculation of the final mark: The semester/year mark must account for no less than 40% and no more than 60% of the final mark, with the exception of modules such as design and research projects and research reports/essays, as well as in modules where the development of general skills is the primary learning activity, where appropriate alternative norms are determined individually by schools or departments. The specific details and/or formula for the calculation of the final mark are set out in the study guide of each module. Also, a schedule listing this information (for all the modules presented in each school) will be compiled, for approval by the Dean.
c. Calculation of the semester/year mark: The semester/year mark is compiled from formative assessment of learning activities such as assignments, presentations, practicals and group projects, as well as from class tests and semester tests. For each module the specific formula for the calculation of the semester/year mark is determined by the lecturer(s) responsible for the presentation of the module and the details are set out in the study guide. Also, a schedule listing this information for all the modules presented in each school will be compiled, for approval by the Dean.

Refer also to G.11.1(b).

d. In some modules specific requirements in respect of certain components of the semester/year mark may be set in order for a student to pass the module (for example that satisfactory performance in and attendance of practical classes are required). Thus, even if a pass mark is obtained in the module, a pass is not granted unless these requirements are met. For such modules these specific requirements are set out in the study guide. Also, a schedule containing this information (for all such modules presented in each school) will be compiled, for approval by the Dean.
e. A student must comply with the subminimum requirements in subdivisions of certain modules. For such modules these specific requirements are set out in the study guide of the module. Also, a schedule containing this information (for all such modules presented in each school) will be compiled, for approval by the Dean.
f. A student may be promoted (exempted from the examination) in certain modules in the School of Information Technology should a specified semester/year mark (minimum 65%) be obtained. For such modules these specific requirements are set out in the study guide of the module. Refer also to G Regulation G.10.3.

Please note: G.10.3 is normally not applied by the School of Engineering and no promotion (exemption from the examination) is allowed in any module, except in special cases where permission of the Dean is required.

Dean's Merit List (Eng. 10.2)

The Dean's Merit List will be published annually on the website of the Faculty and will contain the names of the

students whose academic performance over the year has been excellent and deserves recognition. Letters of commendation will be sent to students who qualify for inclusion on the Dean's Merit List.
To be eligible for inclusion in the Dean's Merit List, a student in the School for Engineering must pass all the modules as prescribed in the curriculum of a specific year of study as published. A student registered for the first, second or third year of the four-year programme must obtain a minimum weighted average of 75% and a student registered on the first, second, third or fourth year of the five year programme must obtain a minimum weighted average of 75%.

Additional regulations and information for the School of Engineering

Selection

A selection procedure takes place prior to admission to any programme in the School of Engineering. Restrictions may be placed on the number of students admitted to the School and/or its departments. Postgraduate selection takes place as stipulated in the respective departmental rules.

Renewal of registration (Eng.4)

Should a student who is repeating a year of study, with the exception of first-year students, fail to obtain sufficient credits to be promoted to the subsequent year of study at the end of the year of repetition, he or she will forfeit his or her right to readmission. Students who forfeit the right to readmission, may apply in writing to the Admissions Committee for readmission to the Faculty. Provisions regarding promotion, including provisions for first-year students, appear in the regulations of the relevant fields of study.

Equivalent modules

A BEng 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.

Duration of examinations in undergraduate modules in the School of Engineering

The duration of an examination in an 8-credit module will not exceed 90 minutes and in a 16-credit module will not exceed 180 minutes, except where special approval is granted by the Dean to exceed these limits.
The duration of a supplementary examination or a special examination in all under-graduate modules will not exceed 90 minutes, except where special approval is granted by the Dean to exceed this limit. In the event of an aegrotat, the duration of the examination can be extended to a maximum period of 180 minutes, depending on an arrangement made between the lecturer and the student.

Exposure to the practice of engineering (Eng. 8)

Engineering students are exposed in three ways to the practice of engineering during the course of their studies:

a. Workshop practice – a module comprising a period at the end of the first year of study during which students are trained in workshop practice. Students in electrical, electronic and computer engineering attend the Introduction to Laboratory Measurements and Computer Simulations’ module.
b. Practical training – specific periods of work at firms during which experience is gained in the practice of engineering. Students may deviate from this stipulation only with the permission of the Dean.
c. Excursions – study excursions arranged for students to visit various engineering firms and installations in order to obtain insight into the industry. This training is compulsory. Details of the modules regarding these aspects of training are explained in the sections of this publication which deal with the curricula and syllabi of the various programmes.

Additional regulations and information for the School for the Built Environment

Selection

Selection takes place prior to admission to the following programmes in the School for the Built Environment:

a. All undergraduate programmes: A restricted number of students are admitted to all undergraduate

programmes.

b. Postgraduate programmes: A restricted number of students are admitted to the following taught programmes: BArchHons, BIntHons, BLArchHons, BScHons (Applied Science), BScHons Quantity Surveying, BScHons Construction Management, MArch(Prof), MInt(Prof), ML(Prof), MSc (Applied Science), MSc Quantity Surveying, MSc Construction Management, MSc Real Estate, MSc Real Estate Retail Property and Master of Town and Regional Planning. Applications close on 31 October for South African students. Admission to the MSc and PhD programmes by research is subject to approval by the relevant head of department and the Dean.

International students

Applications close on 31 August for international students.

International students wanting to be considered for selection must have their qualifications audited and verified by the South African Qualifications Authority (SAQA). Those candidates wanting to register for professional postgraduate degree programmes for purposes of professional registration must further have their qualifications verified by the relevant registering council as to the equivalence of the registration category. All costs are for the direct account of the applicant. All documentation must accompany the application and be submitted before the closing date.

Please Note: Contact details for the various bodies are to be found on the relevant departmental web page.

Promotion requirements in the School for the Built Environment

a. Students whose academic progress is not acceptable can be suspended from further studies. Refer to the following important regulations: G.3 and/or regulations as they appear for the applicable programmes.
b. A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations will be notified in writing by the Dean or admissions committee at the end of the relevant semester.
c. A student who has been excluded from further studies may apply in writing to the admissions committee of the School for the Built Environment for readmission on or before 12 January.
d. Should the student be readmitted by the admissions committee, strict conditions will be set which the student must comply with in order to proceed with studies.
e. Should the student not be readmitted to further studies by the admissions committee, he/she will be informed in writing.
f. Students who are not readmitted by the admissions committee have the right to appeal to the Senate Committee for Admission, Evaluation and Academic Support.
g. Any decision taken by the Senate Committee for Admission, Evaluation and Academic Support is final.

Additional regulations and information for the School of Information Technology

Selection

A selection procedure takes place prior to admission to the degree programmes in the School of Information Technology. The number of students admitted to the under-graduate programmes in the school may be limited. Postgraduate selection takes place in accordance with departmental policy.

Academic literacy

All first-year students in the School of Information Technology enroll for ALL 121, a specialised module in academic literacy for Information Technology. For students in the Four-year programmes, Language, life and study skills 1 and 2 are compulsory in both the first semester and second semester (LST 133 and LST 143).

Requirements for specific modules (IT.3)

A candidate who has:

a. passed the Grade 12 examination in Mathematics with at least 50% will be admitted to WTW 134, WTW 115 and WTW 152, and 60% for WTW 114, WTW 126, WTW 158 and WTW 161 in Mathematics and to WST 111

etc. or obtained at least 3 (40-49%) for Mathematics in Grade 12, will be admitted to WTW 133 and WTW 143

b. obtained at least 4 (50-59%) in Mathematics in the Grade 12 examination, or at least 50% in both Statistics 113, 123, will be admitted to Informatics 112; Economics 113, 123 and 120;
c. obtained at least 5 (60-69%) in Mathematics, or obtained at least 4 (50 – 59%) in Mathematics and has passed WTW 133 and WTW 143, will be admitted to Informatics 154 and 171.
d. not passed at least four Computer science modules at second-year level, will not be permitted to register for the Computer science modules at third-year level, unless special permission has been granted by the relevant head of department.

Minimum study period

The minimum period of study for the degree is indicated at the relevant degree programme. Students registering for a three-year degree, must complete the degree in a maximum of five years. Students registering for a four-year degree, must complete the degree in a maximum of six years.

Additional regulations and information for the Graduate School of Technology Management (GSTM)

Selection

A selection procedure takes place prior to admission to any programme in the GSTM Restrictions may be placed on the number of students admitted to the School. Postgraduate selection takes place as stipulated in the respective departmental rules. (www.up.ac.za/gstm)

Supplementary examinations in the GSTM

Supplementary or special examinations are not granted in any modules at the GSTM.

Minimum/Maximum study period

The minimum period of study for the degree is indicated at the relevant degree programme. Students registering for the honours degree as well as master's degrees, must complete the degree in a maximum of three years.

BEng Metallurgical Engineering (12130005)

Minimum duration of study	4 years

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:

a. Engineering problem solving.
b. Application of specialist and fundamental knowledge, with specific reference to mathematics, basic sciences and engineering sciences.
c. Engineering design and synthesis.
d. Investigation, experimentation and data analysis.
e. Engineering methods, skills, tools and information technology.
f. Professional and general communication.
g. Awareness and knowledge of the impact of engineering activity on society and the physical environment.
h. Work in teams and in multidisciplinary environments.
i. An awareness and ability for lifelong learning.
j. An awareness and knowledge of principles of professional ethics and practice.

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:

a. Mathematics, including numerical methods and statistics (13%)
b. Basic sciences: the natural sciences essential to the programme (15%)
c. 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 following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement; a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of

such an institution; and a candidate who is a graduate of another faculty at the University of Pretoria.

- Life Orientation is excluded when calculating the APS.
- Grade 11 results are used in 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 only guaranteed if a prospective student complies with ALL the requirements below. ?
- **Note:** Candidates who do not comply with the minimum requirements, set out above, but who have obtained a minimum APS of 30, an achievement level of 5 for English, 6 for Mathematics and 5 for Physical Science, will be considered for conditional admission to either the four-year programme or the ENGAGE programme based on the results of the NBT.
- Admission to ENGAGE in the School of Engineering will be determined by the results of the NBT, NSC results, an achievement level of 5 in Mathematics and 4 in Physical Science, as well as an achievement level of 4 in English, together with an APS of 25.
- Students may apply directly to be considered for the ENGAGE programme.
- Tuition will be presented in English only.

Minimum requirements **Achievement level** **English Home Language or English First Additional Language**		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	6	B	6	B	**35**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

ENGAGE Programme minimum requirements **Achievement level** **English Home Language or English First Additional Language**		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	5	C	4	D	**25**

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 2013, 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, receive credit for CBI 410.
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 personal 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 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.

Curriculum: Year 1

Minimum credits: 144

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
Mechanics 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

Curriculum: Year 2

Minimum credits: 162

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
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

Curriculum: Year 3

Minimum credits: 144

Core modules

Engineering management 310 (BSS 310) - Credits: 8.00
Engineering activity and group work 320 (MIA 320) - Credits: 8.00
Thermoflow 310 (MTV 310) - Credits: 16.00
Electrochemistry 310 (NEC 310) - Credits: 16.00
Excursions 320 (NEX 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
Pyrometallurgy 321 (NPM 321) - Credits: 16.00
Industrial training 316 (NPY 316) - Credits: 16.00
Refractory materials 321 (NVM 321) - Credits: 8.00

Curriculum: Final year

Minimum credits: 136

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
Process metallurgy and control 412 (NPB 412) - Credits: 8.00
Metals processing 411 (NPW 411) - Credits: 16.00
Industrial training 416 (NPY 416) - Credits: 16.00
Literature survey 412 (NSC 412) - Credits: 8.00
Project 422 (NSC 422) - Credits: 32.00

BEng Metallurgical Engineering Engage (12136005)

Minimum duration of study	5 years

Programme information

Please note: The Engineering Augmented Degree Programme (ENGAGE) is an extended degree programme with a five-year curriculum. It is designed to enable students who show academic potential but who do not meet the normal entry requirements for the four-year degree programme, to obtain an Engineering degree. ENGAGE students spend the first three years of the programme covering the content of the first two years of the four-year degree programme. They also take compulsory augmented modules in each of the Level 1 subjects. These augmented modules provide students with background knowledge and skills needed to succeed in an engineering degree. The curriculum for years four and five of the ENGAGE programme are identical to the curriculum for years 3 and 4 of the 4-year programme, respectively. Students may apply directly for admission to the programme.

- Students must register for the entire programme, not components of it. The curriculum is fixed; there are no electives.

- Attendance at all components of years 1 to 3 of the programme is compulsory. Non-attendance will only be condoned in the case of illness (sick note required) or family crisis (e.g. a death in the family), in which case students must inform the programme administration immediately.
- Students who fail to meet the attendance requirement for any module in any semester of years 1 to 3 of the programme will be excluded from the programme.
- No augmented module may be repeated more than once.
- Selection into the programme will be based on a combination of performance in the National Senior Certificate examinations or equivalent and other selection tests approved by the faculty.
- A student who fails a mainstream module (e.g. Chemistry) but passes the associated augmented module (e.g. Additional chemistry) does not need to repeat the augmented module.
- A student who fails an augmented module (e.g. Additional chemistry) but passes the associated mainstream module (e.g. Chemistry) does not need to repeat the mainstream module.
- A student must meet the attendance requirement and obtain at least 40% for both the continuous assessment and test components as well as a final mark of 50% in order to pass an augmented module.

i. The curricula of the fourth and the fifth years of study are identical to those of the third and the fourth years of the four-year programme.
ii. JPO 110 is a prerequisite for JPO 120. Credit for JPO is obtained with a final mark of more than 50%. Conditional admission to JPO 120: If the final mark for JPO 110 is between 45% and 49%, a student can register for JPO 120 but credit for JPO 110 and JPO 120 will only be obtained if the final combined mark for JPO 110 and JPO 120 is above 50%.

Please note: All students will be 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.

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 personal 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 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.

Curriculum: Year 1

Minimum credits: 128

Fundamental modules

Academic orientation 112 (UPO 112) - Credits: 0.00

Core modules

General chemistry 172 (CHM 172) - Credits: 16.00
Physics 116 (FSK 116) - Credits: 16.00
Humanities and social sciences 110 (HAS 110) - Credits: 8.00
Humanities and social sciences 120 (HAS 120) - Credits: 8.00
Professional orientation 110 (JPO 110) - Credits: 8.00
Additional Mathematics 1 116 (JPO 116) - Credits: 8.00
Professional orientation 120 (JPO 120) - Credits: 8.00
Additional Mathematics 2 126 (JPO 126) - Credits: 8.00
Additional Physics 152 (JPO 152) - Credits: 8.00
Additional Chemistry 1 161 (JPO 161) - Credits: 8.00
Calculus 158 (WTW 158) - Credits: 16.00
Mathematics 164 (WTW 164) - Credits: 16.00
Workshop practice 121 (WWP 121) - Credits: 6.00

Curriculum: Year 2

Minimum credits: 120

Core modules

Electricity and electronics 111 (EBN 111) - Credits: 16.00
Community-based project 203 (JCP 203) - Credits: 8.00
Additional Electricity and electronics 112 (JPO 112) - Credits: 8.00
Additional Graphical communication 113 (JPO 113) - Credits: 8.00
Additional Materials science 123 (JPO 123) - Credits: 8.00
Additional Mechanics 125 (JPO 125) - Credits: 8.00
Graphical communication 110 (MGC 110) - Credits: 16.00
Materials science 123 (NMC 123) - Credits: 16.00
Mechanics 122 (SWK 122) - Credits: 16.00
Calculus 258 (WTW 258) - Credits: 8.00
Numerical methods 263 (WTW 263) - Credits: 8.00

Curriculum: Year 3

Minimum credits: 138

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
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
Mathematics 238 (WTW 238) - Credits: 16.00
Differential equations 256 (WTW 256) - Credits: 8.00

Curriculum: Year 4

Minimum credits: 144

Core modules

Engineering management 310 (BSS 310) - Credits: 8.00
Engineering activity and group work 320 (MIA 320) - Credits: 8.00
Thermoflow 310 (MTV 310) - Credits: 16.00
Electrochemistry 310 (NEC 310) - Credits: 16.00
Excursions 320 (NEX 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
Pyrometallurgy 321 (NPM 321) - Credits: 16.00
Industrial training 316 (NPY 316) - Credits: 16.00
Refractory materials 321 (NVM 321) - Credits: 8.00

Curriculum: Final year

Minimum credits: 136

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
Process metallurgy and control 412 (NPB 412) - Credits: 8.00
Metals processing 411 (NPW 411) - Credits: 16.00
Industrial training 416 (NPY 416) - Credits: 16.00
Literature survey 412 (NSC 412) - Credits: 8.00
Project 422 (NSC 422) - Credits: 32.00

BEng Mining Engineering (12130006)

Minimum duration of study	4 years

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:

a. Engineering problem solving.
b. Application of specialist and fundamental knowledge, with specific reference to mathematics, basic sciences and engineering sciences.
c. Engineering design and synthesis.
d. Investigation, experimentation and data analysis.
e. Engineering methods, skills, tools and information technology.
f. Professional and general communication.
g. Awareness and knowledge of the impact of engineering activity on society and the physical environment.
h. Work in teams and in multidisciplinary environments.
i. An awareness and ability for lifelong learning.
j. An awareness and knowledge of principles of professional ethics and practice.

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:

a. Mathematics, including numerical methods and statistics (13%)
b. Basic sciences: the natural sciences essential to the programme (15%)

Research study 732 (MSS 732) - Credits: 32.00
Fatigue 780 (MSV 780) - Credits: 16.00
Fluid mechanics 780 (MSX 780) - Credits: 16.00
Advanced fluid mechanics 781 (MSX 781) - Credits: 16.00
Advanced thermodynamics and energy systems 781 (MTX 781) - Credits: 16.00
Reactor coolant flow and heat transfer 782 (MUA 782) - Credits: 16.00
Reactor engineering science 783 (MUA 783) - Credits: 16.00
Reactor physics 784 (MUA 784) - Credits: 16.00
Reactor materials engineering 785 (MUA 785) - Credits: 16.00
Reactor materials engineering 786 (MUA 786) - Credits: 16.00
Fossil fuel power stations 781 (MUU 781) - Credits: 16.00
Vehicle dynamics 780 (MVI 780) - Credits: 16.00
Numerical methods 780 (MWN 780) - Credits: 16.00

BEngHons Metallurgical Engineering (12240063)

Minimum duration of study	1 year

Programme information

The curriculum is determined in consultation with the relevant heads of departments. A student is required to pass modules to the value of at least 128 credits.

The degree is awarded on the basis of examinations only.

Admission requirements

Subject to the stipulations of the General Regulations, Reg. G.1.3 and G.54, a BEng degree or equivalent qualification is required for admission.

Other programme-specific information

A limited number of appropriate modules from other departments are allowed.

Examinations and pass requirements

i. The examination in each module for which a student is registered, takes place during the normal examination period after the conclusion of lectures (i.e. October/November or May/June).
ii. A student registered for the honours degree must complete his or her studies within two years (full-time), or within three years (part-time) after first registration for the degree: Provided that the Dean, on recommendation of the relevant head of department, may approve a stipulated limited extension of this period.
iii. A student must obtain at least 50% in an examination for each module where no semester or year mark is required. A module may only be repeated once.
iv. In modules where semester or year marks are awarded, a minimum examination mark of 40% and a final mark of 50% is required.
v. No supplementary or special examinations are granted at postgraduate level.

Pass with distinction

A student passes with distinction if he or she obtains a weighted average of at least 75% in the first 128 credits

for which he or she has registered (excluding modules which were discontinued timeously). The degree is not awarded with distinction if a student fails any one module (excluding modules which were discontinued timeously).

Curriculum: Final year

Minimum credits: 120

NLO 700 compulsory module / verpligte module

Core modules

Electrometallurgy 700 (NEL 700) - Credits: 30.00
Fabrication engineering 700 (NFE 700) - Credits: 30.00
Physical metallurgy 700 (NFM 700) - Credits: 30.00
Heat treatment 700 (NHB 700) - Credits: 30.00
Hydrometallurgy 700 (NHM 700) - Credits: 30.00
Corrosion 700 (NKR 700) - Credits: 30.00
Research project 700 (NLO 700) - Credits: 30.00
Mechanical metallurgy 700 (NMM 700) - Credits: 30.00
Minerals processing 700 (NMP 700) - Credits: 30.00
Applied theory of sampling for minerals processing 701 (NMP 701) - Credits: 30.00
Pyrometallurgy 700 (NPM 700) - Credits: 30.00
Froth flotation 700 (NSF 700) - Credits: 30.00
Welding metallurgy 700 (NSW 700) - Credits: 30.00
Refractory materials 700 (NVM 700) - Credits: 30.00
Welding processes 700 (NWP 700) - Credits: 30.00
Design of welded structures 701 (NWP 701) - Credits: 30.00

BEngHons Microelectronic Engineering (12240192)

Minimum duration of study	1 year

Programme information

The curriculum is determined in consultation with the relevant heads of departments. A student is required to pass modules to the value of at least 128 credits.

The degree is awarded on the basis of examinations only.

Admission requirements

Subject to the stipulations of Reg. G.1.3 and G.54, a BEng degree or equivalent qualification is required for admission.

Other programme-specific information

Students may take modules to the value of 32 credits from other fields of specialisation or from other departments, with approval of the Coordinator: Postgraduate Studies.

Core modules

Principles of environmental engineering 780 (CEM 780) - Credits: 32.00
Industrial waste engineering 780 (WAI 780) - Credits: 32.00
Biological water treatment 780 (WBW 780) - Credits: 32.00
Chemical water treatment 780 (WCW 780) - Credits: 32.00
Water quality management and research 780 (WQB 780) - Credits: 32.00

BEngHons Welding Engineering (12240064)

Minimum duration of study	1 year

Programme information

The BScHons (Applied Science) degree is conferred by the following academic departments:

- Chemical Engineering
- Civil Engineering
- Industrial and Systems Engineering
- Materials Science and Metallurgical Engineering
- Mechanical and Aeronautical Engineering
- Mining Engineering

Any specific module is offered on the condition that a minimum number of students are registered for the module, as determined by the relevant head of department and the Dean. Students must consult the relevant head of department in order to compile a meaningful programme, as well as on the syllabi of the modules. The relevant departmental postgraduate brochures must also be consulted.

Admission requirements

- BEng degree awarded by the University of Pretoria; or a four-year bachelor’s degree in engineering that ECSA regards as acceptable for registration as a candidate engineer and for eventual registration as a professional engineer.
- The departmental Postgraduate Committee reserves the right to make a thorough assessment of the applicant's academic transcript and CV, and to decide if the applicant is suitable for postgraduate studies. This assessment may include an oral or written entrance examination.

Curriculum: Final year

Minimum credits: 150

Core modules

Fabrication engineering 700 (NFE 700) - Credits: 30.00
Research project 700 (NLO 700) - Credits: 30.00
Welding metallurgy 700 (NSW 700) - Credits: 30.00
Welding processes 700 (NWP 700) - Credits: 30.00
Design of welded structures 701 (NWP 701) - Credits: 30.00

BIArchHons (12242007)

Minimum duration of study	1 year

degree within the minimum prescribed time and pass all modules with a weighted average of 75%.

Curriculum: Final year

Minimum credits: 120

In addition to the prescribed 90 credits, a student must do a 700-level module(s) for 30 credit from other departments,schools or faculties. Students may also register for 700-level modules presented by the Department of Architecture, with the permission of the Head of Department.

Core modules

Project component (Capita selecta) 700 (RFP 700) - Credits: 60.00
Theory component (Capita selecta) 700 (RFS 700) - Credits: 30.00

BScHons Applied Science Metallurgy: Welding Technology (12243036)

Minimum duration of study	1 year

Programme information

The BScHons (Applied Science) degree is conferred by the following academic departments:

- Chemical Engineering
- Civil Engineering
- Industrial and Systems Engineering
- Materials Science and Metallurgical Engineering
- Mechanical and Aeronautical Engineering
- Mining Engineering

Any specific module is offered on the condition that a minimum number of students are registered for the module, as determined by the relevant head of department and the Dean. Students must consult the relevant head of department in order to compile a meaningful programme, as well as on the syllabi of the modules. The relevant departmental postgraduate brochures must also be consulted.

Admission requirements

- Any one of the following:
  - a three-year BSc degree (in natural sciences) (or equivalent) with a weighted average of at least 60%;
  - an appropriate BTech qualification, i.e. one offered by a department of metallurgical engineering at a university of technology in South Africa, with a weighted average of at least 75% and no modules failed in the BTech, excluding the National Diploma;
  - a four-year engineering-based university degree not recognised by ECSA for registration as a professional engineer.
- The departmental Postgraduate Committee reserves the right to make a thorough assessment of the applicant's academic transcript and CV, and to decide if the applicant is suitable for postgraduate studies. This assessment may include an oral or written entrance examination.

Curriculum: Final year

Minimum credits: 150

Core modules

Fabrication engineering 700 (NFE 700) - Credits: 30.00
Research project 700 (NLO 700) - Credits: 30.00
Welding metallurgy 700 (NSW 700) - Credits: 30.00
Welding processes 700 (NWP 700) - Credits: 30.00
Design of welded structures 701 (NWP 701) - Credits: 30.00

BScHons Applied Science Chemical Technology (12243004)

Minimum duration of study	1 year

Programme information

The BScHons (Applied Science) degree is conferred by the following academic departments:

- Chemical Engineering
- Civil Engineering
- Industrial and Systems Engineering
- Materials Science and Metallurgical Engineering
- Mechanical and Aeronautical Engineering
- Mining Engineering

Any specific module is offered on the condition that a minimum number of students are registered for the module, as determined by the relevant head of department and the Dean. Students must consult the relevant head of department in order to compile a meaningful programme, as well as on the syllabi of the modules. The relevant departmental postgraduate brochures must also be consulted.

Admission requirements

An appropriate bachelor's degree, a BTech degree or equivalent qualification is required for admission.

Other programme-specific information

A limited number of appropriate postgraduate modules from other departments are allowed. Not all modules listed are presented each year. Please consult the departmental postgraduate brochure.

Specialisation in Process Technology is possible by registering for specific modules. (Please note that a candidate selecting this option will not be allowed to register for any modules at 700-level before the modules of the first semester at 400-level had been completed successfully.) Please consult the department.

The modules CPB 410, CBI 410 and CSS 420 do not form part of the postgraduate block presentations. Individual arrangements have to be made with the relevant lecturer regarding attendance of lectures, study material, tests and assignments.

Curriculum: Final year

Minimum credits: 128

Core modules

Bioprocessing 732 (CBP 732) - Credits: 32.00
Fluoro-materials science research and technology 732 (CFT 732) - Credits: 32.00
Chemical engineering 707 (CIR 707) - Credits: 32.00

Mechatronics 780 (MEG 780) - Credits: 16.00
Vibration-based condition monitoring 781 (MEV 781) - Credits: 16.00
Advanced heat and mass transfer 780 (MHM 780) - Credits: 16.00
Condition-based maintenance 780 (MIC 780) - Credits: 16.00
Maintenance logistics 782 (MIP 782) - Credits: 16.00
Missile aerodynamics and design 781 (MLD 781) - Credits: 16.00
Experimental methods 782 (MLD 782) - Credits: 16.00
Unmanned aircraft systems technology 783 (MLD 783) - Credits: 16.00
Avionics 784 (MLD 784) - Credits: 16.00
Air conditioning and refrigeration 780 (MLR 780) - Credits: 16.00
Optimum design 780 (MOO 780) - Credits: 16.00
Fracture mechanics 780 (MSF 780) - Credits: 16.00
Numerical thermoflow 781 (MSM 781) - Credits: 16.00
Research study 732 (MSS 732) - Credits: 32.00
Advanced fluid mechanics 781 (MSX 781) - Credits: 16.00
Advanced thermodynamics and energy systems 781 (MTX 781) - Credits: 16.00
Fossil fuel power stations 781 (MUU 781) - Credits: 16.00
Vehicle dynamics 780 (MVI 780) - Credits: 16.00
Numerical methods 780 (MWN 780) - Credits: 16.00

BScHons Applied Science Metallurgy (12243007)

Minimum duration of study	1 year

Programme information

The BScHons (Applied Science) degree is conferred by the following academic departments:

- Chemical Engineering
- Civil Engineering
- Industrial and Systems Engineering
- Materials Science and Metallurgical Engineering
- Mechanical and Aeronautical Engineering
- Mining Engineering

Any specific module is offered on the condition that a minimum number of students are registered for the module, as determined by the relevant head of department and the Dean. Students must consult the relevant head of department in order to compile a meaningful programme, as well as on the syllabi of the modules. The relevant departmental postgraduate brochures must also be consulted.

Admission requirements

An appropriate bachelor's degree, a BTech degree or equivalent qualification.

Other programme-specific information

A limited number of appropriate modules from other departments and from other divisions of Chemical Engineering are allowed. Not all modules listed are presented each year. Please consult the departmental postgraduate brochure.

Curriculum: Final year

Minimum credits: 120

NLO 700 is a compulsory research module (30 credits).
Select one of the other three core modules listed (30 credits) and two modules from the list of electives (60 credits).

Core modules

Basic physical metallurgy 701 (NFM 701) - Credits: 30.00
Basic extractive metallurgy 701 (NHM 701) - Credits: 30.00
Research project 700 (NLO 700) - Credits: 30.00
Basic pyrometallurgy 701 (NPM 701) - Credits: 30.00

Elective modules

Electrometallurgy 700 (NEL 700) - Credits: 30.00
Fabrication engineering 700 (NFE 700) - Credits: 30.00
Physical metallurgy 700 (NFM 700) - Credits: 30.00
Heat treatment 700 (NHB 700) - Credits: 30.00
Hydrometallurgy 700 (NHM 700) - Credits: 30.00
Corrosion 700 (NKR 700) - Credits: 30.00
Mechanical metallurgy 700 (NMM 700) - Credits: 30.00
Minerals processing 700 (NMP 700) - Credits: 30.00
Applied theory of sampling for minerals processing 701 (NMP 701) - Credits: 30.00
Pyrometallurgy 700 (NPM 700) - Credits: 30.00
Froth flotation 700 (NSF 700) - Credits: 30.00
Welding metallurgy 700 (NSW 700) - Credits: 30.00
Refractory materials 700 (NVM 700) - Credits: 30.00
Welding processes 700 (NWP 700) - Credits: 30.00
Design of welded structures 701 (NWP 701) - Credits: 30.00

BScHons Applied Science Mining (12243035)

Minimum duration of study	1 year

Programme information

The BScHons (Applied Science) degree is conferred by the following academic departments:

- Chemical Engineering
- Civil Engineering
- Industrial and Systems Engineering
- Materials Science and Metallurgical Engineering
- Mechanical and Aeronautical Engineering
- Mining Engineering

Any specific module is offered on the condition that a minimum number of students are registered for the module, as determined by the relevant head of department and the Dean. Students must consult the relevant head of department in order to compile a meaningful programme, as well as on the syllabi of the modules. The relevant departmental postgraduate brochures must also be consulted.

University of Pretoria Yearbook 2019

Engineering statistics 220 (BES 220)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Engineering systems are often subjected to variation, uncertainty and incomplete information. Mathematical statistics provides the basis for effectively handling and quantifying the effect of these factors. This module provides an introduction to the concepts of mathematical statistics and will include the following syllabus themes: data analysis, probability theory, stochastic modelling, statistical inference and regression analysis.
Module credits	8.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
Prerequisites	WTW 158 GS, WTW 164 GS
Contact time	3 lectures per week
Language of tuition	Separate classes for Afrikaans and English

Department	Industrial and Systems Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Engineering management 310 (BSS 310)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Programme and systems engineering Concepts: Application of project management, systems thinking, systems approach, product, system and project life cycles, project phases and specification practices. Development models: stage-gate development, project charter, systems engineering models, systems engineering management and life cycle characteristics. Planning and Scheduling: task definition, work breakdown structures, duration estimation, Gantt charts, critical path, resource handling. Costs and Budgets: cost estimates, project life cycle costs, work authorisation. Control: project organisation. Legal: contracts, intellectual property. Case studies and semester project Engineering Economics Decision making in an engineering environment. Allocation of cost. Money-time relationships (discreet interest formulae, tables, financial calculator, Excel). Bases for comparison of alternatives (present worth, annual worth,). Decision making among alternatives before and after tax (useful lives equal to study period, useful lives different among alternatives).
Module credits	8.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering

	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Industrial and Systems Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

General chemistry 171 (CHM 171)

Qualification	Undergraduate
Faculty	Faculty of Natural and Agricultural Sciences
Module content	General introduction to inorganic, analytical and physical chemistry. Nomenclature of inorganic ions and compounds, stoichiometric calculations concerning chemical reactions, redox reactions, solubilities and solutions, atomic structure, periodicity. Molecular structure and chemical bonding using the VSEPR model. Principles of reactivity, electrochemistry, energy and chemical reactions, entropy and free energy. Appropriate tutorial classes and practicals.
Module credits	16.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Electrical Engineering
	BEng Electronic Engineering
	BEng Industrial Engineering Engage
	BEng Metallurgical Engineering
	BEng Mining Engineering
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	No prerequisites.
Contact time	1 practical per week, 1 discussion class per week, 1 web-based period per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Electricity and electronics 122 (EBN 122)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Electrical quantities, units, definitions, conventions. Electrical symbols, ideal and practical current and voltage sources, controlled sources. Ohm's law in resistive circuits, Kirchoff's current and voltage laws, resistors in series and parallel circuits, voltage and current division, mesh current and node voltage methods. Circuit theorems: linearity, superposition, Thevenin and Norton equivalent circuits, sources transformation, power calculation, maximum power transfer. Energy storage elements: current, voltage, power and energy in inductors and capacitors, inductors and capacitors in series and parallel. Ideal operational amplifiers and applications: inverting and noninverting amplifiers, summing amplifiers, current sources, integrators.
Module credits	16.00
Programmes	BEng Chemical Engineering
	BEng Civil Engineering
	BEng Electrical Engineering
	BEng Electronic Engineering
	BEng Metallurgical Engineering
	BEng Mining Engineering
Prerequisites	No prerequisites.
Contact time	3 lectures per week, 1 practical per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Electrical, Electronic and Computer Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Electrical engineering 221 (EIR 221)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Transient response phenomena in RC, RL and RLC circuits: Natural response and step response. Alternating current (AC) circuits: Phasors, impedances, and power in AC circuits. The application of Ohm's law, Kirchoff's circuit theorems, matrix methods, and Thevenin and Norton equivalents to sinusoidal steady-state analysis. Three-phase circuits: Balanced three-phase circuits, star/delta configurations, and three-phase power transfer calculations. Magnetically coupled circuits: Mutual inductance, coupling factor, transformers, ideal transformers and autotransformers. Application of circuit theory to induction motors: basic principles of induction motors, equivalent circuit and analysis thereof, calculation of power and torque through application of Thevenin's theorem. Synoptic introduction to other types of motors.
Module credits	16.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	EBN 111 or EBN 122 and WTW 161/164
Contact time	1 tutorial per week, 1 practical per week, 3 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Electrical, Electronic and Computer Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Physics 176 (FSK 176)

Qualification	Undergraduate
Faculty	Faculty of Natural and Agricultural Sciences
Module content	Introductory mathematics: Symbols, exponents, logarithms, angles in degrees, radial measure, goniometry, differentiation, and integration. Motion along a straight line: position and displacement, acceleration. Vectors: adding vectors, components, multiplying vectors. Motion in two and three dimensions: projectile motion, circular motion. Force and motion: Newton's Law, force, friction. Kinetic energy and work: work, power. Potential energy: Centre of mass, linear momentum. Collisions: impulse and linear momentum, elastic collisions, inelastic collisions. Rotation: kinetic energy of rotation, torque. Oscillations and waves: Simple harmonic motion, types of waves, wavelength and frequency, interference of waves, standing waves, the Doppler effect. Temperature, heat and the first law of thermodynamics.
Module credits	16.00
Programmes	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Electrical Engineering
	BEng Electronic Engineering
	BEng Industrial Engineering Engage
	BEng Metallurgical Engineering
	BEng Mining Engineering
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	No prerequisites.
Contact time	4 lectures per week, 1 discussion class per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Mineralogy 210 (GMI 210)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Crystallography and internal order in minerals (space groups, unit cells, X-ray diffraction data). Bonding, mineral chemistry and solid solution (types of solid solution, calculation of mineral formulae and cation valency). Subsolidus reactions and defects in minerals (thermodynamic basis, defects, importance of subsolidus reactions). Classification and crystal structures of minerals. Mineralogical instrumentation and analysis. Major rock types and their classification. Mineralogical aspects of minerals processing.
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	No prerequisites.
Contact time	2 tutorials per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Humanities and social sciences 110 (HAS 110)

Qualification	Undergraduate
Faculty	Faculty of Humanities
Module content	Social sciences: Perspectives on contemporary society An introduction to long-standing questions about the nature of human societies and contemporary challenges. Topics to be discussed include globalisation and increasing connectedness; rising unemployment, inequality and poverty; rapid urbanisation and the modern city form; transformations in the nature of work; environmental degradation and tensions between sustainability and growth; shifts in global power relations; the future of the nation-state and supra-national governance structures; and possibilities for extending human rights and democracy. Critical questions are posed about modern selfhood, sociality, culture and identity against the background of new communications technologies, ever more multicultural societies, enduring gender, class and race inequities, and the emergence of new and the resurgence of older forms of social and political identity. These issues are approached from the vantage of our location in southern Africa and the continent, drawing on social science perspectives.
Module credits	8.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage

	BEng Mining Engineering
	BEng Mining Engineering Engage
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Anthropology and Archaeology
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Humanities and social sciences 120 (HAS 120)

Qualification	Undergraduate
Faculty	Faculty of Humanities
Module content	Humanities: Text, culture and communication Successful communication of ideas, values and traditions depends on understanding both the literal and implied meanings of texts. In this module students are introduced to a variety of texts, including original literary and visual texts, with a view to developing an understanding of how textual meanings have been constructed and negotiated over time. Students are encouraged to understand themselves as products of – and participants in – these traditions, ideas and values. Appropriate examples will be drawn from, among others, the Enlightenment, Modernism, Existentialism, Postmodernism and Post-colonialism.
Module credits	8.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
Service modules	Faculty of Engineering, Built Environment and Information Technology

Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Afrikaans
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Engineering professionalism 410 (IPI 410)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Requirements to maintain continued competence and to keep abreast of up-to date tools and techniques. ECSA code of conduct, Continuing Professional Development, ECSA outcomes, ECSA process and reasons for registration as CEng and PrEng. Displays understanding of the system of professional development. Accepts responsibility for own actions. Displays judgment in decision making during problem solving and design. Limits decision making to area of current competence. Reason about and make judgment on ethical aspects in case study context. Discerns boundaries of competence in problem solving and design. Case studies typical of engineering practice situations in which the graduate is likely to participate.
Module credits	8.00
Programmes	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 other contact session per week
Language of tuition	Module is presented in English

Department	Engineering and Technology Management
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Community-based project 203 (JCP 203)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	This module is integrated into all undergraduate academic programmes offered by the Faculty. Main objectives: execution of a community project aimed at achieving a beneficial impact on a section of society; awareness of personal, social and cultural values and an understanding of social issues; and development of life skills. Assessment: project proposal, written progress reports, peer assessment, assessment by community, presentation, report presented in the form of a blog.
Module credits	8.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Separate classes for Afrikaans and English

Department	Informatics
Period of presentation	Year

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University of Pretoria Yearbook 2019

Professional orientation 110 (JPO 110)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	A project-based approach is followed to equip students wiuth academic and IT skills to succeed within the School of Engineering at UP.
Module credits	8.00
Programmes	BEng Chemical Engineering Engage
	BEng Civil Engineering Engage
	BEng Computer Engineering Engage
	BEng Electrical Engineering Engage
	BEng Electronic Engineering Engage
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering Engage
Prerequisites	Pass JPO 110. Conditional entry into JPO 120: JPO 110 mark between 45% and 49% . Pass JPO 110 and JPO 120: Final combined mark for JPO 110 and JPO 120 at least 50%.
Contact time	3 tutorials per week, Foundation Course, 3 lectures per week
Language of tuition	Module is presented in English
Department	EBIT Deans Office
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Additional Electricity and electronics 112 (JPO 112)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Background knowledge, problem-solving skills, conceptual understanding and reasoning skills required by EBN 111/122.
Module credits	8.00
Programmes	BEng Chemical Engineering Engage
	BEng Civil Engineering Engage
	BEng Computer Engineering Engage
	BEng Electrical Engineering Engage
	BEng Electronic Engineering Engage
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	Foundation Course, 3 tutorials per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	EBIT Deans Office
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Additional Graphical communication 113 (JPO 113)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Background knowledge, conceptual understanding, drawing skills and reasoning skills required by MGC 110.
Module credits	8.00
Programmes	BEng Chemical Engineering Engage
	BEng Civil Engineering Engage
	BEng Electrical Engineering Engage
	BEng Electronic Engineering Engage
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	Foundation Course, 1 lecture per week, 3 tutorials per week
Language of tuition	Module is presented in English
Department	School of Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Additional Mathematics 1 116 (JPO 116)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Background knowledge, problem-solving skills, conceptual understanding and mathematical reasoning skills required by WTW 158.
Module credits	8.00
Programmes	BEng Chemical Engineering Engage
	BEng Civil Engineering Engage
	BEng Computer Engineering Engage
	BEng Electrical Engineering Engage
	BEng Electronic Engineering Engage
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	3 tutorials per week, Foundation Course, 1 lecture per week
Language of tuition	Module is presented in English
Department	EBIT Deans Office
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Professional orientation 120 (JPO 120)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	A project-based approach is followed to equip students with academic and IT skills to succeed within the School of Engineering at UP.
Module credits	8.00
Programmes	BEng Chemical Engineering Engage
	BEng Civil Engineering Engage
	BEng Computer Engineering Engage
	BEng Electrical Engineering Engage
	BEng Electronic Engineering Engage
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering Engage
Prerequisites	Pass JPO 110. Conditional entry into JPO 120: JPO 110 mark between 45% and 49% . Pass JPO 110 and JPO 120: Final combined mark for JPO 110 and JPO 120 at least 50%.
Contact time	3 lectures per week, 3 tutorials per week, Foundation Course
Language of tuition	Module is presented in English
Department	EBIT Deans Office
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Additional Materials science 123 (JPO 123)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Background knowledge, problem-solving skills, conceptual understanding and reasoning skills required by NMC 113/123.
Module credits	8.00
Programmes	BEng Civil Engineering Engage
	BEng Computer Engineering Engage
	BEng Electrical Engineering Engage
	BEng Electronic Engineering Engage
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	3 tutorials per week, Foundation Course, 1 lecture per week
Language of tuition	Module is presented in English
Department	EBIT Deans Office
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Additional Mechanics 125 (JPO 125)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Background knowledge, problem-solving skills, conceptual understanding and reasoning skills required by SWK 122.
Module credits	8.00
Programmes	BEng Chemical Engineering Engage
	BEng Civil Engineering Engage
	BEng Computer Engineering Engage
	BEng Electrical Engineering Engage
	BEng Electronic Engineering Engage
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 3 tutorials per week, Foundation Course
Language of tuition	Module is presented in English
Department	EBIT Deans Office
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Additional Mathematics 2 126 (JPO 126)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Background knowledge, problem-solving skills, conceptual understanding and mathematical reasoning skills required by WTW 164.
Module credits	8.00
Programmes	BEng Chemical Engineering Engage
	BEng Civil Engineering Engage
	BEng Computer Engineering Engage
	BEng Electrical Engineering Engage
	BEng Electronic Engineering Engage
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	1 lecture per week, Foundation Course, 3 tutorials per week
Language of tuition	Module is presented in English
Department	EBIT Deans Office
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Additional Physics 152 (JPO 152)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Background knowledge, problem-solving skills, conceptual understanding and reasoning skills required by FSK116/176.
Module credits	8.00
Programmes	BEng Computer Engineering Engage
	BEng Electrical Engineering Engage
	BEng Electronic Engineering Engage
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	3 tutorials per week, Foundation Course, 1 lecture per week
Language of tuition	Module is presented in English
Department	School of Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Additional Chemistry 1 161 (JPO 161)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Background knowledge, problem-solving skills, conceptual understanding and reasoning skills required by CHM 171/172.
Module credits	8.00
Programmes	BEng Electrical Engineering Engage
	BEng Electronic Engineering Engage
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	3 tutorials per week, Foundation Course, 1 lecture per week
Language of tuition	Module is presented in English
Department	School of Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Graphical communication 110 (MGC 110)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Freehand sketching covering the following: perspective, isometric and orthographic drawings. Drawing conventions, graphical techniques and assembly drawings. Evaluation of drawings and error detection. True lengths of lines, projections and intersections. Practical applications of these techniques. Introduction to computer-aided drawings, including dimensioning, crosshatching and detailing. Introduction to basic manufacturing processes including primary (casting, forging and extrusion) and secondary (drilling, turning, milling, grinding, broaching and sawing) manufacturing procedures.
Module credits	16.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
Service modules	Faculty of Education
Prerequisites	No prerequisites.
Contact time	3 lectures per week, 3 tutorials per week
Language of tuition	Module is presented in English

Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Engineering activity and group work 320 (MIA 320)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Two exit learning outcomes (ELO) of ECSA are addressed and each must be passed in the same semester. ELO7: Demonstrate critical awareness of the impact of engineering activity on the social, industrial and physical environment. The history of engineering globally and in South Africa. Most important engineering projects globally and in South Africa. The impact of technology on society. Occupational and public health and safety. Occupational Health and Safety Act. Impacts on the physical environment. The personal, social, cultural values and requirements of those affected by engineering activity. The combination of social, workplace (industrial) and physical environmental factors are appropriate to the discipline of the qualification. ELO8: Demonstrate competence to work effectively on a small project as an individual, in teams and in multidisciplinary environments. Identifies and focuses on objectives. Works strategically. Executes tasks effectively. Delivers completed work on time. Effective team work: Makes individual contribution to team activity; performs critical functions; enhances work of fellow team members; benefits from support of team members; communicates effectively with team members; delivers completed work on time. Multidisciplinary work by the following: Acquires a working knowledge of co-workers' discipline; uses a systems engineering approach; communicates across disciplinary boundaries. Report and presentation on team project. Tasks require co-operation across at least one disciplinary boundary. Students acquire a working knowledge of co-workers discipline. Students communicate between disciplinary boundaries.
Module credits	8.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage

	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
Prerequisites	(BSS 310), (CJJ 310) or (EJJ 210) or (BJJ 210) or (MJJ 210) or (NJJ 210) or (PJJ 210)
Contact time	1 other contact session per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Programming and information technology 213 (MPR 213)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Spreadsheet applications: Formulas and calculations, named ranges, plotting and trend lines, goal seek, linear programming, importing and exporting data, data navigation and filtering. Programming fundamentals: Names and objects, conditional and unconditional looping, branching, functions, modules, packages, reading and writing data files, graphical output (plotting). Solving simple problems using a high level programming language to develop, code and debug programs. Solving complex problems by breaking it down into a number of simple problems using concepts such as functions, modules and available packages. Programming principles are developed through solving mathematics and physics problems.
Module credits	16.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Separate classes for Afrikaans and English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

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University of Pretoria Yearbook 2019

Dynamics 210 (MSD 210)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Kinetics of systems of particles, Newton's 2nd law generalised for a system of particles, rate of change of momentum and angular momentum relations, work-energy relations, conservation laws, steady mass flow. Plane kinematics of rigid bodies, rotation, translation, general 2D motion, relative motion analysis. Moments and products of inertia. Plane kinetics of rigid bodies, equations of motion, rotation, translation, general 2D motion, work-energy relations. Vibration and time response.
Module credits	16.00
Programmes	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
Prerequisites	FSK 116 or FSK 176 and SWK 122 and WTW 256 #
Contact time	2 tutorials per week, 3 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Thermoflow 310 (MTV 310)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Fluid mechanics: Introduction to fluid properties and fluid continuum concepts. Fluid statics and pressure. Control volume method for mass, momentum and energy conservation using integral approach. Bernoulli equation. Dimensional analysis and similarity. Flow in pipes and channels: friction coefficients and Reynolds number, pressure drop; laminar, turbulent and transitional flow. Experimental techniques in fluid mechanics. Heat transfer: Introduction to heat transfer mechanisms, thermal properties of materials. Solution of the heat conduction equation for different boundary and initial conditions. Heat generation in a solid. Steady heat conduction. Thermal resistance networks describing conduction, radiation and convection.
Module credits	16.00
Programmes	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Electrochemistry 310 (NEC 310)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Kinetics and thermodynamics of electrochemical reactions of metallurgical importance. Use of equilibrium diagrams to identify possible reactions products. Use of polarisation diagrams to describe reaction kinetics. Application of these principles to metallurgical examples, including corrosion, leaching and electrometallurgy. Influence of substrate composition, electrolyte composition, impurities, reaction products and agitation on kinetics.
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	No prerequisites.
Contact time	3 practicals per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Excursions 320 (NEX 320)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Students attend and participate in five half-day excursions to metallurgical operations. Assessment is based on written reports and oral presentations. The excursions include visits to hydrometallurgical, pyrometallurgical, minerals processing and materials processing plants.
Module credits	8.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	(NMP 310)
Contact time	6 practicals per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Hydrometallurgy 322 (NHM 322)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Merits of hydrometallurgy relative to other extraction methods. Unit processes in hydrometallurgy. Chemical principles of hydrometallurgy. Chemistry of important metals and lixiviants. Application of chemical principles to: leaching; purification and upgrading of leach solutions (precipitation, solvent extraction, ion exchange, activated carbon); product recovery from solution (precipitation, reduction). Relevant analytical methods.
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	(NPT 220) and (NEC 310)
Contact time	3 lectures per week, 3 practicals per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Hydrometallurgy 412 (NHM 412)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Extraction routes and the extractive metallurgy of metals such as gold, copper, zinc, manganese, nickel, cobalt, uranium and the platinum group elements, from ores and secondary sources. Application of thermodynamics and reaction kinetics (including laboratory kinetic data) in understanding and optimisation of extraction routes, and sizing of reactors. Environmental impact of processing routes.
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	(NHM 322)
Contact time	3 lectures per week, 2 tutorials per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Professional and technical communication 210 (NJJ 210)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Communicate effectively, both orally and in writing, with engineering audiences and the community at large. Written communication as evidenced by: uses appropriate structure, use of modern or electronic communication methods; style and language for purpose and audience; uses effective graphical support; applies methods of providing information for use by others involved in engineering activity; meets the requirements of the target audience. Effective oral communication as evidenced by appropriate structure, style and language; appropriate visual materials; delivers fluently; meets the requirements of the intended audience. Audiences range from engineering peers, management and lay persons, using appropriate academic or professional discourse. Typed reports range from short (300-1 000 word plus tables diagrams) to long (10 000-15 000 words plus tables, diagrams, references and appendices), covering material at exit level. Methods of providing information include the conventional methods of the discipline, for example engineering drawings, as well as subject-specific methods.
Module credits	8.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Materials science 113 (NMC 113)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Introduction to materials: the family of materials, atomic structure and types of bonding, crystal types and space arrangement of atoms, directions and planes in crystals, defects in crystals, diffusion in solids. Mechanical properties of materials: stress and strain, mechanical testing (strength, ductility, hardness, toughness, fatigue, creep), plastic deformation, solid-solution hardening, recrystallisation. Polymeric materials: polymerisation and industrial methods, types of polymeric materials and their properties. Corrosion of metals: mechanisms and types of corrosion, corrosion rates, corrosion control. The heat treatment of steel: Fe-C phase diagram, equilibrium cooling, hardening and tempering of steel, stainless steel. Composite materials: Introduction, fibre reinforced polymeric composites, concrete, asphalt, wood.
Module credits	16.00
Programmes	BEng Civil Engineering
	BEng Computer Engineering
	BEng Electrical Engineering
	BEng Electronic Engineering
	BEng Metallurgical Engineering
	BEng Mining Engineering
Prerequisites	No prerequisites.
Contact time	4 lectures per week, 1 practical per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Materials science 223 (NMC 223)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Phase diagrams, phases and solid solutions. The heat treatment of steel (phase equilibria, the diffusion-controlled and martensitic transformations of austenite, hardening and tempering, hardenability, the application of IT and CCT diagrams, heat treatments). Steel types and classification. Cast irons (white, grey, malleable and spherical graphite irons). Stainless steels (ferritic, martensitic, austenitic and duplex types).
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	NMC 113 or NMC 123
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Materials science 313 (NMC 313)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Binary and ternary phase diagrams. Diffusion in alloys (steady-state and nonsteady-state, solid solutions, grain boundaries, homogenisation). Solidification (pure metals and alloys; ingots, castings and welds; segregation, porosity and eutectic solidification). Metallographic and analytical techniques (diffraction, electron microscopy). Precipitation and solid-solution strengthening (principles, and applications to aluminium, magnesium, copper and nickel-base alloys).
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	(NMC 223)
Contact time	3 lectures per week, 3 practicals per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Mechanical metallurgy 320 (NMM 320)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Dislocations and deformation (defects in crystalline materials, movement and elastic energy of dislocations, different crystal lattices, origin of and strengthening by dislocations). Strength of engineering materials (tensile testing, plastic deformation of single crystals and polycrystalline materials, hardness, residual stress). Creep deformation (primary and secondary creep, stress and temperature dependence, creep rupture). Introduction to fracture mechanics (Griffith criterion, stress intensity, fracture toughness, fatigue). Failure analysis. Hot and cold rolling of metals.
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	(NMC 223)
Contact time	3 lectures per week, 4 practicals per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Mechanical metallurgy 700 (NMM 700)

Qualification	Postgraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	We cover the interaction between the internal structure of metals – on the atomic and microscopic scales – and their mechanical properties. Practically important topics such as elastic and plastic stress analysis, dislocations and deformation, room and high temperature deformation processes, mechanical property/microstructure relationships for low and medium Carbon steels and for micro-alloyed and HSLA steels, fatigue processes, stress corrosion cracking, creep deformation processes and fracture mechanics are covered in depth, and illustrated with case studies. The course is largely available on CD-ROM with references to the latest literature.
Module credits	30.00
Programmes	BEngHons Metallurgical Engineering
	BScHons Applied Science Metallurgy
Prerequisites	No prerequisites.
Contact time	48 contact hours per semester
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1 or Semester 2

University of Pretoria Yearbook 2019

Mechanical metallurgy 700 (NMM 700)

Qualification	Postgraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	We cover the interaction between the internal structure of metals – on the atomic and microscopic scales – and their mechanical properties. Practically important topics such as elastic and plastic stress analysis, dislocations and deformation, room and high temperature deformation processes, mechanical property/microstructure relationships for low and medium Carbon steels and for micro-alloyed and HSLA steels, fatigue processes, stress corrosion cracking, creep deformation processes and fracture mechanics are covered in depth, and illustrated with case studies. The course is largely available on CD-ROM with references to the latest literature.
Module credits	30.00
Programmes	BEngHons Metallurgical Engineering
	BScHons Applied Science Metallurgy
Prerequisites	No prerequisites.
Contact time	48 contact hours per semester
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1 or Semester 2

University of Pretoria Yearbook 2019

Minerals processing 310 (NMP 310)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Minerals processing in perspective (economic importance, economic nature of mineral deposits, mineral properties and analysis, mineral processing functions). Liberation analysis (importance and measurement of liberation; particle size analysis). Comminution (theories and principles, crushers, grinding mills). Screening and classification (industrial screening, cyclones). Concentration processes (gravity concentration, dense medium concentration). Froth flotation.
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
Prerequisites	No prerequisites.
Contact time	4 practicals per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Minerals processing 411 (NMP 411)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	The sizing, application and efficiency determination of the most commonly used unit operations covering crushing, screening, classification, milling, gravity concentration, dense medium separation, magnetic separation and thickening.
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	(NMP 310)
Contact time	2 practicals per week, 1 tutorial per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Process design 421 (NOP 421)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Philosophy of design and the design process; phases of plant design and their interrelationships. Principles of project planning and management. Unit and process design, simulation, economic evaluation and optimising as applicable to the metallurgical industry. Execution of a process design project, submission of a report, oral presentations and construction of a scale model.
Module credits	32.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	(NHM 322), (NMM 320), (NPM 321), (NVM 321)
Contact time	1 tutorial per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Process metallurgy and control 412 (NPB 412)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Elements of metallurgical process control (principles, selection of proportional-integral controller, identification of controlled and manipulated variables and disturbances). Transient and steady-state heat transfer in metallurgy (formation of freeze layers, heating and cooling of components). Principles of reaction kinetics in pyrometallurgy (types and identification of rate-determining steps, quantification of overall reaction rate).
Module credits	8.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	(NPM 321)
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Pyrometallurgy 321 (NPM 321)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Overview of pyrometallurgical process routes, types of reactions, and reactor designs. Review of relevant thermodynamic principles (equilibrium constants, Henrian and Raoultian activities and activity coefficients). Slag basicity and viscosity. Energy and reductants. Overview of pyrometallurgical separation principles (vapour-phase, solid-state and liquid-liquid routes). Examples of pyrometallurgical separation processes (ironmaking and steelmaking, sulphide smelting and converting, ferroalloys).
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	NPT 220
Contact time	3 lectures per week, 2 tutorials per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Pyrometallurgy 700 (NPM 700)

Qualification	Postgraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	We aim to provide you with practice in using fundamental principles to analyse pyrometallurgical processes – to be able to go from understanding to process improvement. To this end, the necessary fundamentals of reaction equilibria (including activity descriptions), reaction kinetics, and mass and energy balances are reviewed. Practical examples illustrate the use of these principles. In the final block, we analyse a number of practical processes in more detail. Throughout, the emphasis is on quantification.
Module credits	30.00
Programmes	BEngHons Metallurgical Engineering
	BScHons Applied Science Metallurgy
Prerequisites	No prerequisites.
Contact time	48 contact hours per semester
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1 or Semester 2

University of Pretoria Yearbook 2019

Basic pyrometallurgy 701 (NPM 701)

Qualification	Postgraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	In this module you will develop the skills required to analyse the equilibria of pyrometallurgical processes. Solving such a problem requires skills in thermodynamic analysis, and knowledge of the typical processes (and the conditions within these processes) which are used to extract and refine metals like iron (steel), copper, titanium, chromium, manganese, and aluminium. The aim is to enable you to analyse a current or proposed process with regards to feasibility, and to propose processing conditions (e.g. temperature, slag composition) which will achieve the required equilibrium state. This also applies to refractory systems, where the primary aim will be to evaluate whether a given refractory material is suitable for a given application, or the impact of certain impurities on the refractory material.
Module credits	30.00
Programmes	BScHons Applied Science Metallurgy
Prerequisites	No prerequisites.
Contact time	48 contact hours per semester
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1 or Semester 2

University of Pretoria Yearbook 2019

Process thermodynamics 220 (NPT 220)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	The first, second and third laws of thermodynamics, enthalpy and heat capacity. The criteria for equilibrium, Gibbs free energy, chemical potential, partial molar Gibbs free energy, activity, activity coefficient and the equilibrium constant. Solution thermodynamics of ideal and non-ideal solutions, as well as solution models. Ellingham, Kellogg and Pourbaix diagrams. The thermodynamic principles are applied to metallurgical processes. Applications also include stoichiometry and mass balance problems, as well as the calculation of energy balances.
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	(CHM 171) or (CHM 172)
Contact time	2 tutorials per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Metals processing 411 (NPW 411)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Introduction to welding and joining processes. Welding of carbon steels, stainless steels, aluminium and aluminium alloys. Development and qualification of welding procedure specifications. Liquid metal processing (casting processes, solidification of castings and mould design). Deformation processing (forging, extrusion and rolling), sheet metal processing and surface processing. The identification and prevention of defects.
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	(NMC 313), (NMM 320)
Contact time	3 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Industrial training 316 (NPY 316)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	*Attendance module only During or at the end of the second year of study, students in Metallurgical Engineering undergo at least six weeks of prescribed training in industry. A satisfactory report on the practical training must be submitted to the Faculty Administration within one week of registration. In exceptional circumstances the prescribed minimum period can be reduced, as approved by the Dean.
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	No prerequisites.
Contact time	1 other contact session per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Industrial training 416 (NPY 416)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	*Attendance module only During or at the end of the third year of study, students in Metallurgical Engineering undergo at least six weeks of prescribed training in the industry. A satisfactory report on the practical training must be submitted to the department within one week of registration. In exceptional circumstances the prescribed minimum period can be reduced, as approved by the Chairman of the School of Engineering.
Module credits	16.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	No prerequisites.
Contact time	1 other contact session per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1 or Semester 2

University of Pretoria Yearbook 2019

Literature survey 412 (NSC 412)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Literature search (using electronic databases of publications, formulating search strategies). Hypothesis formulation and preliminary experimental planning (identifying research question and stating hypothesis, proposing critical experiments, evaluating feasibility of possible experimental approaches). Literature survey (critical evaluation of published information, synthesising available information into a coherent argument, written and oral reporting). Final experimental planning (formulation of experiments with attention to calibration, uncertainty, reliability and safety).
Module credits	8.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	(NHM 322), (NMM 320), (NPM 321), (NVM 321)
Contact time	1 tutorial per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Project 422 (NSC 422)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Execution of a research project: experimentation (with attention to safety, reliability, calibration and reproducibility); analysis of results to yield data (with statistical analysis of uncertainty); interpretation of data (to test the stated hypothesis); written reporting of results (with updated literature survey, description of experimental approach, data obtained, conclusions, and scientific and industrial implications); oral and poster presentations.
Module credits	32.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	NSC 411 or NSC 412
Contact time	1 tutorial per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Refractory materials 321 (NVM 321)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Classification, requirements and properties of refractory materials. Manufacturing principles. Specification and testing of refractory materials. The main refractory systems, i.e silica, aluminosilicates, alumina, magnesia, magnesia-chrome, magnesia-carbon, doloma, zircon, zirconia, silicon carbide and graphite, and their applications. Principles of ternary phase diagrams and their application in refractory systems, and interactions between slag, metal and refractory materials.
Module credits	8.00
Programmes	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	(NPT 220) and NPM 321 #
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Materials Science and Metallurgical Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Mechanics 122 (SWK 122)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	Equivalent force systems, resultants. Newton's laws, units. Forces acting on particles. Rigid bodies: principle of transmissibility, resultant of parallel forces. Vector moments and scalar moments. Relationship between scalar- and vector moments. Couples. Equivalent force systems on rigid bodies. Resultants of forces on rigid bodies. Equilibrium in two and three dimensions. Hooke's law. Trusses and frameworks. Centroids and second moments of area. Beams: distributed forces, shear force, bending moment, method of sections, relationship between load, shear force and bending moment.
Module credits	16.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
	BSc Engineering and Environmental Geology
	BSc Extended programme - Physical Sciences

	BSc Meteorology
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	WTW 158
Contact time	2 tutorials per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Calculus 158 (WTW 158)

Qualification	Undergraduate
Faculty	Faculty of Natural and Agricultural Sciences
Module content	*This module is designed for first-year engineering students. Students will not be credited for more than one of the following modules for their degree: WTW 158, WTW 114, WTW 134, WTW 165. Introduction to vector algebra. Functions, limits and continuity. Differential calculus of single variable functions, rate of change, graph sketching, applications. The mean value theorem, the rule of L'Hospital. Indefinite integrals, integration.
Module credits	16.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
	BSc Engineering and Environmental Geology
	BSc Geology
Service modules	Faculty of Engineering, Built Environment and Information Technology

Prerequisites	60% for Mathematics in Grade 12
Contact time	1 tutorial per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Mathematics 164 (WTW 164)

Qualification	Undergraduate
Faculty	Faculty of Natural and Agricultural Sciences
Module content	*This module is designed for first-year engineering students. Students will not be credited for more than one of the following modules for their degree: WTW 146, WTW 148 and WTW 124, Vector algebra with applications to lines and planes in space, matrix algebra, systems of linear equations, determinants, complex numbers, factorisation of polynomials and conic sections. Integration techniques, improper integrals. The definite integral, fundamental theorem of Calculus. Applications of integration. Elementary power series and Taylor's theorem. Vector functions, space curves and arc lengths. Quadratic surfaces and multivariable functions.
Module credits	16.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
	BSc Engineering and Environmental Geology

	BSc Extended programme - Physical Sciences
	BSc Geology
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 114 GS or WTW 158 GS
Contact time	4 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Mathematics 238 (WTW 238)

Qualification	Undergraduate
Faculty	Faculty of Natural and Agricultural Sciences
Module content	Linear algebra, eigenvalues and eigenvectors with applications to first and second order systems of differential equations. Sequences and series, convergence tests. Power series with applications to ordinary differential equations with variable coefficients. Fourier series with applications to partial differential equations such as potential, heat and wave equations.
Module credits	16.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 256 and WTW 258 GS
Contact time	4 lectures per week, 1 tutorial per week
Language of tuition	Separate classes for Afrikaans and English

Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Differential equations 256 (WTW 256)

Qualification	Undergraduate
Faculty	Faculty of Natural and Agricultural Sciences
Module content	Theory and solution methods for linear differential equations as well as for systems of linear differential equations. Theory and solution methods for first order non-linear differential equations. The Laplace transform with application to differential equations. Application of differential equations to modelling problems.
Module credits	8.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
	BSc Mathematics
	BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 158 and WTW 164

Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

University of Pretoria Yearbook 2019

Calculus 258 (WTW 258)

Qualification	Undergraduate
Faculty	Faculty of Natural and Agricultural Sciences
Module content	Calculus of multivariable functions, directional derivatives. Extrema. Multiple integrals, polar, cylindrical and spherical coordinates. Line integrals and the theorem of Green. Surface integrals and the theorems of Gauss and Stokes.
Module credits	8.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
	BSc Mathematics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 158 and WTW 164
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English

Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

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 each student to familiarise himself or herself 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.

University of Pretoria Yearbook 2019

Numerical methods 263 (WTW 263)

Qualification	Undergraduate
Faculty	Faculty of Natural and Agricultural Sciences
Module content	Numerical integration. Numerical methods to approximate the solution of non-linear equations, systems of equations (linear and non-linear), differential equations and systems of differential equations. Direct methods to solve linear systems of equations.
Module credits	8.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Civil Engineering
	BEng Civil Engineering Engage
	BEng Computer Engineering
	BEng Computer Engineering Engage
	BEng Electrical Engineering
	BEng Electrical Engineering Engage
	BEng Electronic Engineering
	BEng Electronic Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
	BEng Mining Engineering
	BEng Mining Engineering Engage
	BSc Mathematics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 164
Contact time	2 lectures per week, 1 tutorial per week

Language of tuition	Separate classes for Afrikaans and English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

University of Pretoria Yearbook 2019

Workshop practice 121 (WWP 121)

Qualification	Undergraduate
Faculty	Faculty of Engineering, Built Environment and Information Technology
Module content	*Attendance module only The module is offered at the end of the first year of study and lasts at least eight days, during which training is given in the following workshops: electronic projects, panel wiring, electrical motors and switch gear, general machines, welding, turning and sheet metal work. Each student's progress is assessed after each workshop.
Module credits	6.00
Programmes	BEng Chemical Engineering
	BEng Chemical Engineering Engage
	BEng Industrial Engineering
	BEng Industrial Engineering Engage
	BEng Mechanical Engineering
	BEng Mechanical Engineering Engage
	BEng Metallurgical Engineering
	BEng Metallurgical Engineering Engage
Prerequisites	No prerequisites.
Contact time	1 other contact session per week
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 2