UNDERGRADUATE **2021**

Faculty of Engineering and the Built Environment

UNIVERSITY OF JOHANNESBURG

www.uj.ac.za

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Always compare the information contained a print version of the
Rules and Regulations with the electronic version on the UJ Internet.
The electronic copy is updated.
The University reserves the right to supplement, delete or change any part of a regulation without prior notice.

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Academic Departments

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Civil Engineering Science – Auckland Park Campus
Head of Department: Prof M Dinka
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FACULTY-SPECIFIC REGULATIONS

EB1 ACADEMIC REGULATIONS

The Faculty Regulations should be read in conjunction with the *Academic Regulations* of the University of Johannesburg, which contains:

Admission requirements
Registration regulations
Credit and promotion requirements
Exemption and recognition of prior learning (RPL) requirements
Prerequisite and compulsory modules
Duration of programme
Teaching, learning and assessment,
Regulations for examinations and tests
Academic regulations applicable to Master's and Doctoral Degrees
The regulations for the particular programme as provided in this publication.

Academic programmes of the Faculty of Engineering and the Built Environment (FEBE) are accredited by a number of professional councils (statutory bodies). Professional entities, like the Engineering Council of South Africa (ECSA), require strict adherence to assessment criteria associated with exit-level outcomes (ELOs). Due to the many benefits of programme accreditation and statutory requirement for professional registration – where applicable, the faculty gives priority to assessment requirements as applicable for accreditation.

EB2 DIPLOMA AND DEGREE PROGRAMMES OFFERED

All BEng programmes are offered on the Auckland Park Campus (APK) and BEngTech and BTech programmes on the Doornfontein Campus (DFC)

Programme		Minimum study period	Campus
Diploma including *extended diploma programmes	Diploma	3 years full-time	DFC
Bachelor of Engineering Technology including *extended degree programmes	BEngTech	3 years full-time	DFC
Bachelor of Engineering	BEng	4 years full-time	APK

* Add one year to the minimum study period for the extended degrees and diplomas.

EB3 APPLICATION FOR ADMISSION TO STUDY AT THE UNIVERSITY

Prospective students must apply for admission to programmes not later than the determined closing dates as published on the UJ webpage. An annually determined application fee may be payable. Admission is subject to selection in accordance with programme-specific admission requirements determined by the Faculty Board, as well as minimum requirements set for transfer students, approved by Senate.
Admission is also subject to:

a) the University's Enrolment Management Plan approved by the Department of Education , the Senate and the Faculty Board.
b) quota determination of elective modules as approved.
c) professional regulatory requirements where programmes are regulated by external regulatory boards/council.
d) requirements related to the student equity profile.
e) senate-approved selection, placement of admission tests.

EB3.1 Compliance with the minimum programme admission requirements

EB3.1.1 Admissions before 2008

M-score points are awarded for the six best symbols (taking faculty-and programme- specific requirements into account) in the SC/Grade 12 according to the scale below.
A maximum of six subjects will be used to calculate the M-score with a maximum M-score of 30.

EB3.1.2 National senior certificate admission requirements (from 2009)

The University of Johannesburg and the Faculty of Engineering and the Built Environment reserve the right to change the admission requirements for the Faculty of Engineering and the Built Environment. A limited number of students are admitted to certain fields of study. In addition to the general minimum admission requirements above, programme-specific requirements may apply.

EB3.1.2.1 ADMISSION SCORE TABLE

APS	NATIONAL			INTERNATIONAL										
	NSC/IEB	SC HG (M-SCORE)	SC SG (M-SCORE)	HIGCSE/NSSC	IGCSE/NSSC (OL)	AS LEVELS	A LEVELS	IB (HL)	IB (SL)	WAEC	KCSE	Diplome/Exam D'Etat	CHL/EM	Baccalaureate
10	-	-	-	-	-	-	A	7	-	-	-	-	-	-
9	-	-	-	-	-	-	B	6	-	-	-	-	-	-
8	-	-	-	-	-	-	C	5	-	-	-	-	-	-
7	7 (80-100%)	A	-	1	-	A	D	4	7	-	A	-	-	-
6	6 (70-79%)	B	A	2	-	B	E	3	6	-	B	-	-	-
5	5 (60-69%)	C	B	3	A	C	-	2	5	A	C	80-100%	16-20	16-20
4	4 (50-59%)	D	C	4	B	D	-	1	4	B	D	70-79%	14-15	14-15
3	3 (40-49%)	E	D	-	C	E	-	-	3	C	E	50-69%	10-13	10-13
2	2 (30-39%)	F	E	-	D/E	-	-	-	2	D/E	F	30-49%	8-9	8-9

1	**1 (0-29%)**	**G**	**F**	**-**	**F/G**	**-**	**-**	**-**	**1**	**F/G**	**G**	**0-29%**	**0-7**	**0-7**

ABREVIATIONS

NSC	National Senior Certificate (completed Grade 12 **since** 2008)
SC HG	Senior Certificate Higher Grade (completed Grade 12 before 2008)
SC SG	Senior Certificate Standard Grade (completed Grade 12 before 2008)
IEB	Independent Examination Board
HIGCSE	Higher International General Certificate of Secondary Education
NSSC (HL)	Namibia Senior Secondary Certificate (Higher Level)
IGCSE	International General Certificate of Secondary Education
NSSC (OL)	Namibia Senior Secondary Certificate (Ordinary Level)
AS Levels	Advanced Subsidiary Level
A Levels	Advanced Level
IB (HL)	International Baccalaureate Schools (Higher Levels)
IB (SL)	International Baccalaureate Schools (Standard Levels)
WAEC	West African Examination Council
KCSE	Kenya Certificate of Secondary Education
Diplome/Exam D'Etat	Diplome d'Etat or d'Etudes Secondaire du Cycle
CHL/EM	Certificado de Habilitacoes Literarias (Mozambique / Enssino Medio (Angola
Baccalaureate	Gaboness School Leaving

3.3 Admission requirements for International applicants and applicants who completed the Senior Certificate (SC)

3.3.1 Admission Point Scores (APS) are awarded for the six best symbols (taking faculty- and programme-specific requirements into account) in the SC, HIGCSE, IGCSE, A-levels, AS-Levels, O-levels, IB WAEC, KCSE, Diplome/Exam D'Etat, CHL/EM or the Baccalaureate according to the table above. A maximum of six subjects will be used to calculate the total APS.

3.3.2 Applicants who obtained the SC will be considered for admission to study at the University in accordance with their final Grade 12 results.

3.4 Admission Requirements for applicants who obtained the National Senior Certificate (NSC) in 2008 or later

(a) Life Orientation is not counted in the calculation of the total APS nor is it considered as an individual compulsory subject.

(b) In total six subjects are used for the calculation of the APS. The total APS of an applicant is the sum of the achievement ratings of the programme compulsory subjects and the remaining-NSC subjects of that applicant

(c) If applicants completed more than the minimum number of subjects in their NSC, the compulsory subjects and the best three remaining subjects will be used to calculate the total APS.

(d) Refer to the UJ Prospectus for the requirements per qualification and Faculty.

3.5 Admission requirements for applicants who obtained the National Certificate Vocational (NCV) and the National Senior Certificate for Adults (NASCA)

National Senior Certificate for Adults (NASCA): The following criteria will apply for admission to all undergraduate Engineering programmes (BEng and BEng Tech).

- ✓ **The following minimum subject requirements will apply for admission:**
  - English 60% **APS 5 - Exception BEng Tech APS 4**
  - Maths 60% APS 5 (with the exception of BEng with IT that requires an APS 6)
  - Physical Science 60% APS 5 (with the exception of BEng with IT that requires an APS 6)
- ✓ Applicants will be required to complete a PsyCaD assessment obtaining an unconditional recommendation;
- ✓ Recommendation by the relevant Head of Department;
- ✓ Senate Discretionary Conditional Admission for applicants who have successfully completed the NASCA, provided that the applicant meets all the requirements;
- ✓ Admission will also be based on the availability of space according to the Enrolment Management Plan of UJ as approved by the Department of Higher Education and Training.

3.6 Admission Requirements for the Amended Senior Certificate (ASC) Applicants:

Amended Senior Certificate (ASC): The following criteria will apply for admission to all undergraduate Engineering programmes (BEng and BEngTech).

- ✓ **The following minimum subject requirements will apply for admission:**
  - English 60% **APS 5**
  - Maths 60% APS 5 (with the exception of BEng with IT that requires an APS 6)
  - Physical Science 60% APS 5 (with the exception of BEng with IT that requires an APS 6)
- ✓ Applicants will be required to complete a PsyCaD assessment obtaining an unconditional recommendation;
- ✓ Recommendation by the relevant Head of Department;
- ✓ Senate Discretionary Conditional Admission for applicants who have successfully completed the ASC, provided that the applicant meets all the requirements;
- ✓ Admission will also be based on the availability of space according to the Enrolment Management Plan of UJ as approved by the Department of Higher Education and Training.

EB3.6.1 BENG DEGREE PROGRAMMES

- **BEng Electrical and Electronic Engineering/Mechanical Engineering/Civil Engineering**

Programme	Code	Minimum APS	English	Mathematics	Physical Sciences
Degree Programmes (4 years)					
Bachelor of Engineering Degree (4 years)					
BEng Electrical Engineering	B6ELSQ	32	5	5	5
BEng Mechanical Engineering	B6MESQ	32	5	5	5
BEng Civil Engineering	B6CISQ	32	5	5	5

EB.3.6.2 DIPLOMA PROGRAMMES

Programme	Code	Minimum APS	English	Mathematics	Mathematics Literacy
Diploma Programmes (3 years)					
Management Services	D6MASQ	19 with Mathematics 21 with Mathematical Litera+cy	4	3	5
Operations Management	D6OPMQ	20 with Mathematics 22 with Mathematical Literacy	4	3	5
Extended Diploma Programmes (4 years)					

Management Services	D6MAEQ	19) with Mathematics 21 with Mathematical Literacy	4	3	5
Operations Management	D6OPEQ	20 with Mathematics 22 with Mathematical Literacy	4	3	5

EB.3.6.3 EXTENDED BACHELOR OF ENGINEERING TECHNOLOGY PROGRAMMES

Programme	Code	Minimum APS	English	Mathematics	Physical Sciences
Extended Bachelor of Engineering Technology Degree Programmes (4 years)					
BEng Tech (Civil Engineering) Extended	B6CX0Q	26	4	4	4
Bachelor of Science in Construction (Extended)	B6COXQ	26	4	5	5
BEng Tech (Electrical Engineering) Extended	B6ELXQ	25	4	5	5
BEng Tech (Industrial Engineering) Extended	B6INXQ	24	4	5	5
BEng Tech (Mechanical Engineering) Extended	B6MEXQ	24	4	5	5
BEng Tech (Physical Metallurgy) Extended	B6PX0Q	22	4	4	4
BEng Tech (Extraction Metallurgy) Extended	B6EX0Q	22	4	4	4

EB3.6.4 BACHELOR & BACHELOR OF ENGINEERING TECHNOLOGY PROGRAMMES

Programme	Code	Minimum APS	English	Mathematics	Physical Sciences
Bachelor of Engineering Technology Degree Programmes (3 years)					
BEng Tech in Chemical Engineering	B6CE1Q	30	4	5	5
BEng Tech in Civil Engineering	B6CV0Q	28	4	5	5
Bachelor of Science in Construction	B6CN0Q	30	4	5	5
BEng Tech in Electrical Engineering	B6EL1Q	30	4	5	5
BEng Tech in Industrial Engineering	B6INDQ	30	4	5	5
BEng Tech in Mechanical Engineering	B6MECQ	30	4	5	5
BEng Tech in Physical Metallurgy	B6PHYQ	30	4	5	5
BEng Tech in Extraction Metallurgy	B6EXTQ	30	4	5	5
BEng Tech in Mining Engineering	B6MINQ	23	4	5	5
Bachelor of Mine Surveying	B6SU0Q	23	4	5	5
Bachelor of Urban and Regional Planning	B6UP0Q	27	4	5	Geog 5

EB3.6.5 National certificate (vocational) NCV admission requirements

The University of Johannesburg and the Faculty of Engineering and the Built Environment reserve the right to change the admission requirements for the Faculty of Engineering and the Built Environment. A limited number of students are admitted to certain fields of study. In addition to the general minimum admission requirements above, programme-specific requirements may apply.

Admission Point Score		
Rating Code	**Rating**	**Percentage**
5	Outstanding	80-100
4	Highly	70-79
3	competent	50-69
2	Competent	40-49
1	Not yet competent	0-39
	Not achieved	

National Certificate (Vocational) (NCV) Guidelines

Subject to institutional admission requirements, the minimum admission requirement to a Bachelor's degree programme is a National Certificate (Vocational) Level 4 issued by Council for General and Further Education and Training. The minimum legislative requirements for admission to a Bachelor's degree include the achievement of:

- Three (3) fundamental subjects between 60 - 69% (3)
  (Including English as the language of learning and teaching at UJ)
- Three (3) vocational subjects from the designated list between 70 - 79% (4)

For admission to a **National diploma** the applicant must have:

- A NCV (level 4) issued by the Council for General and Further Education and Training
- Achieved 70-79 (APS 4) for all 5 subjects – fundamental and vocational categories (minimum APS of 25)
- Passed English as Primary or First Additional Language with a minimum score of 4
- Passed Mathematics and Physical Sciences as Fundamental Components with a minimum score of 4
- Passed Mathematics, Physical Sciences and Life Sciences as Fundamental Components with a minimum score of 4

EB3.6.5.1 Admission of International applicants

3.6.5.1.1 Admission of International applicants is subject to the conditions set out in the Immigration Act 13 of 2002.

3.6.5.1.2 The success of an International application depends on both the confirmation of academic acceptance and the obtaining of the necessary statutory documentation and state approval.

3.6.5.1.3 All prospective International students are required to submit proof of English language proficiency, which may consist of:

(a) the results of the internationally recognised **International English Language testing system** (IELTS) test (with a score of six for undergraduate studies and a score of seven for postgraduate studies);

or

(b) English passed at school-leaving level;

or

(c) The results of the UJ English Language Programme (UJELP) test

EB3.6.6 ENROLMENT MANAGEMENT PROCESS

3.6.6.1 FEBE Enrolment Management Process will be based on *accepting the best students for each programme to fill the number of places available* (rather than accepting students on a first-come-first-served basis meeting the minimum published admission requirements). The implication of this is that applicants will be *ranked* according to criteria described in point 3.3.3 below, and may be placed on a *waiting list* before a final decision is made as to whether they will or will not be offered a place in a programme.

3.6.6.2 Those students who are selected for their first choice of programme will be offered a place in that particular programme. Students who are not selected for their first choice of programme may be offered a place in one of their lower preferences, or in any other programme for which the applicant may be considered suitable.

3.6.6.3 Admission will be based on final Grade 11 scores, provisional (or final) APS scores and scores in key subjects as well as other department-specific criteria, and may be supplemented (as set out in 3.3.6 below) by approved selection/placement tests (e.g. NBT), with each Head of Department being responsible for selection/placement of any student in his/her department. International students will be assessed on an equivalent scoring system. Note that this is *provisional* admission, subject to final APS scores being above the minimum published admission requirements for the particular programme.

3.6.6.4 In line with the Enrolment Management Plan, each Head of Department will determine the maximum intake of new students that the department can accommodate, based on infrastructure, staffing and other resources, as well as expected throughput (Expected throughput will determine the number of students who are likely to repeat any particular module, and who may therefore reduce the number of places available for new students).

3.6.6.5 Students applying to FEBE will be placed into one of three categories: (a) *excellent students* (above a certain cut-off of score/criteria as set out in point 3.3.3 above), who will be given admission without further testing; (b) *mid-range students*, who do not meet the cut-off for admission without further testing, but do meet the minimum published admission requirements, who will be waitlisted and may be required to write further selection/placement tests before a decision is taken on their acceptance and/or placement; and (c) *weaker students*, who do not meet the minimum published admission requirements, or who on the basis of their final Grade 11 scores, provisional (or final) APS scores and scores in key subjects will clearly not meet the requirements for acceptance, who may be rejected outright.

3.6.6.6 The cut-off scores for final Grade 11 scores, provisional (or final) APS scores and scores in key subjects for admission without further testing (see 3.3.6(a) above) will be determined internally by each Head of Department. These cut-off scores are likely to be adjusted from year to year, and are also likely to be *adjusted as time progresses during the admissions process of a particular year, depending on the number and quality of applications received for a particular programme*. Each department may also allow a percentage of places (approximately 10%) open for excellent last minute walk-in applicants. Although the automatic acceptance scores are not fixed, *the guiding principle is that each Head of*

Department will seek to fill the number of places available in each programme with the best students applying, and endeavour to place students on those programmes for which they have a reasonable chance of success in obtaining the qualification within the allowed time period.

3.6.6.7 This acceptance process will be applicable to first year students as well as transfer students in higher years within UJ and from other universities.

3.6.6.8 While students may not be required to write further tests *for admission/selection and placement purposes*, individual departments may continue to use supplementary tests (e.g. NBT) and/or internal departmental tests *for the purposes of profiling/diagnosis of student strengths and weaknesses.*

EB4 EXPERIENTIAL LEARNING

4.1 Experiential Learning is a phase during which instruction and relevant practical experience, relating specifically to the selected programme, are integrated.

4.2 Students are requested to submit their experiential learning report according to Faculty submission dates. *First-term Experiential Learning Reports should be submitted during the second week of July. Second-term Experiential Learning Reports should be submitted at the latest, during the second week in January of the following year.*

4.3 While the University of Johannesburg undertakes to assist students in obtaining suitable experiential learning placements at approved companies, the onus remains on the student to secure such placement. An experiential learning agreement creates a separate contract between the employer and the student.

4.4 Students are personally responsible for obtaining structured experiential learning with an approved provider. (The Faculty will provide an information service for training opportunities, but will not be responsible for finding experiential learning opportunities for students). Experiential learning guidelines are available from the Departments concerned. At the completion of each level of experiential learning, students must submit documentary evidence of having completed their experiential learning, as specified.

4.5 Students must register (and pay the prescribed registration fees) with the University of Johannesburg (UJ) for experiential learning in the semester during which they will complete experiential learning at the workplace. Under no circumstances will backdated registration be allowed. Deadlines will be determined by the Faculty.

4.6 A statement of competency, based on industry and Faculty assessment of students' performance in the workplace, must be obtained for each programme level associated with experiential learning.

4.7 Applications for recognition of prior work experience instead of experiential learning must be completed at the time of applying to study for the National Diploma.

EB5 RECOGNITION OF PRIOR LEARNING (RPL)

The University, may on grounds of RPL and subject to Senate-approved special admission rules, admit students who do not comply with the minimum requirements.

EB6 PROMOTION REQUIREMENTS

EB6.1 General Promotion requirements

6.1.1 Students will only be permitted to register for the higher module level if they have passed the prerequisite modules. Faculty regulations EB24 and EB23 provide the list of modules taught, together with the required prerequisite modules for the Engineering Technology and Engineering Science programmes respectively.

6.1.2 No student may attend lectures or any contact sessions in a module, receive study material or supervision, or have access to any electronic study material or sources, or be assessed in a module if he/she is not a registered student at the UJ for the relevant module for the academic semester/year concerned.

6.1.3 No assessment result is official if a student was not registered for a module in the specific academic year.

6.1.4 Students who have failed a module twice will not be allowed to continue their studies in the same module at the University, except with permission of the Executive Dean on recommendation of the relevant Head of Department after consultation with the Lecturer, or on recommendation of the Faculty's Examination and/or assessment Committee (Academic Regulation 6.6).

EB6.2 Promotion requirements pertaining to Extended Programmes

6.2.1 Students in the extended programme will be permitted to continue their studies into the second year of study on condition that if a first-year module was failed, the module failed, is not a prerequisite for entry to any course in the second year.

6.2.2 Students who fail more than one module in the first year of the extended programme will only be permitted to register in the Faculty of Engineering for a second time, with permission of the Dean.

6.2.3 The extended modules will have a mid-year test (during scheduled examination timetable), whereupon continuation will be determined according to the possibilty of a pass at the end of the year. The assessment at the end of the module (November examination) will be an integrated assessment of all the outcomes.

6.2.4 Mainstream Engineering students will be accommodated into the extended programme if progress in their degree course is unsatisfactory, on condition that there is still a possibility of graduating in the minimum required period plus one year (M+1).

6.2.5 Additional promotion requirements pertaining to Extended Diploma Programmes:

- Students in the extended diploma programme will not be permitted to continue their studies if a fully foundational first-year module (FFRP111; FWPN111; FPOM111; FSPC11A; FSPC11B) was failed.
- Students who fail a foundational provision module in the first year of the extended programme will only be permitted to register in the Faculty of Engineering for a second time, with permission of the Dean.
- Students will only be permitted to register for the higher module level if they have passed the foundational provision modules.

EB6.3 Promotion requirements pertaining to undergraduate programmes

6.3.1 A student is admitted to the second year of study after he/she has successfully completed at least 60% of the prescribed number of modules of the first year of study.

6.3.2 A student is admitted to the third year of study after all modules of the first year of study and at least 60% of the prescribed number of modules of the second year of study, have been passed.

6.3.3 A student proceeds to the fourth year of study in respect of the BEng degree programmes after all modules of the second year of study and at least 60% of the prescribed number of modules of the third year of study, have been passed.

6.3.4 A student is permitted to register for engineering modules of a specific year of study only if he/she is promoted to that specific year of study.

6.3.5 A student who wishes to present only his/her Project Investigation and Design in respect of the BEng degree programmes for completion of his/her studies may complete these modules by means of full-time study within one semester.

6.3.6 The duration of Project Investigation will be two semesters, with the exception of the degree programmes in Civil Engineering where the duration is one semester.

Project Investigation and Civil Design must be commenced so that the student, upon completion thereof, also completes his/her studies for the BEng degree.

6.3.7 A student who, during any semester, fails all modules registered for, may be excluded from the Faculty.

6.3.8 A student may be excluded if they do not:

- Successfully complete all modules in the first year of study within two years,
- Successfully complete all modules in the second year of study within three years,
- Successfully complete all modules in the third year of study within five years,
- Successfully complete all modules in the fourth year of study within six years.

6.3.9 A student may be excluded at the end of the first semester if their results will prevent sufficient progress toward their degree in the second semester.

6.3.10 A student who is deemed by the Faculty to be making insufficient academic progress may be placed on warning (see EB7.2, E1/E2), and may be excluded if any module in the following semester is not successfully completed.

EB7 ASSESSMENT

EB7.1 General

When a summative assessment opportunity is used as a last (comprehensive) summative assessment opportunity, a minimum module mark of 40% and where applicable, attendance of 80% in all lectures, tutorials and practicals are required for admission to the summative assessment opportunity concerned.

7.1.1 Special **summative** assessment opportunities are considered by the faculty in which the programme/qualification resides, for students who, in the event of illness, for compassionate reasons, on religious grounds or for similar legitimate reasons, were prevented from attending a summative assessment opportunity. Students may be granted a special summative assessment opportunity if they apply for it within seven calendar days after the original date of the relevant summative assessment opportunity. The Executive Dean or the Vice-Dean, in consultation with the relevant Head of Department, considers all applications and decides whether or not to grant the special summative assessment opportunity. The Faculty Board determines the procedure for and manner of such application in accordance with University procedure. The application procedure must be contained in the relevant programme-specific information or learning guide.

7.1.2 The Assessment Committee or a senior administrative officer of a faculty in which the module resides may grant a student a supplementary last summative assessment opportunity if

(a) The student failed a module but obtained a final mark of at least 40%

or

(b) The student failed a module but obtained a final period/semester/year mark of at least 60%.

7.1.3 The Assessment Committee or a senior administrative officer of a faculty in which the qualification resides may grant a student a supplementary last summative assessment opportunity, if the student requires not more than the equivalent of two semester modules or one year module for the completion of the relevant qualification, provided that the student:-

(a) was registered for the relevant module in the current academic year; and

(b) was admitted to, and participated in the last assessment opportunity in the relevant module; and

(c) has complied with all the experiential or practical requirements prescribed for the qualification (where applicable), excluding work-integrated modules; and

(d) was not granted a supplementary last assessment opportunity in the relevant module during the current academic year and

(e) The Executive Dean of the faculty in which the qualification resides may, in exceptional circumstances and in consultation with the Executive Dean of the faculty in which the particular modules reside, waive one or more of the conditions specified in (a) to **or** (e).

7.1.4 Supplementary assessments for continuous assessment modules are scheduled as part of the assessment plan for a particular module. The following applies:

(a) A minimum of **40%** final mark (FM) in the predetermined assessment is required to gain access to a supplementary assessment.

(b) Supplementary assessments are limited to one scheduled assessment per semester module, or two scheduled assessments per year module, or according to each faculty's internal assessment policy.

(c) A maximum of no more than a pass mark is awarded for the supplementary assessment.

7.1.5 Special summative assessment and supplementary assessment opportunities reflect the same degree of difficulty and cover the same scope as the original summative assessment opportunity.

7.1.6 Students are personally responsible for ascertaining whether they qualify for a special assessment or a supplementary assessment opportunity and for acquainting themselves with the details of the timetable and the venue.

7.1.7 Students' entitlement to a special or supplementary summative assessment opportunity lapses if they fail to use the opportunity.

7.1.8 Students may not be granted another supplementary summative assessment opportunity if they have used and failed a previous one except if the Executive Dean of the faculty in which the qualification resides has waived requirement (d) of AR 10.5.4 above.

7.1.9 The final mark of **after** a supplementary assessment opportunity is capped at 50%. **This rule does not apply to continuous assessment modules (refer to AR 10.5.5).**

7.1.10 No capping of a final mark is applicable in the case of a special summative assessment opportunity.

EB7.2 Result Codes

After completion of the last summative assessment session of the semester, students will receive a global result code regarding their overall performance for the year/semester. The following table explains the result codes given to students after the last summative assessment (exams).

RESULT		BUSINESS RULES	PROMOTION TO NEXT YEAR
CODE	**DESCRIPTION**		
E1	PROCEED: PASS ALL COURSES NOV	Warning: At the end of the first semester the student is allowed to proceed in the second semester with his/her studies for that specific qualification on condition that all modules must be passed at the end of that semester to prevent exclusion on academic grounds.	N/A

E2	PROCEED: PASS ALL COURSES JUNE	Warning: At the end of the second semester the student is allowed to proceed in the next academic year with his/her studies for that specific qualification on condition that all modules must be passed at the end of the first semester of that year to prevent exclusion on academic grounds.	NO
EE	REFER TO FACULTY POLICY ABOVE	Warning: The student must take note of the applicable faculty policy that is placed at the top of the result letter.	NO
F4	FAILED ALL SUBJECTS	Student failed all modules and is excluded from the Faculty (see Academic Regulation 6.13).	NO
F7 *	RE-ADMISSION PROGRAMME REFUSED	The student is excluded on academic grounds and may not proceed with his/her studies in that specific programme (see Academic Regulation 6.8).	NO
P4	PROMOTED	The student may reregister the next year for the same qualification and may register for modules of the following curriculum year (see Academic Regulation 6.7)	YES
P5	MAY CONTINUE STUDIES	The student may reregister the next year for the same qualification but may not register for any modules of the following curriculum year (see Academic Regulation 6.7).	NO
P6	DEGREE/DIPL/ CERT COND SSA EXAM	The student will complete his/her qualification if he/she passes all modules he/she has been admitted to the SSA examination.	NO
P7	OBTAINED DEGREE/DIPLOMA/ CERT	The student has complied with all requirements for the completion of the applicable qualification (see Academic Regulation 10.6.1).	NO
P8	DEGREE/DIPL/ CERT PASSED WITH DISTINCTION	The student has complied with all requirements for the completion of the applicable qualification cum laude passed with distinction see Academic Regulation 10.6.2).	NO
PH	POTENTIAL GRADUANDUS/A	The student will complete his/her qualification if he/she passes all modules he/she has been registered for in this academic year.	NO
SV	APPOINTMENT WITH HOD	The student is requested to contact the HOD urgently to clarify certain aspects of the student's future registration. This is normally the case where certain decisions have to be made before the student will be allowed to register online.	NO

UT	ADMISSION DOCUMENT OUTSTANDIN G	Admission documents are still not yet been submitted and re-registration will not be allowed unless these documents are submitted satisfactorily.	NO

EB7.3 Appeals against academic exclusion (F7)

Students may lodge an appeal against their academic exclusion (i.e. receiving an F7 (undergraduate) or 7F (postgraduate) global result code) at the specific faculty on the campus where the student is registered. Faculty-specific arrangements will be made and dates publicised by the Faculty concerned.

(a) Applicants who want to appeal must follow the prescribed administrative procedure by submitting their motivation and supporting documents as well as other substantiating documents to the relevant dean's office according to faculty guidelines and procedures and in accordance with UJ policies.
(b) The Faculty Appeals Committee will consider the appeals and may refuse or allow re-admission.
(c) The students will be notified in writing of the outcome of the appeal.
(d) The decision of the Faculty Appeals Committee is final.
(e) Students who transfer to another faculty retain their academic record related to their previous registration for any other programme/s.

EB8 OBTAINING A QUALIFICATION

EB8.1 Students obtain a qualification if they have passed every module prescribed for a programme and have successfully completed experiential, service or work integrated learning where applicable.

EB8.2 A qualification is awarded or conferred with distinction if the requirements below are met:

(a) Duration:

(i) Students must complete an undergraduate programme in the minimum period of study specified for the programme, unless the Executive Dean has approved a longer period of study for legitimate reasons.
(ii) Students must complete a BTech qualification in one year if registered fulltime and within two years if registered part-time.

(b) Average final mark for the qualification:

(i) Students must achieve a weighted and/or proportional calculated average final mark for an undergraduate qualification of at least 75% as determined by the Faculty Board, approved by Senate and contained in the Faculty Rules and Regulations.
(ii) Students must achieve an average final mark for an BTech qualification of at least 75% calculated by weighting the final marks for all the modules comprising the qualification in accordance with the credit values allocated to the modules.
(iii) Decimal marks may be rounded upwards or downwards in accordance with the decision take by the Faculty Assessment Committee concerned.

(c) A student must never have failed a module as a first attempt in the relevant programme.

(d) Students for a BTech qualification must have been registered for the full curriculum as prescribed for each academic year on a full-time or part-time basis, as the case may be.

(e) If students are transferred from another Higher Education Institution in the same programme at the UJ the same requirements as stated shall apply subject to the necessary changes having been made.

(f) If students change programmes within the UJ only the modules related to the new programme will be taken into consideration in calculating whether the qualification is obtained with distinction.

EB9 REGISTRATION AT PROFESSIONAL BODIES

EB9.1 Professional Engineer

9.1.1 The Baccalaureus Ingeneriae (BEng) degree programmes in Electrical and Electronic, Electrical and Electronic with Information Technology as endorsement, Mechanical, Mechanical with Information Technology as endorsement and Civil Engineering, offered at the University of Johannesburg are accredited by the Engineering Council of South Africa (ECSA) and allow BEng graduates to register as "Candidate Engineer."

9.1.2 In terms of the Professional Engineer's Act of South Africa (Act 46 of 2000), it is compulsory that a three-year period of practical training and experience under the guidance of a professional engineer be completed after graduation. Following this, a student qualifies for registration as a Professional Engineer. This period may be reduced by up to one year in recognition of successful postgraduate degree studies. It is of utmost importance that every student should register as a "Candidate Engineer" immediately after graduation.

EB9.2 Professional Engineering Technologist

The Baccalaureus Technologiae (BTech) degree programmes in Engineering Technology offered at the University of Johannesburg are accredited by ECSA, enabling BTech graduates to register as professional technologists at ECSA.

EB9.3 Professional Engineering Technician

The National Diploma programmes in Engineering offered at the University of Johannesburg are accredited by ECSA, enabling NDip diplomats to register as professional technicians at ECSA.

EB9.4 Built Environment

Graduates in Town and Regional Planning may apply for registration as a technician or planner with the SACPLAN.

EB10 RECOGNITION OF DIPLOMAS AND DEGREES

10.1 The programmes offered by the Faculty of Engineering and the Built Environment at the University of Johannesburg are recognised for membership by South African and foreign professional associations.

10.2 Foreign universities recognise these diplomas and degrees for admission to postgraduate studies. Additional admission requirements may apply.

EB11 REGISTRATION REQUIREMENTS

For specific Faculty Admission requirements, see Regulation EB3.

11.1 All undergraduate students who enrol at the University of Johannesburg for the first time, must submit certified copies of their grade 12 results upon registration. Certified copies of the National Senior Certificate, issued by the Committee of University Principles, must be submitted to the Faculty Officer upon receipt thereof.

11.2 Students from other universities who wish to continue their studies at the University of Johannesburg must submit their Academic Records and Certificates of Good Conduct, issued by the other university, at registration.

11.3 All admission documents, as requested by the University for undergraduate and postgraduate students who register for the first semester, must be submitted by

15 May. Students who register for the second semester, must comply with this requirement by 15 September.

11.4 Failure to submit admission documents timeously will result in the cancellation of registration. Registration of students is conditional until all requirements for admission have been met.

EB12 EXEMPTION AND RECOGNITION REQUIREMENTS

12.1 A Head of Department may, in consultation with the Executive Dean or in accordance with a list of exemptions approved by the Executive Dean, grant exemption from and award a credit for a module to students on the grounds that they have passed a relevant module at the University or at another accredited Higher Education Institution.

12.2 Exemption from and awarding of credit for modules, as stipulated in EB12.1, may not be granted for more than half the number of modules required in an undergraduate programme in which exemption and recognition are requested. At least half the number of semester modules, including the exit level modules where appropriate, should be passed at the University for the University to award the diploma or confer the degree. The Executive Dean concerned, in consultation with the Registrar, may give permission to the student (for legitimate reasons) to complete such exit level module(s) at another HEI in South Africa, or abroad in accordance with the academic record concerned. For the purposes of this sub-regulation, a year module counts as two semester modules, and one term module counts as half a semester module.

12.3 Only in exceptional circumstances may the Executive Dean grant exemption from an exit level or semester core module that has been passed at another institution or in another programme.

12.4 Exemption from or credit for a module may only be granted for one further programme in addition to the programme in which the module was originally completed

EB13 PROGRAMME AND MODULE CHANGES

13.1 After the official registration period and within the appointed time, students may change their registration only with the permission of the Executive Dean of the faculty.

13.2 Application for programme changes must be made on the prescribed form. These changes are subject to adherence to closing dates.

13.3 Cancellation of studies:

13.3.1 Students cancel their studies in a particular programme or module by official notification thereof before the date determined by the University. This notification is submitted to the relevant faculty officer.

13.3.2 Students who fail to notify the University officially before the prescribed dates will forfeit any claim to the reimbursement of money.

13.3.3 Cancellation of studies in a semester module(s) or a year module(s) within the 21-calendar day period before the beginning of the assessment opportunity will be regarded as absent from the assessment opportunity. Cancellation of studies in a continuous evaluation year module within the 42-calendar day period before the beginning of the assessment opportunities will be regarded as absent from the assessment opportunity.

EB14 EXTENSION OF STUDY PERIOD

A student who is registered for a three or four-year programme and fails to complete the programme within a further period of two years will only be allowed

to continue if granted special permission by the Executive Dean on recommendation of the relevant Head of Department.

EB15 FEES PAYABLE

In respect of fees payable, refer to the Brochure: **Student Fees.**
If not in possession of this brochure and information needs to be obtained urgently, STUDENT FINANCES: 011 559 3777 can be contacted.

EB16 BASIC DEFINITIONS

16.1 *Curriculum*: The global study programme for a specific degree programme.
16.2 *Syllabus*: The content of a module.
16.3 *Year-module (YM)*: A single module that extends over a year and in which the final examination is conducted at the end of the second semester. A minimum semester mark of 40% is required for the first semester to continue with studies in the second semester. A passmark of 50% is required for a year-module.
16.4 *Semester module (SM)*: A module that extends over one semester. A passmark of 50% is required for a semester module.
16.5 *Sub-semester module (SSM)*: A semester module which is divided in sub-semester modules.
16.6 *Prerequisite*: If module X is a prerequisite for module Y, a student must pass module X prior to admission to module Y.
16.7 *Co-requisite*: If module X is a co-requisite for module Y, a student must pass module X prior to admission to module Y in the same year of study.
16.8 *Couplet modules (CM)*: Two modules in a specified year, whereby the second module builds upon the first module. The passing mark of each module is usually 50%, but a student who did not obtain the required 50% in the first module, will be granted entry to the second module with a minimum mark of 40% in the last assessment opportunity (examination) and a final mark of at least 40%. To obtain credit for both modules, the second module must be passed and an average of 50% for both modules has to be obtained by the student. Credit (a pass result) can be obtained for the second module if a final mark of 50% is obtained for this module, and not an average of 50% for both modules. If the first module is repeated while a credit has already been obtained for the second module, the first module must be passed on its own.

ENGINEERING TECHNOLOGY PROGRAMMES

EB17 DIPLOMA PROGRAMMES

EB 17.1 DIP: MANAGEMENT SERVICES D6MASQ

Purpose of the programme
The aim of the qualification is to develop the student's applied and cognitive competencies in the acquisition, interpretation, understanding and application of management information and decision support. The student should be able to analyse and explain company and environmental data, information and systems in the context of a company and its business environment, and to assess and interpret the external impact of decisions. The student should also be able to reflect on his/her managerial decisions and applications to assess the effect thereof in the holistic context of specialised management functions in industry, in order to contextualise their learning to their business environment, and to appreciate improvements and interventions they can affect in their working environments.

Outcomes
Exit level outcomes:
The qualifying student should be able to:

a) Demonstrate detailed understanding and acquired knowledge to apply different manufacturing, operations and services to an organization in a way that improves organization development and effectiveness. This can involve design, installation, commissioning and implementation of control systems, improvement systems and strategies and new ideas useful in addressing "specific needs" required for operations process/system to function optimally
b) Understand and apply strategic management services and strategies required to organize, plan, lead and control a system and operational processes to function optimally
c) Analyse, prepare and apply the dynamics of systems management and design in order to maximize organizational performance, development, efficiency and effectiveness
d) Apply Management Services techniques in order to make sound decisions required for assisting in the efficient and effective running of an organization.
e) Apply different management services practices principals, methods, techniques and ideas in order to improve overall organizational planning, operational, tactical and strategic implementation and performance
f) Illustrate by means of submitting a project based on a research methodology illustrating knowledge, application and implementation of management services techniques, ideas, principles, theories and strategies in order to optimize operational processes and the use of resources.

Admission Requirements and Selection Criteria
Refer to Faculty Regulation EB3 for the minimum admission requirements.

Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
BMA01A1	Business Management 1A (Year module)	BMA01B1	Business Management 1B
CAE01A1	Costing and Estimating 1A	CAE01B1	Costing and Estimating 1B
OPM11A1	Operations Management	OPM11B1	Operations Management 1B
ORE11A1	Organisational Effectiveness 1A	ORE11B1	Organisational Effectiveness 1B
STAQTA1	Quantitative Techniques 1A	STAQTB1	Quantitative Techniques 1B

Second year

First semester		Second semester	
BMA02A2	Business Management 2A	BMA02B2	Business Management 2B
EUC01A1	End-User Computing 1A	EUC01B1	End-User Computing 1B
OPT22A2	Operations Management Techniques 2A	OPT22B2	Operations Management Techniques 2B
ORE22A2	Organisational Effectiveness 2A	ORE22B2	Organisational Effectiveness 2B
QAS22A2	Quality Assurance 2A	AFINSA1	African Insights

Third year

First semester		Second semester	
BMA03A3	Business Management 3A	BMA03B3	Business Management 3B
ORE33A3	Organisational Effectiveness 3A	ORE33B3	Organisational Effectiveness 3B
SAD01A1	Systems Analysis and Design 1A	SAD01B1	Systems Analysis and Design 1B
MAN3YR3	Management Services	MAN3YR3	Management Services

EB17.2 DIP: OPERATIONS MANAGEMENT D6OPMQ

Purpose of the programme
To develop the student's applied and cognitive competencies in the acquisition, interpretation, understanding and application of management information and decision support.
The student should be able to:
- manage operational resources within the operations management field,

- demonstrate detailed understanding of the different supply chain objectives needed in different operational circumstances
- reflect on managerial decisions and applications to assess the effect thereof in the holistic context of specialized operational management functions in industry, in order to contextualize their learning to their business environment, and to appreciate improvements and interventions they can affect in their working environments.

Outcomes

Exit level outcomes:

The qualifying student should be able to:

a) Conduct and display knowledge and application of the role and scope of the operations managers function in the context of the production of goods and services in either profit oriented or not-for-profit endeavors.

b) Recognize, understand and use different quantitative and qualitative techniques tools and models applicable in operations management in contemporary manufacturing / service organizations to optimize operation processes

c) Conduct and display knowledge and application of project and supply chain management principles, quality and productivity improvement.

d) Apply a logical and analytical approach in problem solving and prepare a managerial report that will ensure resource and process optimization based on the findings.

e) Understand the role of quality and quality improvements in the life of an organization which include implementation of quality systems and use of quality tools to make informed decisions.

f) Understand and display basic information technology, human relations skills, and financial principles in order to plan and control operational systems.

g) Illustrate by means of submitting a report based on a direct practical industrial experience simulation illustrating knowledge and application of operations management in various manufacturing and service industries.

Admission Requirements and Selection Criteria

Refer to Faculty Regulation EB3 for the minimum admission requirements.

Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
OPM11A1	Operations Management 1A	OPM11B1	Operations Management 1B
ORE11A1	Organisational Effectiveness 1A	ORE11B1	Organisational Effectiveness 1B
STAQTA1	Quantitative Techniques A	STAQTB1	Quantitative Techniques B
WPD11A1	Workplace Dynamics 1A	WPD11B1	Workplace Dynamics 1B

Second year

First semester		Second semester	
OPM22A2	Operations Management 2A	OPM22B2	Operations Management 2B
OPT22A2	Operations Management Techniques 2A	OPT22B2	Operations Management Techniques 2B
ORE22A2	Organisational Effectiveness 2A	ORE22B2	Organisational Effectiveness 2B
QAS22A2	Quality Assurance 2A	AFINSA1	African Insights

Third year

First semester		Second semester	
EUC01A1	End-User Computing 1A	EUC01B1	End-User Computing 1B
FPO0AA1	Financial Principles in Operation 1A	FPO0BB1	Financial Principles in Operation 1B
OPM33A3	Operations Management	OPM33B3	Operations Management 3B
OPT33A3	Operations Management Techniques 3A	OPT33B3	Operations Management Techniques 3B
OPP3YR3	Operations Management Practice 3 (Year module)	OPP3YR3	Operations Management Practice 3

EB18 DIPLOMA EXTENDED PROGRAMMES

EB18.1 EXTENDED PROGRAMME DIP: MANAGEMENT SERVICES D6MAEQ

18.1.1 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester	Second semester
FRP10Y1	Fundamental Research Practice (Year module)
WPP1YR1	Workplace Preparation (Year module)
FBM10Y1	Fundamentals of Business Mathematics (Year module)
BME0YA1	Business Management 1A (Year module)
ORE1AY1	Organisational Effectiveness 1A (Year module)
EUC01A1	End-User Computing 1A

Second year

First semester		Second semester	
CAE01A1	Costing And Estimating 1A	CAE01B1	Costing And Estimating 1B
OPM11A1	Operations Management	OPM11B1	Operations Management 1B

STAQTA1	Quantitative Techniques 1A	STAQTB1	Quantitative Techniques 1B
BME0YA1	Business Management 1B	BME0YB1	Business Management 1B
ORE1AY1	Organisational Effectiveness 1A	ORE1BY1	Organisational Effectiveness 1B

Third year

First semester		Second semester	
BMA02A2	Business Management 2A	BMA02B2	Business Management 2B
OPT22A2	Operations Management Techniques 2A	OPT22B2	Operations Management Techniques 2B
ORE22A2	Organisational Effectiveness 2A	ORE22B2	Organisational Effectiveness 2B
QAS22A2	Quality Assurance 2A	AFINSA1	African Insights
EUC01B1	End-User Computing1 B		

Fourth year

First semester		Second semester	
BMA03A3	Business Management 3A	BMA03B3	Business Management 3B
ORE33A3	Organisational Effectiveness 3A	ORE33B3	Organisational Effectiveness 3B
SAD01A1	Systems Analysis and Design 1A	SAD01B1	Systems Analysis and Design 1B
MAN3YR3	Management Services (Year module)	MAN3YR3	Management Services

EB18.2 EXTENDED PROGRAMME DIP: OPERATIONS MANAGEMENT D6OPEQ

18.2.1 Curriculum

CODE	MODULE	CODE	MODULE

First year

First and second semester	
FRPE0Y1	Fundamental Research Practice (ENG) EXT (Year module)
WPP10Y1	Workplace Preparation (ENG) EXT (Year module)
FBM10Y1	Fundamental Business Mathematics (Year module)
BPJ1AY1	Operations Management 1A (Year module)
ORE1AY1	Organisational Effectiveness 1A (Year module)
EUC01A1	End-User Computing 1A

Second year

First semester		Second semester	
STAQTA1	Quantitative Techniques A	STAQTB1	Quantitative Techniques B
BPJ1BY1	Operations Management 1B (Year module)	BPJ1BY1	Operations Management 1B
ORE1BY1	Organisational Effectiveness 1B (Year module)	ORE1BY1	Organisational Effectiveness 1B
WPD11A1	Work Place Dynamics 1A	WPD11B1	Work Place Dynamics 1B
		EUC01B1	End-User Computing 1B

Third year

First semester		Second semester	
QAS22A2	Quality Assurance 2A	AFINSA 1	African Insights
OPM22A2	Business Management 2A	OPM22B2	Business Management 2B
OPT22A2	Operations Management Techniques 2A	OPT22B2	Operations Management Techniques 2B
ORE22A2	Organisational Effectiveness 2A	ORE22B2	Organisational Effectiveness 2B
		EUC01B1	End-User Computing 1B

Fourth year

First semester		Second semester	
FPO0AA1	Financial Principles in Operation 1A	FPO0BB1	Financial Principles in Operation 1B
OPM33A3	Operations Management 3A	OPM33B3	Operations Management 3B
OPT33A3	Operations Management Techniques 3A	OPT33B3	Operations Management Techniques 3B
OPP3YR3	Operations Management Practice 3 (Year module)	OPP3YR3	Operations Management Practice 3

EB19 ADVANCED DIPLOMA PROGRAMMES

EB19.1 ADVANCE DIPLOMA IN MANAGEMENT SERVICES A6MS0Q

Purpose of the programme

The purpose of the Advanced Diploma in Management Services is to introduce students to applied and cognitive competencies in the acquisition, interpretation, understanding and applications of best practices and work study techniques within organisation. The aim of the programme is to provide problem solving services to medium- or large- sized organisations and definite management support role to all types of management. The programme Helps companies with structuring their internal environment to search out, evaluate and employ knowledge that improve the efficiency and effectiveness of the organisation

Outcomes

The Faculty of Engineering and the Built Environment at the University of Johannesburg introduced DIPLOMAS in order to replace National Diplomas, which led to BTech programmes being phased out as they did not align with the new Diplomas. Therefore, the need by the Department of Quality and Operations Management (DQOM) to introduce the Advanced Diploma in Management Services that align with the Diploma programme is a necessity as aligned with the Higher Education Qualification Sub-Framework (HEQSF) structure. The aim of the qualification is to develop the student's applied and cognitive competencies in the acquisition, interpretation, understanding and applications of operations management. Under the guidance of our advisory committee, this qualification is now regarded as in critical demand in the industry.

Management Services is an administrative tool that can assist with questions on organisational effectiveness and the establishment of work procedures and methods. The quality of the information provided by the programme's students can have a major influence on the quality of decision making by management

Admission Requirements and Selection Criteria

Refer to Faculty Regulation EB3 for the minimum admission requirements.

The minimum admission requirement is a relevant National Diploma or Diploma qualification at NQF level 6 or NQF level 6 equivalent. Students are selected on the basis of academic merit and an approved field(s) of study. An average mark of 60% in the previous degree qualification is required. Preferences will be given to students that have completed a Diploma in Management Services and Operations Management.

Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
JOA7X01	**Job Analysis**	**MNE7XB1**	**Management Economics**

ORE7X01	**Organizational Effectiveness 4A**	**ORE7X02**	**Organizational Effectives 4B**
QPP7X01	**Quality Planning and Implementation 4**	**PMM7X02**	**Project Management**
RMQ7X01	**Research Methodology**	**STR7XB1**	**Strategic Management**

EB 19.2 ADVANCE DIPLOMA IN OPERATIONS MANAGEMENT A6OM0Q

Purpose of the programme

The purpose of the Advanced Diploma in Operations Management is to develop the students' applied and cognitive competencies in acquisition, interpretation, understanding and applications of Operations Management principles so that students should be able to analyse and explain operations decisions. Additionally, the student should also be able to reflect on the theories and application of these operations management decisions in their respective workplace. The qualification is to develop a graduate competency in the knowledge, attitudes, insight and skills required for the quality management and related professions. The proposed curriculum will enable the graduate to competently apply and integrate theoretical principles, evidence-based techniques, practical experience and appropriate skills in an independent manner in a variety of settings.

Outcomes

The Faculty of Engineering and the Built Environment at the University of Johannesburg introduced DIPLOMAS in order to replace National Diplomas, which led to BTech programmes being phased out as they did not align with the new Diplomas. Therefore, the need by the Department of Quality and Operations Management (DQOM) to introduce the Advanced Diploma in Operations Management that align with the Diploma programme is a necessity as aligned with the Higher Education Qualification Sub-Framework (HEQSF) structure. The aim of the qualification is to develop the student's applied and cognitive competencies in the acquisition, interpretation, understanding and applications of operations management. Under the guidance of our advisory committee, this qualification is now regarded as in critical demand in the industry It is important to note that the mission of Department of Quality and Operations Management is to provide services and products in the form of students to the City of Johannesburg, Gauteng Province, South Africa and the world at large in the form, quality and quantities required. It is within this mission that the Advanced Diploma in Operations Management is aimed for:

- To strive for the delivery and provision of state-of-the-art knowledge in Operations Management to create suitably qualified students for the

public sector, commerce and industry.
- To maintain and enhance academic excellence through advanced research and instruction in Operations Management.

To contribute to the development of the South African commerce and industry through the provision of quality and professional consultancy services and industry based student projects

Admission Requirements and Selection Criteria
Refer to Faculty Regulation EB3 for the minimum admission requirements.
Minimum admission requirements

The minimum admission requirement is a relevant National Diploma or Diploma qualification at NQF level 6 or NQF level 6 equivalent. Students are selected on the basis of academic merit and an approved field(s) of study. An average mark of 60% in the previous degree qualification is required. Although preference will be given to student with Operations Management and Management Services qualifications.

Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
OMT7X01	**Operations Management Techniques 4A**	**OMT7X02**	**Operations Management Techniques 4B**
OPM7X01	**Operations Management 4A**	**OPM7X02**	**Operations Management 4B**
QPI7X01	**Quality Planning and Implementation**	**PMO7X02**	**Project Management**
RMO7X01	**Research Methodology**	**FPC7X02**	**Financial Planning and Control**

EB 19.3 ADVANCE DIPLOMA IN QUALITY MANAGEMENT A6Q20Q

Purpose of the programme

The purpose of the Advanced Diploma in Quality is to prepare the student from a production and/or service environment to become a quality practitioner specialising in quality tools and techniques. The qualifying person will apply a body of knowledge, skills and applied competencies of quality and quality principles, tools and techniques to implement, maintain and improve quality in their respective working environment. The qualification is to develop a graduate who is proficient in the knowledge, attitudes, insight and skills required for the quality management. The proposed curriculum will enable the student to competently apply and integrate theoretical principles, evidence-based techniques, practical experience and appropriate skills in an independent manner in a variety of settings.

Outcomes

The Faculty of Engineering and the Built Environment at the University of Johannesburg introduced DIPLOMAS in order to replace National Diplomas, which led to BTech programmes being phased out as they did not align with the new Diplomas. Therefore, the need arose for the Department of Quality and Operations Management (DQOM) is to introduce the Advanced Diploma in Quality as aligned with the new HEQSF structure as well as other institutions, which offer the same qualification.

Furthermore, in view of the dramatic changes that have occurred in the business environment over the last decade, many BTech programmes have become outdated. This, together, with the shortage of persons both in the public and in private sectors with the requisite management knowledge and skills to execute their duties efficiently and effectively, presented an ideal opportunity to develop a new and more relevant curriculum. Therefore, the Advanced Diploma in Quality is to equip students from the production or service environment (both public and private sector), to become a quality practitioner specialising in quality technologies and methodologies. In this regard, the Advanced Diploma in Quality is targeted at persons in junior/middle management position, as well as, those who aspiring to these positions and who wish to increase promotional prospects by acquiring this qualification. Consequently, this contribute to the development of the South African commerce and industry through the provision of quality and professional consultancy services and industry based student projects in to assist small to medium scale industries to establish sound quality techniques.

Admission Requirements and Selection Criteria

Refer to Faculty Regulation EB3 for the minimum admission requirements.
The minimum admission requirement is a relevant National Diploma or Diploma qualification at NQF level 6 or NQF level 6 equivalent. Students are selected on the basis of academic merit and an approved field(s) of study. An average mark of 60% in the previous degree qualification is required

Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
QMS7X01	**QUALITY MANAGEMENT SYSTEMS**	**CQI7X02**	**CONTINUAL QUALITY IMPROVEMENT**
QPI7X01	**QUALITY PLANNING AND IMPLEMENTATION**	**PMQ7X02**	**PROJECT MANAGEMENT**

RMQ7X01	**RESEARCH METHODOLOGY**	**QAS7X02**	**QUALITY AUDITING SYSTEMS**
STA7AQT	**STATISTICAL QUALITY TECHNIQUES A**	**STA7BQT**	**STATISTICAL QUALITY TECHNIQUES B**

EB20 BACHELOR'S DEGREE (B)

Applicants for the Bachelor's Degree programme must have a background in science and mathematics, and are selected on academic merit as well as potential.

Award of Bachelor's Degree
A Bachelor's Degree in the relevant field of study will be awarded to candidates after successful completion of all requirements.

EB20.1 Bachelor of Science in Construction B6CN0Q

20.1.1 Purpose of the programme

The purpose of the Bachelor of Construction is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing Construction Professional. Specifically, the qualification provides graduates with the following abilities: analytical thinking, managerial competence, relevant technological competence, and creative, critical thinking.

20.1.2 Outcomes

Students credited with this qualification will be able to:
 demonstrate knowledge of construction methods and techniques;
 demonstrate knowledge in measurement, description and specification for construction work;
 perform cost estimation techniques and preparation of tenders;
 demonstrate knowledge of basic management and planning and supervision processes in the entire project cycle;
 demonstrate an understanding of basic legal issues in construction and perform construction contracts administration;
 evaluate socio-economic issues affecting construction and project environment;
 demonstrate a grasp of the application of information technologies, computer usage and computer applications in the construction environment;
 demonstrate competence in written and oral communication in the construction environment.

20.1.3 Curriculum

CODE	MODULE	CODE	MODULE
First year			

First semester		Second semester	
CDRCO1A	Construction Drawing 1A	CTCC01B	Construction Technology 1B
CMGCO1A	Construction Management 1A	STAE1B1	Engineering Statistics 1B
PHYB1Y1	Construction Science 1 (Year module)	PHYB1Y1	Construction Science
MATE1A1	Engineering Mathematics 1A (Year module)	MATE1B1	Engineering Mathematics 1B
ECO01A1	Economics 1A (Year module)	ECO01B1	Economics 1B
		SUCCO1B	Surveying 1B
		DQUAN1B	Descriptive Quantification 1B

Second year

First semester		Second semester	
CACCOY0	Construction Accounting 2 (Year module)	CACCOY0	Construction Accounting 2
CMGCOY0	Construction Management 2 (Year module)	CMGCOY0	Construction Management 2
CTCCOY0	Construction Technology 2 (Year module)	CTCCOY0	Construction Technology 2
DQUANY0	Descriptive Quantification 2 (Year module)	DQUANY0	Descriptive Quantification 2
SMEC12A	Soil Mechanics 2A	GLGB22B	Engineering Geology (Construction) 2B
SCTCOY0	Building Structures 2 (Year module)	SCTCOY0	Building Structures 2
AFINSA1	African Insights	CLWCO2B	Construction Law 2B

Third year

**Before progression to any third year module, the student has to complete all first and second modules (inclusive of the internship successfully)			
First semester		Second semester	
APECOY0	Analysis Of Prices And Estimating 3 (Year module)	APECOY0	Analysis Of Prices And Estimating 3
CECCOY0	Construction Economics 3 (Year module)	CECCOY0	Construction Economics 3
CLWCO3A	Construction Law 3A	CRMET3B	Research Methods 3B
CMGCO3Y	Construction Management 3 (Year module)	CMGCOY3 CMGCO3Y	Construction Management 3
CTCCO3Y	Construction Technology 3 (Year module)	CTCCO3Y	Construction Technology 3

DQUAN3Y	Descriptive Quantification 3 (Year module)	DQUAN3Y	Descriptive Quantification 3
SCTCO3Y	Building Structures 3 (Year module)	SCTCO3Y	Building Structures 3

EB20.2 Bachelor of Mine Surveying B6SU0Q

20.2.1 Purpose of the programme

The purpose of the Bachelor of Mine Surveying degree is thus to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing Mine Surveyor (technologist). Specifically, the qualification provides graduates with:
 Preparation for careers in mining engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to make a contribution to the economy and national development;
 The educational base required to undertake PLATO stage 2 qualifications that will allow them to practice as registered professional Mine Surveyors
 For graduates with an appropriate level of achievement, the ability to enter NQF level 8 programmes and then proceed to a Master's degree.
 For Certificated Mine Surveyors, the education base for achieving proficiency in mine surveyors and occupational health and safety.

20.2.2 Outcomes

Exit level outcomes:

Students who complete this programme will be able to:
 Systematically diagnose and solve broadly defined mining engineering and Mine Surveying problems by applying engineering and surveying principles;
 Apply knowledge of mathematics, natural science and engineering sciences to defined and applied engineering procedures, processes, systems and methodologies to solve broadly-defined mining engineering and surveying problems;
 Perform procedural and non-procedural design of broadly defined components, systems, works, products or processes to meet desired needs normally within applicable standards, codes of practice and legislation in mining engineering;
 Conduct investigations of broadly-defined problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments, analyse and interpret results to provide valid conclusions;
 Use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modelling, for the solution of broadly defined mining engineering problems with an understanding of the limitations, restrictions, premises, assumptions and constraints;
 Communicate effectively, both orally and in writing, with engineering audiences and the affected parties.
 Demonstrate a knowledge and understanding of the impact of mining engineering activity on the society, economy, industrial and physical environment, and address issues by analysis and evaluation.
 Demonstrate knowledge and understanding of mining engineering management principles and apply these to one's own work, as a member and leader in a team and to manage projects
 Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of Mine Surveyors.

19.2.3 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
AFINSA1	African Insights	CADMIB1	Computer Aided Design 1B
ECS1AA1	Engineering Communication Skills 1A	ECS1BB1	Engineering Communication Skills 1B

MATE1A1	Engineering Mathematics 1A	PHYE1B1	Engineering Physics 1B
PHYE1A1	Engineering Physics 1A	STAE1B1	Engineering Statistics 1B
ENVMNA1	Environmental Management 1A	MATMI B1	Measurement Mathematics 1B
MSVMSA1	Mine Surveying 1A	SWKMSB1	Mine Surveying Practice 1B
SDRMSA1	Survey Draughting 1A		

Second year

First semester		Second semester	
GLGE2A2	Engineering Geology (Mining) 2A	MGTMNB2	Engineering Management (Mine) 2B
MBEMNA2	Mineral Beneficiation 2A	MSVMSBY	Mine Surveying 2B
MREMSA2	Mineral Reserve Evaluation 2A	SWKMSB2	Mine Surveying (Practice) 2B
SMMMNA2	Mining Surface 2A	MREMSB2	Mineral Resource Evaluation 2B
SSVMSA2	Site Surveying 2A	MTSMNB2	Mining Technical Services 2B
COAMNA2	Mining Coal 2A	SGEMNB2	Structural Geology 2B
MMEMNA2	Mining Metal 2A		

Third year

First semester		Second semester	
MGTMNA3	Engineering Management (Mine) 3A	DVPMSB3	Mine Design And Valuation Project 3B
MPDMNA3	Mine Planning And Design 3A	MSVMSB3	Mine Surveying 3B
MSVMSA3	Mine Surveying 3A	SWKMSB3	Mine Surveying Workshop 3B
SWKMSA3	Mine Surveying Workshop 3A		
MREMSA3	Mineral Resource Evaluation 3A		
MRLMSA3	Mineral Resource Legislation 3A		

EB20.3 Bachelors in Urban and Regional Planning B6UP0Q

19.3.1 Purpose of the programme

The purpose of the programme is to provide students with advanced planning education covering all aspects of human settlement planning and sustainable development of the Built Environment that are needed by the professional Town Planner. The programme is designed for those who intend to become professional town planners and who possess a good matric foundation or qualification. The programme will ensure that graduates are well-equipped with the knowledge and skills necessary for them to compete with their colleagues in the profession and in allied professions as they work in tandem towards shaping the growth and development of the built environment.

19.3.2 Outcomes

Students who complete this programme will be able to:
 systematically diagnose and solve broadly defined planning problems by applying appropriate planning principles, techniques and methodologies;
 apply knowledge of design and theory to analyse and arrive at appropriate planning solutions to built environment problems;

 use relevant technological tools like GIS, AutoCAD, and SPSS in the design and data analysis required of professional planners;
 engage with complex issues surrounding the built environment from a planning point of view;
 manage community participation through identifying community dynamics and applying community participation techniques and facilitating a process of capacity building;
 monitor land use and development by reviewing and interpreting planning legislations, methodologies, policies and trends;
 apply knowledge of integrated development principles in all planning related work;
 apply scoping and surveying techniques to analyze sites and solve problems;
 apply communication skills in retrieving and disseminating information;
 apply ethical principles in undertaking any planning work;
 manage planning inputs within a project through the management of time, quality and human resources;
 work in a team;
 research plans, within the built and natural environment, to assist in facilitating land use and spatial planning; and
 conduct themselves in a professional manner.

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
CPSTRA1	Introduction to Computer Studies 1A	ARCTRB1	Architural Design 1B
DRWTRA 1	Planning Design: Techniques of Drawing 1A	CIPTRB1	Civil Engineering for Planners 1B
ECS1AA1	Engineering Communication Skills 1A	CPATRB1	Computer Application: Intro and AutoCAD 1B
GEPTRA1	Geography for Planning 1A	ECS1BB1	Engineering Communication Skills 1B
PLNTRA1	History and Principles of Planning 1A	LSVTRB1	Intro to Land Surveying 1B
MATMIA1	Measurement Mathematics 1A	PLSTRB1	Planning Design and Intro to Planning Survey 1B
AFINSA1	African Insights	PUSTRB1	Population and Urbanisation Studies 1B
Second year			
First semester		Second semester	
ECPTRA2	Economics for Planners 2A	URBTRB2	Planning Design: Urban Renewal 2B
LPLTRA2	Legal Principles: Planning Law& Admin 2A	HDETRB2	Housing Development 2B
NDSTRA2	Plan Design: Neighbourhood Design& Site Plan 2A	LATTRB2	Land Economics and Tenure System 2B
QTPTRA2	Quantitative Techniques in Planning 2A	LDCTRB2	Legal Principle Dev Control & Settlement Disputes 2B
TRATRA2	Transportation Planning 2A	RLUTRB2	Rural Land Use and Development planning 2B
CPATRB1	Computer Application: GIS 2A	ULUTRB2	Urban Land Use and Development Planning 2B
Third year			

First semester		Second semester	
BEPTRA3	Building Economics, Property Valuation and Management 3A	APTTRB3	Advanced Planning Theory 3B
ACMTRA3	Computer Applications: Advanced Computer Modelling 3A	ASSTRB3	Plan. Design Advance Strategic& Spatial Plan 3B
RADTRA3	Regional Analysis & Development Planning 3A	ESMTRB3	Environmental Science & Management 3B
RESTRA3	Research Techniques in Planning 3A	MGTTRB3	Management in Planning 3B
SOCTRA3	Sociology and Planning 3A	PPMTRB3	Project Planning and Management 3B
SPSTRA3	Plan Design: Spatial Planning / 3A	TOUTRB3	Tourism and Recreation Planning 3B

EB21 BACHELORS EXTENDED PROGRAMME

EB21.1 Bachelor of Science in Construction B6SC0Q

21.1.1 Curriculum

CODE	MODULE	CODE	MODULE

First year

First and second semester	
CDRCED1	Construction Drawing 1A (Year module)
CONMED1	Construction Management 1A (Year module)
CONTED1	Construction Technology 1A (Year module)
MATYED1	Engineering Mathematics 1A (Year module)
DQUAED1	Descriptive Quantification 1A (Year module)
FRRED01	Fundamental Research Practice (Year module)
WPPED01	Workplace Preparation (Year module)
COMAED1	Computer Applications (Year module)

Second year

First semester		Second semester	
AFINSA1	African Insights		
MATYED2	Engineering Mathematics 1B	MATYED2	Engineering Mathematics 1B
CONMED2	Construction Management 1B (Year module)	CONMED2	Construction Management 1B
PHYB1Y1	Construction Science 1 (Year module)	PHYB1Y1	Construction Science 1
		STAE1B1	Engineering Statistics 1B
CONTED2	Construction Technology 1B(Year module)	CONTED2	Construction Technology 1B
ECO01A1	Economics 1A (Degree) (Year module)	ECO01B1	Economics 1B (Degree)
		SUCCO1B	Site Surveying 1B

DQUBED1	Descriptive Quantification 1B (Year module)	DQUBED1	Descriptive Quantification 1B

Third year

First semester		Second semester	
CACCOY0	Construction Accounting 2 (Year module)	CACCOY0	Construction Accounting 2
CMGCOY0	Construction Management 2 (Year module)	CMGCOY0	Construction Management 2
CTCCOY0	Construction Technology 2 (Year module)	CTCCOY0	Construction Technology 2
DQUANY0	Descriptive Quantification 2 (Year module)	DQUANY0	Descriptive Quantification 2
SMEC12A	Soil Mechanics 2A	GLGB22B	Engineering Geology (Construction) 2B
SCTCOY0	Building Structures 2 (Year module)	SCTCOY0	Building Structures 2
		CLWCO2B	Construction Law 2B

Fourth year

First semester		Second semester	
APECOY0	Analysis Of Prices And Estimating 3 (Year module)	APECOY0	Analysis Of Prices And Estimating 3
CECCOY0	Construction Economics 3 (Year module)	CECCOY0	Construction Economics 3
CLWCO3A	Construction Law 3A		
CMGCO3Y	Construction Management 3 (Year module)	CMGCO3Y	Construction Management 3
CTCCO3Y	Construction Technology 3 (Year module)	CTCCO3Y	Construction Technology 3
DQUAN3Y	Descriptive Quantification 3 (Year module)	DQUAN3Y	Descriptive Quantification 3
SCTCO3Y	Building Structures 3 (Year module)	SCTCO3Y	Building Structures 3
		CRMET3B	Research Methods

EB22 BACHELORS OF ENGINEERING TECHNOLOGY (BEngTech)

Applicants for the Bachelors of Engineering Technology programme must have a background in science and mathematics, and are selected on academic merit as well as potential.

Award of Bachelors of Engineering Technology
A Bachelors of Engineering Technology in the relevant field of study will be awarded to candidates after successful completion of all requirements.

EB22.1 BEngTech: ELECTRICAL ENGINEERING (NQF 7) B6EL1Q

22.1.1 Purpose of the programme

The purpose of the BEngTech (Electrical Engineering) is thus to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing Electrical Engineering Technologist. Specifically, the qualification provides graduates with:

• Preparation for careers in engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to make a contribution to the economy and national development;
• The educational base required for registration as a Professional Engineering Technologist with ECSA.
• For graduates with an appropriate level of achievement, the ability to enter NQF level 8 (Honours) programmes and then proceed to Master's degrees.
• For certificated engineers, the education base for achieving proficiency in electrical engineering and occupational health and safety.

21.1.2 Outcomes

The exit level outcomes as informed by ECSA are that students who complete this programme will be able to:
• Systematically diagnose and solve broadly defined electrical engineering problems by applying engineering principles;
• Apply knowledge of mathematics, natural science and engineering sciences to defined and applied engineering procedures, processes, systems and methodologies to solve broadly-defined electrical engineering problems;
• Perform procedural and nonprocedural design of broadly defined components, systems, works, products or processes to meet desired needs normally within applicable standards, codes of practice and legislation in electrical engineering;
• Conduct investigations of broadly-defined problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments, analyse and interpret results to provide valid conclusions;
• Use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modeling, for the solution of broadly-defined electrical engineering problems with an understanding of the limitations, restrictions, premises, assumptions and constraints;
• Communicate effectively, both orally and in writing, with engineering audiences and the affected parties.
• Demonstrate a knowledge and understanding of the impact of electrical engineering activity on the society, economy, industrial and physical environment, and address issues by analysis and evaluation.
• Demonstrate knowledge and understanding of electrical engineering management principles and apply these to one's own work, as a member and leader in a team and to manage projects
• Engage in independent learning and lifelong learning through well-developed learning skills.
• Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of electrical engineering technology practice.

21.1.3 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
ALGELA1	Algorithms/ Programming 1A	ALGELB1	Algorithms/ Programming 1B
CETE1A1	Engineering Chemistry (Chemical) 1A	DIGST1B	Digital Systems 1B
		ELCELB1	Electronic Circuits 1B
ELTENA1	Electrical Engineering 1A	ELTENB1	Electrical Engineering 1B
MATE1A1	Engineering Mathematics 1A (Year Module)	MATE1B1	Engineering Mathematics 1B
PHYE1A1	Engineering Physics x 1A	PHYSCB1	Engineering Physics Electrical 1B
WKSEL1A	Workshop Skills 1A	WKSEL1B	Workshop Skills 1B
Second year			

First semester		Second semester	
DIGSTA2	Digital Systems 2A	DIGSTB2	Digital Systems 2B
ELCELA2	Electronic Circuits 2A	PJEELB2	Electrical Project 2B
MATE2A2	Engineering Mathematics 2A	MCCELB2	Mechatronics & Control 2B
SENELA2	Sensors and Devices 2A	NETELB2	Networks 2B
SWEELA2	Software Engineering 2A		
SIGSTA2	Signals and Systems 2A		
AFINSA1	African Insights		

Third year

First semester		Second semester	
CPS3AA3	Complementary Studies 3A	CSTELB3	Control Systems 3B
PJEELA3	Electrical Project 3A	PJEELB3	Electrical Project 3B
EMAEL3A	Machines 3A	POWERB3	Power Electronics 3B
POWSTA3	Power Systems 3A	TMGELB3	Technology Management 3B
PJMELA3	Project Management (Electrical) 3A		
SIGSTA3	Signals and Systems 3A		
INCEL3A	Instrumentation and Control 3A		

EB21.2 BEngTech: CIVIL ENGINEERING B6CV0Q

21.2.1 Purpose of the programme

ECSA views the process of professional development in engineering as having three principal phases: education, training and experience leading to registration and continuing development during practice. The phases are separated by important stages. At Stage 1, educational requirements are met. During employment, training is completed and experience is gained to attain the competencies for Stage 2, namely professional competence at the point of registration. Holding a qualification attached to a programme accredited for the category of registration is the normal way of meeting the Stage 1 educational requirements. (ECSA document: E-02-PT Rev1 Bachelor of Engineering Tech)

The purpose of the BEngTech (Civil Engineering) is thus to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing Civil Engineering Technologist. Specifically, the qualification provides graduates with:
• Preparation for careers in engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to make a contribution to the economy and national development;
• The educational base required for registration as a Professional Engineering Technologist with ECSA.
• For graduates with an appropriate level of achievement, the ability to enter NQF level 8 programmes and then proceed to masters degrees.

21.2.2 Outcomes

Exit level outcomes:

Students who complete this programme will be able to:
• Systematically diagnose and solve broadly defined Civil Engineering problems by applying engineering principles;
• Apply knowledge of mathematics, natural science and engineering sciences to defined and applied engineering procedures, processes, systems and methodologies to solve broadly-defined Civil engineering problems;
• Perform procedural and nonprocedural design of broadly defined components, systems, works, products or processes to meet desired needs normally within applicable standards,

codes of practice and legislation in Civil engineering;
• Conduct investigations of broadly-defined problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments, analyse and interpret results to provide valid conclusions;
• Use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modeling, for the solution of broadly-defined Civil engineering problems with an understanding of the limitations, restrictions, premises, assumptions and constraints;
• Communicate effectively, both orally and in writing, with engineering audiences and the affected parties.
• Demonstrate a knowledge and understanding of the impact of Civil engineering activity on the society, economy, industrial and physical environment, and address issues by analysis and evaluation.
• Demonstrate knowledge and understanding of Civil engineering management principles and apply these to one's own work, as a member and leader in a team and to manage projects
• Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of Civil engineering technology practice.

21.2.3 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
AFINSA1	African Insights	CDRCIB1	Computer Aided Drawing 1B
APMCIA1	Basic Science (Applied Mechanics) 1A	CMSCI1B	Construction Methods And Safety 1B
CDRCIA1	Civil Engineering Drawing 1A	GLGC1B1	Engineering Geology (Civil) 1B
CPSELA1	Computer Skills 1A	MATE1B1	Engineering Mathematics 1B
ECS1AA1	Engineering Communication Skills 1A	MGTCIB1	Management 1B
MATE1A1	Engineering Mathematics 1A	SURCIB1	Surveying 1B
STAE1A1	Engineering Statistics 1A	TSTCIB1	Theory of Structures 1B
SURCIA1	Surveying 1A		

Second year

First semester		Second semester	
MATE2A2	Engineering Mathematics 2A	CMGCI2B	Contract Management 2B
GTECIA2	Geotechnical Engineering 2A	GTECIB2	Geotechnical Engineering 2B
HYDCIA2	Hydraulics 2A	HYOCIB2	Hydrology 2B
TRACIA2	Transportation Engineering 2A	STRCIB2	Structural Analysis 2B
SUSCIA2	Principles of Sustainability 2A	TRACIB2	Transportation Engineering 2B
SOM2AA2	Strength of Materials 2A	CRM2BB2	Research Methodology 2B

Third year

First semester		Second semester	
CDPCI3A	Capstone Project 3A	CDPCIB3	Capstone Civil Design Project 3B
SSDCIA3	Structural Steel Design 3A	ETHHUB3	Ethics and Community Studies 3B
WRDCI3A	Reticulation Design 3A	WWWCIB3	Water & Waste Water Engineering 3B
RCSCIA3	Reinforced Concrete Design 3A	PJMCI3B	Project Management 3B
TRACI3A	Transportation Engineering 3A	TRACI3B	Transportation Engineering 3B
STRCIA3	Structrural Analysis 3A		

EB21.3 BEngTech: INDUSTRIAL ENGINEERING (NQF 7) B6INDQ

21.3.1 Purpose of the programme

The purpose of the BEngTech (Industrial Engineering) is thus to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing industrial engineering technologist. Specifically, the qualification provides graduates with:

• Preparation for careers in engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to make a contribution to the economy and national development;

• The educational base required for registration as a Professional Engineering technologist with ECSA.

• For graduates with an appropriate level of achievement, the ability to enter NQF level 8 programmes and then proceed to Master's degrees.

• For certificated engineers, the education base for achieving proficiency in industrial engineering / plant operations and occupational health and safety.

21.3.2 Outcomes

The exit level outcomes as informed by ECSA are that students who complete this programme will be able to:

• Systematically diagnose and solve broadly defined industrial engineering problems by applying engineering principles;

• Apply knowledge of mathematics, natural science and engineering sciences to defined and applied engineering procedures, processes, systems and methodologies to solve broadly-defined industrial engineering problems;

• Perform procedural and nonprocedural design of broadly defined components, systems, works, products or processes to meet desired needs normally within applicable standards, codes of practice and legislation in industrial engineering;

• Conduct investigations of broadly-defined problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments, analyse and interpret results to provide valid conclusions;

• Use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modeling, for the solution of broadly-defined industrial engineering problems with an understanding of the limitations, restrictions, premises, assumptions and constraints;

• Communicate effectively, both orally and in writing, with engineering audiences and the affected parties.

• Demonstrate a knowledge and understanding of the impact of industrial engineering activity on the society, economy, industrial and physical environment, and address issues by analysis and evaluation.
• Demonstrate knowledge and understanding of industrial engineering management principles and apply these to one's own work, as a member and leader in a team and to manage projects
• Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of industrial engineering technology practice.

21.3.3 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
CPSELA1	Computer Skills 1A	ECS1BB1	Engineering Communication Skills 1B
ELTELA1	Electrotechnology 1A	MATE1B1	Engineering Mathematics 1B
ECS1AA1	Engineering Communication Skills 1A	STAE1B1	Engineering Statistics 1B
MATE1A1	Engineering Mathematics 1A	EWSMIB1	Engineering Work Study 1B
PHYE1A1	Engineering Physics 1A	MANMIB1	Mechanical Manufacturing Engineering 1B
TGRMIA1	Technical Graphics 1A	THFMIB1	Thermofluids 1B

Second year

First semester		Second semester	
AFINSA1	African Insights	AUTMIB2	Automation 2B
MATE2A2	Engineering Mathematics 2A	FACMIB2	Facility Lay Out And Materials Handling 2B
MFDMIA2	Manufacturing Systems Design 2A	IACMIB2	Industrial Accounting 2B
MATMIA2	Material Science 2A	INFMIB2	Information Systems 2B
PDEMIA2	Production Engineering 2A	OPRMIB2	Operational Research 2B
QUAMIA2	Quality Assurance 2A		

Third year

First semester		Second semester	
EMGMIA3	Engineering Management (Industrial) 3A	ENTMIB3	Entrepreneurship 3B
PDTMIA3	Production Technology 3A	LOGMIB3	Logistics Engineering 3B
PENMIA3	Project Engineering 3A	PJIMIB3	Final Year Project 3B
PJIMIA3	Final Year Project 3A	QMSIB3	Quality Management Systems 3B
PRSMIA3	Project Research 3A	SYSMIB3	System Dynamics 3B

EB21.4 BEngTech: Mining Engineering (NQF7) B6MINQ

21.4.1 Purpose of the programme

The purpose of the BEngTech (Mining Engineering) is thus to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing Mining Engineering Technologist. Specifically, the qualification provides graduates with:
• Preparation for careers in engineering itself and areas that potentially benefit from

engineering skills, for achieving technological proficiency and to make a contribution to the economy and national development;
• The educational base required for registration as a Professional Engineering Technologist with ECSA.
• For graduates with an appropriate level of achievement, the ability to enter NQF level 8 programmes and then proceed to masters degrees.
• For certificated engineers, the education base for achieving proficiency in mining engineering / plant operations and occupational health and safety.

21.4.2 Outcomes

Exit level outcomes:

Students who complete this programme will be able to:
• Systematically diagnose and solve broadly defined Mining Engineering problems by applying engineering principles;
• Apply knowledge of mathematics, natural science and engineering sciences to defined and applied engineering procedures, processes, systems and methodologies to solve broadly-defined mining engineering problems;
• Perform procedural and nonprocedural design of broadly defined components, systems, works, products or processes to meet desired needs normally within applicable standards, codes of practice and legislation in mining engineering;
• Conduct investigations of broadly-defined problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments, analyse and interpret results to provide valid conclusions;
• Use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modelling, for the solution of broadly-defined mining engineering problems with an understanding of the limitations, restrictions, premises, assumptions and constraints;
• Communicate effectively, both orally and in writing, with engineering audiences and the affected parties.
• Demonstrate a knowledge and understanding of the impact of mining engineering activity on the society, economy, industrial and physical environment, and address issues by analysis and evaluation.
• Demonstrate knowledge and understanding of mining engineering management principles and apply these to one's own work, as a member and leader in a team and to manage projects
• Engage in independent and life-long learning through well-developed learning skills.
• Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of mining engineering technology practice.

21.4.3 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
AFINSA	African Insights	CHMMNB1	Chemistry For Miners 1B
ECS1AA1	Engineering Communication Skills 1A	CADMIB1	Computer Aided Design 1B
EDRMIA1	Engineering Drawing 1A	ECS1BB1	Engineering Communication Skills 1B
MATE1A1	Engineering Mathematics 1A	PHYE1B1	Engineering Physics 1B
PHYE1A1	Engineering Physics 1A	STAE1B1	Engineering Statistics 1B

ENVMNA1	Environmental Management 1A	MATM1B1	Measurement Mathematics 1B
		MINPRB1	Mining Engineering Practice 1B

Second year

First semester		Second semester	
GLGE2A2	Engineering Geology (Mining) 2A	MGTMNB2	Engineering Management (Mining) 2B
MINMNA2	Mine Engineering 2A	MEQMNB2	Mine Equipment 2B
MSVMSA2	Mine Surveying 2A	MEVMSB2	Mining Economics Valuation 2B
MBEMNA2	Mineral Beneficiation 2A	GEMINB2	Geotechnical Engineering (Mining) 2B
COAMNA2	Mining Coal 2A	SGEMNB2	Structural Geology 2B
MMEMNA2	Mining Metal 2A	OCCUPB2	Occupational Hygiene (Mining) 2B
SMMMNA2	Mining Surface 2A		

Third year

First semester		Second semester	
MGTMNA3	Engineering Management (Mine) 3A	SSPMNB3	Special Study Project 3B
MPDMNA3	Mine Planning And Design 3A		
MINMNA3	Mining 3A		
MLEMNA3	Mining Legislation 3A		
GEMINA3	Geotechnical Engineering (Mining) 3A		
OCCUPA3	Occupational Hygiene (Mining) 3A		

EB21.5 BEngTech: Mechanical Engineering (NQF7) B6MECQ

21.5.1 Purpose of the programme

The purpose of the BET in Mechanical Engineering is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing Mechanical Engineering Technologist. Specifically, the qualification provides graduates with:
• Preparation for careers in engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to make a contribution to the economy and national development;
• The educational base required for registration as a Professional Engineering Technologist with ECSA.
• For graduates with an appropriate level of achievement, the ability to enter NQF level 8 programmes and then proceed to masters degrees.
• For certificated engineers, the education base for achieving proficiency in mechanical engineering / plant operations and occupational health and safety.

21.5.2 Outcomes

The exit level outcomes, as informed by ECSA, are that students who complete this programme will be able to:

• Apply mechanical engineering principles to systematically diagnose and solve broadly-defined engineering problems
• Apply knowledge of mathematics, natural science and engineering sciences to defined and applied mechanical engineering procedures, processes, systems and methodologies to solve broadly-defined engineering problems
• Perform procedural design of broadly-defined mechanical engineering components, systems, works, products or processes to meet desired needs within applicable standards, codes of practice and legislation
• Conduct investigations of broadly-defined mechanical engineering problems through locating, searching and selecting relevant data from codes, data bases and literature, designing and conducting experiments, and analysing and interpreting results to provide valid conclusions
• Use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modelling, for the solution of broadly-defined mechanical engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints
• Communicate effectively, both orally and in writing, with engineering audiences and affected parties
• Demonstrate knowledge and understanding of the impact of mechanical engineering activity on the society, economy, industrial and physical environment, and address issues by analysis and evaluation
• Demonstrate knowledge and understanding of mechanical engineering management principles and apply these to one's own work, as a member and leader in a team and to manage projects
• Demonstrate competence to engage in independent and life-long learning through well-developed learning skills
• Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of mechanical engineering technology practice.

21.5.3 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
AFINSA1	African Insights	ACDMIB1	Autocad 1B
CPSELA1	Computer Skills 1A	ECS1BB1	Engineering Communication Skills 1B
ECS1AA1	Engineering Communication Skills 1A	MATE1B1	Engineering Mathematics 1B
ELTELA1	Electro-technology 1A	PHYE1B1	Engineering Physics 1B
MATE1A1	Engineering Mathematics 1A	STRMIB1	Strength Of Materials 1B
MDRMIA1	Mechanical Engineering Drawing 1A	WKSMIB1	Mechanical Manufacturing 1B
PHYE1A1	Engineering Physics 1A	WKSPIB1	Workshop Practice 1B
Second year			
First semester		Second semester	

ELTELA2	Electro/technology 2A	ASMMIB2	Applied Strength Of Materials 2B
MATE2A2	Engineering Mathematics 2A	EMVMNB2	Environmental Management 2B
FLMMIA2	Fluid Mechanics 2A	HYMMIB2	Hydraulic Machines 2B
MDSMIA2	Mechanical Engineering Design 2A	MADMIB2	Machine Design 2B
WKSMIA2	Mechanical Manufacturing 2A	SPLMIB2	Steam Plant 2B
WKSPIA2	Workshop Practice 2A	TMAMIB2	Theory Of Machines 2B
TRDMIA2	Thermodynamics 2A		

Third year

First semester		Second semester	
FLMMIA3	Fluid Mechanics 3A	AUCMIB3	Automatic Control 3B
PJMMIA3	Mechanical Engineering Design Project 3A	PJMMIB3	Mechanical Engineering Design Project 3B
MEMMIA3	Mechanics Of Machines 3A	RACMIB3	Refrigeration And Air Conditioning 3B
STRMIA3	Strength Of Materials 3A	SANMIB3	Stress Analysis 3B
TRDMIA3	Thermodynamics 3A	TRMMIB3	Turbo Machines 3B

EB21.6 BEngTech: CHEMICAL ENGINEERING (NQF 7) B6CE1Q

21.6.1 Purpose of the programme

The purpose of the BEngTech (Chemical Engineering) is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing chemical engineering technologist. Specifically, the qualification provides graduates with:
•preparation for careers in engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to make a contribution to the economy and national development;
•the educational base required for registration as a Professional Technologist with ECSA; and
•for graduates with an appropriate level of achievement, the ability to enter NQF level 8 programmes and then proceed to Masters degrees.

21.6.2 Outcomes

Students who complete this programme should be able to:
•apply engineering principles to systematically diagnose and solve broadly-defined engineering problems;
•apply knowledge of mathematics, natural science and engineering sciences to defined and applied engineering procedures, processes, systems and methodologies to solve broadly-defined engineering problems;
•perform procedural and non-procedural design of broadly defined components, systems, works, products or processes to meet desired needs, normally within applicable standards, codes of practice and legislation;
•conduct investigations into broadly-defined problems through locating, searching and selecting relevant data from codes, databases and literature, designing and conducting experiments, and analysing and interpreting results in order to provide valid conclusions;
•use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modelling, for the solution of broadly-defined

engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints;
•communicate effectively, both orally and in writing, with engineering audiences and affected parties;
•demonstrate knowledge and understanding of the impact of engineering activity on the society, economy, industrial and physical environment, and address issues by analysis and evaluation;
•demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member and leader in a team and to manage projects;
•engage in independent and life-long learning through well-developed learning skills;
•comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of engineering technology practice.

21.6.3 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
AFINSA1	African Insights	CEFCHB1	Chemical Engineering Fundamentals 1B
CPTCHA1	Chemical Process Technology 1A	CPTCHB1	Chemical Process Technology 1B
CPSELA1	Computer Skills 1A	CETE1B1	Engineering Chemistry (Chemical) 1B
CETE1A1	Engineering Chemistry (Chemical) 1A	ECS1BB1	Engineering Communication Skills 1B
ECS1AA1	Engineering Communication Skills 1A	EDRMIB1	Engineering Drawing 1B
MATE 1A1	Engineering Mathematics 1A	MATE1B1	Engineering Mathematics 1B
PHYSCA1	Engineering Physics (Chemical) 1A		
Second year			
First semester		Second semester	
CEFCHA2	Chemical Engineering Fundamentals 2A	ATDCHB2	Applied Thermodynamics 2B
CELCHA2	Chemical Engineering Laboratory 2A	CELCHB2	Chemical Engineering Laboratory 2B
CTDCHA2	Chemical Thermodynamics 2A	PFFCHB2	-Process Fluid Flow 2B
MATE2A2	Engineering Mathematics 2A	PRDCHB2	Process Design 2B
PRCCHA2	PROCESS CONTROL 2A	UNOCHB2	Unit Operations 2B
TPRCHA2	Transfer Processes 2A		
Third year			
First semester		Second semester	
EMGCHA3	Engineering Management (Chemical) 3A	CELCHB3	Chemical Engineering Laboratory 3B
IRDCHA3	Introduction and Reactor Design 3A	ENVCHB3	Environmental Engineering 3B
MSOCHA3	Multistage Operations 3A	IESCHB3	Innovation and Entrepreneurial Skills 3B

PTECHA3	Particle Technology 3A	IPJCHB3	Investigative Project 3B
PRDCHA3	Process Design 3A	PRCCCB3	PROCESS CONTROL 3B

EB21.7 BEngTech: EXTRACTION METALLURGY (NQF 7) B6EXTQ

21.7.1 Purpose of the programme

The purpose of the BEngTech (Extraction Metallurgy) is thus to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent, practicing Extraction QUMetallurgy Technologist. Specifically, the qualification will provide the graduate with:
• preparation for a career in engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to make a contribution to the economy and national development;
• the educational base required for registration as a Professional Engineering Technologist with ECSA; and
• for graduates with an appropriate level of achievement, the ability to enter NQF level 8 programmes and then proceed to Master's degrees.

21.7.2 Outcomes

Exit level outcomes:

The exit level outcomes as informed by ECSA are that students who complete this programme will be able to:
• systematically diagnose and solve broadly defined metallurgical problems by applying engineering principles;
• apply knowledge of mathematics, natural science and engineering sciences to defined and applied engineering procedures, processes, systems and methodologies to solve broadly-defined metallurgical problems;
• perform procedural and non-procedural design of broadly defined components, systems, works, products or processes to meet desired needs normally within applicable standards, codes of practices;
• conduct investigations of broadly-defined problems by locating, searching and selecting relevant data from codes, databases and literature, designing and conducting experiments, and analysing and interpreting results in order to provide valid conclusions;
• use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modeling, for the solution of broadly-defined metallurgical problems with an understanding of their limitations, restrictions, premises, assumptions and constraints;
• communicate effectively, both orally and in writing, with engineering audiences and affected parties;
• demonstrate knowledge and understanding of the impact of metallurgical activity on the society, economy, industrial and physical environment, and address issues by analysis and evaluation;
• demonstrate knowledge and understanding of metallurgical management principles and apply these to one's own work, as a member and leader in a team and to manage projects;
• engage in independent and life-long learning through well-developed learning skills; and
• comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of metallurgical technology practice.

21.7.3 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
AFINSA1	African Insights		
CETM1A1	Engineering Chemistry (Metallurgy) 1A	CETM1B1	Engineering Chemistry (Metallurgy) 1B
EDRM1A1	Engineering Drawing 1A	METMTB1	Fundamentals of Metallurgy 1B
CPSELA1	Computer Skills 1A	MPRMTB1	Metallurgy Engineering Practice 1B
ECS1AA1	Engineering Communication Skills 1A	ECS1BB1	Engineering Communication Skills 1B
MATE1A1	Engineering Mathematics 1A	MATE1B1	Engineering Mathematics 1B
PHYE1A1	Engineering Physics 1A	PHYE1B1	Engineering Physics 1B
		STAE1B1	Engineering Statistics 1B

Second year

First semester		Second semester	
		ECHMTB2	Electrochemistry 2B
GMESCA2	Engineering Geology (Metallurgy) 2A	GMESCB2	Engineering Geology (Metallurgy) 2B
HMTMTA2	Heat and Mass Transfer 2A ‘’	PREMTB2	Process Engineering 2B
MEAMTA2	Metallurgical Accounting 2A	MPRMTB2	Mineral Processing 2B
MPRMTA2	Mineral Processing 2A		
MTDMTB2	Metallurgical Thermodynamics 2B		
PSTMTA2	Analytical Techniques 2A		

Third year

First semester		Second semester	
CPRMTA3	Coal Processing 3A		
PRMMTA3	Project Methodology 3A	FAPMTB3	Ferroalloy Production 3B
FMEMTA3	Ferrous Metallurgy 3A	REFMTB3	Refractory Technology 3B
HMEMTA3	Hydrometallurgy 3A	PRDMTB3	Process Design (Metallurgy) 3B
PYRMTA3	Pyrometallurgy 3A	INMMTB3	Industrial Minerals 3B
NFMMTA3	Non-Ferrous Metallurgy 3A	PRCCHB3	Process Control (Metallurgy) 3B
		PEMMTB3	Metallurgical Project 3B
		PMEMTB3	Principles of Management and Economics 3B

		PMGMTB3	Project Management (Metallurgy) 3B

EB21.8 BEngTech: Physical Metallurgy (NQF7) B6PHYQ

21.8.1 Purpose of the programme

The purpose of the BEngTech (Physical Metallurgy) is thus to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent, practicing Metallurgical Technologist. Specifically, the qualification provides graduates with:
• preparation for careers in engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to make a contribution to the economy and national development;
• the educational base required for registration as a Professional Engineering Technologist with ECSA;
• for graduates with an appropriate level of achievement, the ability to enter NQF level 8 programmes and then proceed to Master's degrees;

21.8.2 Outcomes

Students who complete this programme will be able to:
• systematically diagnose and solve broadly defined metallurgical problems by applying engineering principles;
• apply knowledge of mathematics, natural science and engineering sciences to defined and applied engineering procedures, processes, systems and methodologies to solve broadly-defined metallurgical problems;
• perform procedural and non-procedural design of broadly defined components, systems, works, products or processes to meet desired needs normally within applicable standards, codes of practice;
• conduct investigations into broadly-defined problems by locating, searching and selecting relevant data from codes, databases and literature, designing and conducting experiments, and analyzing and interpreting results in order to provide valid conclusions;
• use appropriate techniques, resources, and modern engineering tools, including information-technology, prediction and modeling, for the solution of broadly-defined metallurgical problems with an understanding of the limitations, restrictions, premises, assumptions and constraints;
• communicate effectively, both orally and in writing, with engineering audiences and affected parties;
• demonstrate knowledge and understanding of the impact of metallurgical activity on the society, economy, industrial and physical environment, and address issues by analysis and evaluation;
• demonstrate knowledge and understanding of metallurgical management principles and apply these to one's own work, as a member and leader in a team and to manage projects;
• engage in independent and life-long learning through well-developed learning skills; and
• comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of metallurgical technology practice.

21.8.3 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
AFINSA1	African Insights	CETM1B1	Engineering Chemistry (Metallurgy) 1B
CPSELA1	Computer Skills 1A	ECS1BB1	Engineering Communication Skills 1B
CETM1A1	Engineering Chemistry (Metallurgy) 1A	MATE1B1	Engineering Mathematics 1B
ECS1AA1	Engineering Communication Skills 1A	PHYE1B1	Engineering Physics 1B
EDRMIA1	Engineering Drawing 1A	METMTB1	Fundamentals Of Metallurgy 1B
MATE1A1	Engineering Mathematics 1A	MPRMTB1	Metallurgy Engineering Practice 1B
PHYE1A1	Engineering Physics 1A	STAE1B1	Engineering Statistics 1B

Second year

First semester		Second semester	
HMTMTA2	Heat and Mass Transfer 2A	MTTMTB2	Material Testing 2B
MTTMTA2	Material Testing 2A	MMEMTB2	Mechanical Metallurgy 2B
MMEMTA2	Mechanical Metallurgy 2A	MTDMTB2	Metallurgical Thermodynamics 2B
PMTMTA2	Physical Metallurgy 2A	PMTMTB2	Physical Metallurgy 2B
ALLMTA2	Structure And Properties Of Alloy 2A	QUAMTB2	Quality Techniques 2B

Third year

First semester		Second semester	
CORMTA3	Corrosion Technology 3A	AMAMTB3	Advanced Engineering Materials 3B
FOUMTA3	Foundry Technology 3A	CDSMTB3	Casting Design And Simulation 3B
MDEMTA3	Mechanical Deformation Technologies 3A	PEMMTB3	Metallurgical Project 3B
PISMTA3	Production Of Iron And Steel 3A	PMCMTB3	Powder Metallurgy And Ceramic Material 3B
PRMMTA3	Project Methodology 3A	PMEMTB3	Principles Of Management & Economics 3B
		REFMTB3	Refractory Technology 3B
		WLDMTB3	Welding Technology 3B

EB22 EXTENDED PROGRAMMES

EB22.1 BEngTech: INDUSTRIAL ENGINEERING (NQF7) B6INXQ

22.1.1 Curriculum

First year

First and second semester	
FRRED01	Fundamental Research Practice (Year Module)
WPPED01	Workplace Preparation (Year Module)
PMEDT01	Physics (Mechanics) (Theory) (Year Module)
PMEDP01	Physics (Mechanics) (Practical) (Year Module)

EDRED01	Engineering Drawing (Year Module)
FOMED01	Foundation Mathematics (Year Module)
FPYED01	Foundation Physics (Year Module)
CPSED01	Computer Skills (Year Module)

Second year

First semester		Second semester	
CODE	**MODULE**	**CODE**	**MODULE**
ECS1AA1	Engineering Communication Skills 1A	ECS1BB1	Engineering Communication Skills 1B
ELTELA1	Electrotechnology 1A	EWSMIB1	Engineering Work Study 1B
MATE1A1	Engineering Mathematics 1A	MANMIB1	Mechanical Manufacturing Engineering 1B
		MATE1B1	Engineering Mathematics 1B
		STAE1B1	Engineering Statistics 1B
		THFMIB1	Thermofluids 1B

Third year

First semester		Second semester	
AFINSA1	African Insights	AUTMIB2	Automation 2B
MATE2A2	Engineering Mathematics 2A	FACMIB2	Facility Lay Out And Materials Handling 2B
MFDMIA2	Manufacturing Systems Design 2A	IACMIB2	Industrial Accounting 2B
MATMIA2	Material Science 2A	INFMIB2	Information Systems 2B
PDEMIA2	Production Engineering 2A	OPRMIB2	Operational Research 2B
QUAMIA2	Quality Assurance 2A		

Fourth year

First semester		Second semester	
EMGMIA3	Engineering Management (Industrial) 3A	ENTMIB3	Entrepreneurship 3B
PDTMIA3	Production Technology 3A	PJIMIB3	Final Year Project 3B
PENMIA3	Project Engineering 3A	LOGMIB3	Logistics Engineering 3B
PJIMIA3	Final Year Project 3A	SYSMIB3	System Dynamics 3B
PRSMIA3	Project Research 3A	QMSMIB3	Quality Management Systems 3B

EB22.2 BEngTech: PHYSICAL METALLURGY (NQF7) B6PX0Q

22.2.1 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester and Second semester	
CPSAED1	Computer Applications (Year Module)
ECMSED1	Chemistry X1 (Theory) (Year Module)
ECMSED2	Chemistry X1 (Practical) (Year Module)

EDRED01	Engineering Drawing 1 (Year Module)
FRRED01	Fundamental Research Practice (Year Module)
MATHED1	Mathematics 1A
PHADPX1	Engineering Physics X 1A(Practical) (Year Module)
PHADTX1	Engineering Physics X 1A (Theory) (Year module)
WPPED01	Workplace Preparation (Year Module)

Second year

First semester		Second semester	
AFINSA1	African Insights	ECS1BB1	Engineering Communication Skills 1B
CETM2A1	Engineering Chemistry (Metallurgy) 2A	METMTB1	Fundamentals of Metallurgy 1B
ECS1AA1	Engineering Communication Skills 1A	MPRMTB1	Metallurgy Engineering Practice 1B
MATM2A1	Engineering Mathematics 1B	STAEB1	Engineering Statistics 1B
PHADTX2	Engineering Physics X 1B (Theory) (Year Module)	PHADTX2	Engineering Physics X 1B (Theory) (Year Module)
PHADPX2	Engineering Physics X 1B (Practical) (Year Module)	PHADPX2	Engineering Physics X 1B (Practical) (Year Module)

Third Year

First semester		Second semester	
HMTMTA2	Heat & Mass Transfer 2A	MTTMTB2	Material Testing 2B
MTTMTA2	Material Testing 2A	MMEMTB2	Mechanical Metallurgy 2B
MMEMTA2	Mechanical Metallurgy 2A	MTDMTB2	Metallurgical Thermodynamics 2B
PMTMTA2	Physical Metallurgy 2A	PMTMTB2	Physical Metallurgy 2B
ALLMTA2	Structure And Properties Of Alloy 2A	QUAMTB2	Quality Techniques 2B

Fourth year

First semester		Second semester	
CORMTA3	Corrosion Technology 3A	AMAMTB3	Advanced Engineering Materials 3B
FOUMTA3	Foundry Technology 3A	CDSMTB3	Casting Design And Simulation 3B
MDEMTA3	Mechanical Deformation Technologies 3A	PEMMTB3	Metallurgical Project 3B
PISMTA3	Production Of Iron And Steel 3A	PMCMTB3	Powder Metallurgy And Ceramic Material 3B
PRMMTA3	Project Methodology 3A	PMEMTB3	Principles Of Management & Economics 3B
		REFMTB3	Refractory Technology 3B
		WLDMTB3	Welding Technology 3B

EB22.3 BEngTech: Extraction Metallurgy (NQF7) B6EX0Q

22.3.1 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester
CPSAED1	Computer Applications (Year Module)	
ECMSED1	Chemistry 1 (Theory) (Year Module)	
ECMSED2	Chemistry 1 (Practical) (Year Module)	
EDRED01	Engineering Drawing 1 (Year Module)	
FRRED01	Fundamental Research Practice (Year Module)	
MATHED1	Mathematics 1 (Year Module)	
WPPED01	Workplace Preparation(Year Module)	
PHADPX1	Engineering Physics X 1B (Practical) (Year Module)	
PHADTX1	Engineering Physics X 1B (Theory) (Year Module)	

Second year

First semester		Second semester	
AFINSA1	African Insights	ECS1BB1	Engineering Communication Skills 1B
CETM2A1	Engineering Chemistry (Metallurgy) 1B	METMB1	Fundamentals of Metallurgy 1B
ECS1AA1	Engineering Communication Skills 1A	MPRMTB1	Metallurgy Engineering Practice 1B
MATM2A1	Engineering Mathematics 1B	STA1B1	Engineering Statistics 1B
PHADTX2	Engineering Physics x 1B(Theory) yr module	PHADTX2	Engineering Physics x 1B(Theory) yr module
PHADPX2	Engineering Physics x 1B(Practical) yr module	PHADPX2	Engineering Physics x 1B(Practical) yr module

Third Year

First semester		Second semester	
GMESCA2	Engineering Geology (Metallurgy) 2A	GMESCB2	Engineering Geology (Metallurgy) 2B
HMTMTA2	Heat and Mass Transfer 2A	ECHMTB2	Electrochemistry 2B
MEAMTA2	Metallurgical Accounting 2A	PREMTB2	Process Engineering 2B
MPRMTA2	Mineral Processing 2A	MPRMTB2	Mineral Processing 2B
PSTMTA2	Analytical Techniques 2A	MTDMTB2	Metallurgical Thermodynamics 2B

Fourth year

First semester		Second semester	
CPRMTA3	Coal Processing 3A	FAPMTB3	Ferroalloy Production 3B
FMEMTA3	Ferrous Metallurgy 3A	INMMTB3	Industrial Minerals 3B
HMEMTA3	Hydrometallurgy 3A	PEMMTB3	Metallurgical Project 3B
NFMMTA3	Non-Ferrous Metallurgy 3A	PMEMTB3	Principles of Management and Economics 3B
PRMMTA3	Project Methodology 3A	PMGMTB3	Project Management (Metallurgy) 3B
PYRMTA3	Pyrometallurgy 3A	PRCCHB3	Process Control (Metallurgy) 3B
		PRDMTB3	Process Design (Metallurgy) 3B
		REFMTB3	Refractory Technology 3B

EB22.4 BEngTech: ELECTRICAL ENGINEERING (NQF7) B6L1XQ

22.4.1 Curriculum

CODE	MODULE	CODE	MODULE

First year

First and second semester	
FRRED01	Fundamental Research Practice (Year Module)
WPPED01	Workplace Preparation (Year Module)
FOMED01	Foundation Mathematics (Year Module)
FPYED01	Foundation Physics (Year Module)
FCHED01	Foundation Chemistry (Year Module)
ALGED01	Algorithms (Semester 1)
PRGED01	Programming (Semester 2)
ELTED01	Foundation Electrotechnology (Year Module)

Second year

First semester		Second semester	
MATE1A1	Engineering Mathematics 1A	MATE1B1	Engineering Mathematics 1B
CETE1A1	Engineering Chemistry (Chemical) 1A	DIGSTB1	Digital Systems 1B
PHYE1A1	Engineering Physics 1A	PHYSCB1	Engineering Physics Electrical 1B
ELTENA1	Electrical Engineering 1A	ELTENB1	Electrical Engineering 1B
WKSEL1A	Workshop Skills 1A	ELCELB1	Electronic Circuits 1B
		WKSEL1B	Workshop Skills 1B

Third year

First semester		Second semester	
DIGSTA2	Digital Systems 2A	MCCELB2	Mechatronics & Control 2B
AFINSA 1	African Insights	NETELB2	Networks 2B
ELCELA2	Electronic Circuits 2A	DIGSTB2	Digital Systems 2B
MATE2A2	Engineering Mathematics 2A	PJEELB2	Electrical Project 2B
SENELA2	Sensors And Devices 2A		
SWEELA2	Software Engineering 2A		
SIGSTA2	Signals and Systems 2A		

Fourth year

First semester		Second semester	
INCEL3A	Instrumentation and Control 3A	CSTELB3	Control Systems 3B
CPS3AA3	Complementary Studies 3A	PJEELB3	Electrical Project 3B
PJEELA3	Electrical Project 3A	POWERB3	Power Electronics 3B
EMAEL3A	Machines 3A	TMGELB3	Technology Management 3B
POWSTA3	Power Systems 3A		
PJMELA3	Project Management (Electrical) 3A		
SIGSTA3	Signals and Systems 3A		

EB22.5 BEngTech: CIVIL ENGINEERING (NQF7) B6CX0Q

22.5.1 Curriculum

CODE	MODULE	CODE	MODULE

First year

First and second semester	
FRRED01	Fundamental Research Practice (Year Module)
WPPED01	Workplace Preparation (Year Module)
FOMED01	Foundation Mathematics (Year Module)
FPYED01	Foundation Physics (Year Module)
APMED01	Basic Science (Applied Mechanics) and Lab
CDRED01	Drawing & Computer Aided Drawing (Year Module)
CPSED01	Computer Skills (Year Module)

Second year

First semester		Second semester	
AFINSA 1	African Insights	CMSCI1B	Construction Methods And Materials 1B
STAE1A1	Engineering Statistics 1A	GLGC1B1	Engineering Geology (Civil) 1B
MATE1A1	Engineering Mathematics 1A	MATE1B1	Engineering Mathematics 1B
ECS1AA1	Engineering Communication Skills 1A	MGTCIB1	Management 1B
SUSCIA1	Principle of Sustainability 2A	SURCIB1	Surveying 1B
SURCIA1	Surveying 1A	TSTED01	Theory Of Structures 1B
SOM2AA2	Strength of Materials 2A	CMGCI2B	Cotract Mangement 2B
		CRM2BB2	Research Methodology 2B

Third year

First semester		Second semester	
MATE2A2	Engineering Mathematics 2A	GTECIB2	Geotechnical Engineering 2B
GTECIA2	Geotechnical Engineering 2A	HYOCIB2	Hydrology 2B
HYDCIA2	Hydraulics 2A	STRCIB2	Structural Analysis 2B
TRACIA2	Transportation Engineering 2A	TRACIB2	Transportation Engineering 2B

Fourth year

First semester		Second semester	
RCSCIA3	Reinforced Concrete Design 3A	PJMCI3B	Project Managment
SSDCIA3	Structural Steel Design 3A	ETHHUB3	Ethics And Community Studies 3B
STRCIA3	Structural Analysis 3A	WWWCIB3	Water & Waste Water Engineering 3B
TRACIA3	Transportation Engineering 3A	TRACIB3	Transportation Engineering 3B

CDPCI3A	Capstone Project 3A	CDPCIB3	Capstone Civil Design Project 3B
WRDCIA3	Reticulation Design 3A		

EB22.6 BEngTech: MECHANICAL ENGINEERING (NQF7) B6MEXQ

22.6.1 Curriculum

CODE	MODULE	CODE	MODULE

First year

First and second semester	
CPSED01	Computer Skills (Year Module)
FOMED01	Foundation Mathematics (Year Module)
FPYED01	Foundation Physics (Year Module)
FRRED01	Fundamental Research Practice (Year Module)
MDRED01	Mechanical Engineering Drawing (Year Module)
PMEDP01	Physics (Mechanics) Practical (Year Module)
PMEDT01	Physics (Mechanics) Theory (Year Module)
WPPED01	Workplace Preparation (Year Module)

Second year

First semester		Second semester	
ECS1AA1	Engineering Communication Skills 1A	ACDMIB1	Autocad 1B
MATE1A1	Engineering Mathematics 1A	ECS1AB1	Engineering Communication Skills 1B
ELTELA1	Electrotechnology 1A	MATE1B1	Engineering Mathematics 1B
AFINSA1	African Insights	STRMIB1	Strength Of Materials 1B
		WKSMIB1	Mechanical Manufacturing 1B
		WKSPIB1	Workshop Practice 1B
		PHYE1B1	Engineering Physics 1B

Third year

First semester		Second semester	
ELTELA2	Electrotechnology 2A	ASMMIB2	Applied Strength Of Materials 2B
FLMMIA2	Fluid Mechanics 2A	HYMMIB2	Hydraulic Machines 2B
MATE2A2	Engineering Mathematics V 2A	MADMIB2	Machines Design 2B
MDSMIA2	Mechanical Engineering Design 2A	SPLMIB2	Steam Plant 2B
TRDMIA2	Thermodynamics 2A	TMAMIB2	Theory Of Machines 2B
WKSMIA2	Mechanical Manufacturing 2A	EMVMNB2	Environmental Management 2B
WKSPIA2	Workshop Practice 2A		

Fourth year

First semester		Second semester	
MEMMIA3	Mechanics Of Machines 3A	AUCMIB3	Automatic Control 3B
FLMMIA3	Fluid Mechanics 3A	RACMIB3	Refrigeration And Air Conditioning 3B
PJMMIA3	Mechanical Engineering Design Project 3A	PJMMIB3	Mechanical Engineering Design Project 3B
STRMIA3	Strength Of Materials 3A	SANMIB3	Stress Analysis 3B
TRDMIA3	Thermodynamics 3A	TRMMI3B	Turbo Machines 3B

ENGINEERING SCIENCE PROGRAMMES

EB24 BACHELOR OF ENGINEERING

EB24.1 ELECTRICAL AND ELECTRONIC ENGINEERING B6ELSQ

24.1.1 Purpose of the programme

The purpose of the qualification is to develop an engineering intellectual who can identify, assess and formulate the engineering needs of the society at large, and research and solve the identified engineering problems creatively and innovatively, by applying scientific, mathematical, engineering, economic and other relevant principles and methods. The qualification prepares students for an engineering science, design and project-based career through fundamental understanding, use and appropriate application of engineering methods, skills, tools and information technology. The qualification also provides a platform for lifelong learning.

24.1.2 Outcomes

The student should be able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering problems creatively and innovatively by applying knowledge of mathematics, basic science and engineering sciences from first principles.
2. Plan and manage small engineering projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering practice.
3. Work effectively, individually and with others, as a member of a team, group, organisation, and community or in multi-disciplinary environments.
4. Organise and manage him/herself and his/her activities responsibly, effectively, professionally and ethically, accept responsibility within his/her limits of competence and exercise judgment based on knowledge and expertise.
5. Plan and conduct appropriate levels of investigation, research and/or experiments by applying relevant theories and methodologies, and perform appropriate data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with engineering audiences and the community at large, using appropriate structure, style and graphical support.
7. Use and assess appropriate research methods, skills, tools and information technology effectively and critically in engineering practice, and show an understanding and a willingness to accept responsibility for the impact of engineering activities on society and the environment.
8. Perform procedural and non-procedural design and synthesis of components, systems, works, products or processes as a set of related systems and assess their social, legal, health, safety and environmental impact and benefits.

9. Employ various learning strategies and skills to master module outcomes required for preparing him/herself to engage in continuous learning, to keep abreast of knowledge and skills required in the inter-disciplinary field.
10. Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering activities.
12. Explore, where applicable, education and career opportunities.
13. Organise and develop entrepreneurial opportunities through engineering problem-solving, design, technical research and managerial skills.

24.1.3 Admission Requirements and Selection Criteria

Refer to Faculty Regulation E.3 for the minimum admission requirements for this programme.
Students are selected on academic merit and a personal interview, if deemed necessary.
The number of student enrolments will be limited.

24.1.4 Promotion Requirements

Refer to Faculty Regulations EB4 and EB5, stipulating the promotion requirements for Engineering Sciences programmes and the requirements for awarding a passed with distinction BEng degree.

24.1.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
APM01A1	Applied Mathematics 1A (Engineering)	APM01B1	Applied Mathematics 1B (Engineering)
IINEEA1	Introduction to Engineering Design 1A	PJCEEB1	Project Communication 1B
MATENA1	Engineering Mathematics 1A	MATENB1	Engineering Mathematics 1B
PHYE01A	Engineering Physics 1A	PHYE0B1	Engineering Physics 1B
CEM01A1	Chemistry 1A	ETNEEB1	Electrotechnics 1B
EEMEEA1	Electrical Engineering Methods 1A		
Second year			
First semester		Second semester	
APM02A2	Applied Mathematics 2A	APM02B2	Applied Mathematics 2B
ETNEEA2	Electrotechnics 2A	ETNEEB2	Electrotechnics 2B
MATEAA2	Engineering Mathematics 2A2	MATEAB2	Engineering Mathematics 2B2
MATECA2	Engineering Mathematics 2A1	MATECB2	Engineering Mathematics 2B1
PHYE2A2	Engineering Physics 2A	IEP2BB2	Engineering Economics and Practice 2B
MODEEA2	Modelling 2A	MTKEEB2	Science of Materials 2B
PJEELA2	Electrical Projects 2A	TRDMCB 2	Thermodynamics 2B

Third year

First semester		Second semester	
AMDEEA3	Advanced Modelling 3A	BHSEEB3	Control Systems 3B
EMNEEA3	Electromagnetics 3A	EKAEEB3	Electronics 3B
KRLEEA3	Power Systems 3A	EEPEEB3	Electrical Engineering Practical 3B
STAE0A3	Statistics for Engineers 3A	PJBEEB3	Project Management 3B
SSTEEA3	Signals and Systems 3A	RKEEE3B	Computer Systems 3B
AFINSA1	African Insights	SIGEEB3	Signal Processing 3B
SIOEEA3	Systems Engineering and Design 3A	SIOEEB3	Systems Engineering and Design 3B
		TELEEB3	Telecommunications 3B

Fourth year

First semester		Second semester	
BHSEEA4	Control Systems 4A	EMNEEB4	Electromagnetics 4B
RKEEEA4	Computer Systems 4A	EMAEEB4	Electrical Machines 4B
HSEEEA4	High Speed Electronics 4A	KRLEEB4	Power Systems 4B
PWEEA4	Power Electronics 4A	OTSEEB4	Optical Systems 4B
EEPEEA4	Electrical Engineering Practical 4A	RTIENB4	Legal Applications in Engineering Practice 4B
PJEEEA4	Project Investigation (Electrical) 4A	PJEEEB4	Project Investigation (Electrical) 4B
SIGEEA4	Signal Processing 4A		
TELEEA4	Telecommunications 4A		

EB24.2 CIVIL ENGINEERING B6CISQ

24.3.1 Purpose of the programme

The purpose of the qualification is to develop an engineering intellectual who can identify, assess and formulate the engineering needs of the society at large, and research and solve the identified engineering problems creatively and innovatively, by applying scientific, mathematical, engineering, economic and other relevant principles and methods. The qualification prepares students for an engineering science, design and project-based career through fundamental understanding, use and appropriate application of engineering methods, skills, tools and information technology. The qualification also provides a platform for lifelong learning.

24.3.2 Outcomes

The student should be able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering problems creatively and innovatively by applying knowledge of Mathematics, Basic Science and Engineering Sciences from first principles.
2. Plan and manage small engineering projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation, community or in multi-disciplinary environments.
4. Organise and manage him/herself and his/her activities responsibly, effectively, professionally and ethically, accept responsibility within his/her limits of competence, and exercise judgment based on knowledge and expertise.
5. Plan and conduct limited investigations, research and experiments commensurate with the level of competence by applying appropriate theories and methodologies, and perform data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with engineering audiences and the community at large, using appropriate structure, style and graphical support.
7. Use and assess appropriate engineering methods, skills, tools and information technology effectively and critically in engineering practice, and show an understanding and a willingness to accept responsibility for the impact of engineering activities on society and the environment.
8. Perform procedural and non-procedural design and synthesis of components, systems, works, products or processes as a set of related systems and assess, where applicable, their social, legal, health, safety and environmental impact and benefits.
9. Employ various learning strategies and skills to master module outcomes required in fundamental mathematics, engineering sciences, engineering design research and aspects of management, thereby preparing him/herself to engage in lifelong learning, to keep abreast of knowledge and skills required in the engineering field.
10. Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically.
11. Demonstrate cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering activities.
12. Explore education and career opportunities.
13. Organise and develop entrepreneurial opportunities through engineering problem-solving, design, technical research and managerial skills.

24.3.3 Admission Requirements and Selection Criteria

Refer to Faculty Regulation E.3 for the minimum admission requirements for this programme.

Students are selected on academic merit and a personal interview, if deemed necessary.
The number of student enrolments will be limited.

24.3.4 Promotion Requirements

Refer to Faculty Regulations EB4 and EB5, stipulating the promotion requirements for Engineering Sciences programmes and the requirements for awarding a passed with distinction BEng degree.

24.3.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
APM01A1	Applied Mathematics 1A	APM01B1	Applied Mathematics 1B
IINEEA1	Introduction to Engineering Design 1A	DRGCIB1	Draughting for civil engineers 1B
MATENA1	Engineering Mathematics 1A	MATENB1	Engineering Mathematics 1B
PHYE0A1	Engineering Physics 1A	PHYE0B1	Engineering Physics 1B
CEM01A1	Chemistry 1A	ETNEEB1	Electrotechnics 1B
		BTKCIB1	Concrete Technology1B
Second year			
First semester		Second semester	
APM02A2	Applied Mathematics 2A	APM02B2	Applied Mathematics 2B
MATEAA2	Engineering Mathematics 2A2	MATEAB2	Engineering Mathematics 2B2
MATECA2	Engineering Mathematics 2A1	MATECB2	Engineering Mathematics 2B1
MGACIA2	Applied Mechanics 2A	SMCCIB2	Strength of Materials for Civil Engineers 2B
GLG01A1	Geology 1A	HTA3BB3	Heritage Assessment 3B
STRCIA2	Fluid Mechanics 2A	ENME0B2	Environmental Management for Engineers 2B
MODEEA2	Modelling 2A	COM0B22	Communication 2B
Third year			
First semester		Second semester	
GTGCIA3	Geotechnical Engineering 3A	GTGCIB3	Geotechnical Engineering 3B
SUSCIA3	Structural Engineering 3A	SUSCIB3	Structural Engineering 3B
HMGCIA3	Hydraulic Engineering 3A	HMGCIB3	Hydraulic Engineering 3B
STAE0A3	Statistics for Engineers 3A	VVICIB3	Transportation Engineering 3B
AFINSA1	African Insights	PJBCIB3	Project Management 3B
VVICIA3	Transportation Engineering 3A	OPMCIB3	Surveying 3B
Fourth year			
First semester		Second semester	

GTGCIA4	Geotechnical Engineering 4A	OWSCIB4	Civil Design 4B
PJBCIA4	Project Management 4A	PJSCIB4	Civil Project Investigation 4B
SUSCIA4	Structural Engineering 4A1	CPPCIB4	Civil Professional Practice 4B
SDICIA4	Urban Hydraulics 4A	RTICIB4	Legal Applications in Engineering Practice 4B
UDSCIA4	Urban Development Studies 4A		
SUCCIA4	Structural Engineering 4A2		

EB24.3 MECHANICAL ENGINEERING B6MESQ

24.4.1 Purpose of the programme

The purpose of the qualification is to develop an engineering intellectual who can identify, assess and formulate the engineering needs of the society at large, and research and solve the identified engineering problems creatively and innovatively, by applying scientific, mathematical, engineering, economic and other relevant principles and methods. The qualification prepares students for an engineering science, design and project-based career through fundamental understanding, use and appropriate application of engineering methods, skills, tools and information technology. The qualification also provides a platform for lifelong learning.

24.4.2 Outcomes

The student should be able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering problems creatively and innovatively by applying mathematics, basic science and engineering sciences from first principles.
2. Plan and manage small engineering projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation, community or in multi-disciplinary environments.
4. Organise and manage him/herself and his/her activities responsibly, effectively, professionally and ethically, accept responsibility within his/her limits of competence, and exercise judgment based on knowledge and expertise.
5. Plan and conduct limited investigations, research and experiments by applying appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with engineering audiences and the community at large, using appropriate structure, style and graphical support.
7. Use and assess appropriate research methods, skills, tools and information technology effectively and critically in engineering practice, and show an understanding and a willingness to accept responsibility for the impact of engineering activities on society and the environment.
8. Perform procedural and non-procedural design and synthesis of components, systems, works, products or processes as a set of related systems and assess, where applicable, their social, legal, health, safety and environmental impact and benefits.
9. Employ various learning strategies and skills to master module outcomes required in fundamental Mathematics, engineering sciences, engineering design research and

aspects of management, thereby preparing him/herself to engage in lifelong learning, to keep abreast of knowledge and skills required in the engineering field.
10. Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically.
11. Demonstrate cultural and aesthetic sensitivity across a range of social context in the execution of engineering activities.
12. Explore education and career opportunities.
13. Organise and develop entrepreneurial opportunities through engineering problem-solving, design, technical research and managerial skills.

24.4.3 Admission Requirements and Selection Criteria

Refer to Faculty Regulation EB3 for the minimum admission requirements for this programme.
Students are selected on academic merit and a personal interview, if deemed necessary.
The number of student enrolments will be limited.

24.4.4 Promotion Requirements

Refer to Faculty Regulations EB4 and EB5, stipulating the promotion requirements for Engineering Sciences programmes and the requirements for awarding a passed with distinction BEng degree.

24.4.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
APM01A1	Applied Mathematics 1A	APM01B1	Applied Mathematics 1B
GKMEEA1	Graphical Communication 1A	GKMEEB1	Graphical Communication 1B
IINEEA1	Introduction to Engineering Design 1A	IINEEB1	Introduction to Engineering Design 1B
MATENA1	Engineering Mathematics 1A	MATENB1	Engineering Mathematics 1B
PHYE0A1	Engineering Physics 1A	PHYE0B1	Engineering Physics 1B
CEM01A1	Chemistry 1A	ETNEEB1	Electrotechnics 1B
Second year			
First semester		Second semester	
APM02A2	Applied Mathematics 2A	APM02B2	Applied Mathematics 2B
MATEAA2	Engineering Mathematics 2A2	MATEAB2	Engineering Mathematics 2B2
MATECA2	Engineering Mathematics 2A1	MATECB2	Engineering Mathematics 2B1
OWMMCA2	Design (Mechanical) 2A	OWMMCB2	Design (Mechanical) 2B
ETNEEA2	Electrotechnics 2A	MTKMCB2	Science of Materials 2B
STRCIA2	Fluid Mechanics 2A	SLRBCB2	Strength of Materials 2B
MODEEA2	Modelling 2A	TRDMCB2	Thermodynamics 2B
Third year			
First semester		Second semester	
AFINSA1	African Insights	INPMCB3	Engineering Practice 3B
OWMMCA3	Design (Mechanical) 3A	MKEMCB3	Theory of Machines 3B

STAE0A3	Statistics for Engineers 3A01	OWMMCB3	Design (Mechanical) 3B
STRMCA3	Fluid Dynamics 3A	VVEMCB3	Manufacturing Methods 3B
		SLRBCB3	Strength of Materials 3B
TMSMCA3	Thermofluids 3A	COMMCB3	Communication 3B
MTKMCA3	Science of Materials 3A		
MLAMCY3	Mechanical Engineering Laboratory 3	MLAMCY3	Mechanical Engineering Laboratory 3

Fourth year

First semester		Second semester	
OIPMCY4	Design and Engineering Practice 4	OIPMCY4	Design and Engineering Practice 4 (Year module)
PJMMCY4	Project Investigation (Mechanical) 4	PJMMCY4	Project Investigation (Mechanical) 4 (Year module)
WAOMCA4	Heat Transfer 4A	RTICIB4	Legal Applications in Engineering Practice 4B
SLRBCA4	Strength of Materials 4A	MPPMB4	Management Principles and Practice 3B
TRMMCA4	Thermomachines 4A	TMLMCB4	Thermal Systems 4B
MVSMCA4	Advanced Manufacturing Systems 4A	TKNMCB4	Control Systems (Mechanical) 4B

PROGRAMME MODULES

EB25 MODULES: ENGINEERING TECHNOLOGY PROGRAMMES

EB25.1 DIPLOMA MODULES

EB25.1.1 ALPHABETICAL LIST WITH PREREQUISITES

NAME		CODE	PRE-REQUISITE
Business Management 1A		BMA01A1	
Business Management 1B		BMA01B1	
Business Management 2A		BMA02A2	Business Management 1A (BMA01A1)
			Business Management 1B (BMA01B1)
Business Management 2B		BMA02B2	Business Management 1A (BMA01A1)
			Business Management 1B (BMA01B1)
Business Management 3A		BMA03A3	Business Management 2A (BMA02A2)
			Business Management 2B (BMA02B2)
Business Management 3B		BMA03B3	Business Management 2A (BMA02A2)

			Business Management 2B (BMA02B2)
Costing and Estimating 1A		CAE01A1	Refer to Faculty of Economic & Financial Sciences
Costing and Estimating 1B		CAE01B1	Refer to Faculty of Economic & Financial Sciences
End-User Computing 1A		EUC01A1	
End-User Computing 1B		EUC01B1	
Operations Management 1A		OPM11A1	
Operations Management 1B		OPM11B1	
Operations Management 2A		OPM22A2	Operations Management 1A (OPM11A1)
			Operations Management 1B (OPM11B1)
Operations Management 2B		OPM22B2	Operations Management 1A (OPM11A1)
			Operations Management 1B (OPM11B1)
Operations Management 3A		OPM33A3	Operations Management 2A (OPM22A2)
			Operations Management 2B (OPM22B2)
Operations Management 3B		OPM33B3	Operations Management 2A (OPM22A2)
			Operations Management 2B (OPM22B2)
Operations Management Practice 3		OPP3YR3	Operations Management 2A (OPM22A2)
			Operations Management 2B (OPM22B2)
Operations Management Techniques 2A		OPT22A2	STAQTA1
			STAQTB1
Operations Management Techniques 2B		OPT22B2	STAQTA1
			STAQTB1
Operations Management Techniques 3A		OPT33A3	Operations Management Techniques 2A (OPT22A2)
			Operations Management Techniques 2B (OPT22B2)
Operations Management Techniques 3B		OPT33B3	Operations Management Techniques 2A (OPT22A2)
			Operations Management Techniques 2B (OPT22B2)
Opto-Electronics 4	YM	OPE411	
Organisational Effectiveness 1A		ORE11A1	
Organisational Effectiveness 1B		ORE11B1	
Organisational Effectiveness 2A		ORE22A2	Organisational Effectiveness 1A (ORE11A1)
			Organisational Effectiveness 1B (ORE11B1)

Organisational Effectiveness 2B		ORE22B2	Organisational Effectiveness 1A (ORE11A1)
			Organisational Effectiveness 1B (ORE11B1)
Organisational Effectiveness 3A		OEF33A3	Organisational Effectiveness 2A (ORE22A2)
			Organisational Effectiveness 2B (ORE22B2)
Organisational Effectiveness 3B		OEF33B3	Organisational Effectiveness 2A (ORE22A2)
			Organisational Effectiveness 2B (ORE22B2)
Quality Assurance 2A		QAS22A2	
Quality Assurance 2B		QAS22B2	
Quantitative Techniques A		STAQTA1	Refer to Faculty of Science
Quantitative Techniques B		STAQTB1	Refer to Faculty of Science
Systems Analysis and Design 1A		SAD01A1	
Systems Analysis and Design 1B		SAD01B1	
Workplace Dynamics 1A		WPD11A1	
Workplace Dynamics 1B		WPD11B1	

EB25.1.2 MODULE DESCRIPTIONS: DIP PROGRAMMES

EB25.1.2 MODULE DESCRIPTIONS: DIP PROGRAMMES

The outcomes and assessment criteria of each module are stated in the relevant learning guides.

BMA01A1	**BUSINESS MANAGEMENT 1A**		
NQF Level	**5**	**Credits**	**16**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is to introduce students to the main themes and concepts of Business Management. The lectures, discussions and prescribed reading are designed to enable you to understand and analyse these concepts in a practical and basic manner.		
Content	Refer to the Rules and Regulations of the Faculty of Management for information		

BMA01B1	**BUSINESS MANAGEMENT 1B**		
NQF Level	**5**	**Credits**	**16**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of the module is to introduce the learner to the field of General Management and develop a student who can clearly demonstrate a focused knowledge on the issues of the manager and the development of management theory as well as the task of management, namely planning, organising, leading and controlling.		
Content	Refer to the Rules and Regulations of the Faculty of Management for information		

BMA02A2	**BUSINESS MANAGEMENT 2A**		
NQF Level	**5**	**Credits**	**16**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is to provide a well-rounded, broad education that equips students with the knowledge base, theory and methodology of operations management and applied competencies in the mastering, analysis, interpretation and application within this field as well as to provide a basis for further learning		
Content	Refer to the Rules and Regulations of the Faculty of Management for information		

BMA02B2	**BUSINESS MANAGEMENT 2B**

NQF Level	**5**	**Credits**	**16**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is to provide a well-rounded, broad education that equips students with the knowledge base, theory and methodology of financial management and public relations management and applied competencies in the mastering, analysis, interpretation and application within these fields as well as to provide a basis for further learning.		
Content	Refer to the Rules and Regulations of the Faculty of Management for information		

BMA03A3	**BUSINESS MANAGEMENT 3A**		
NQF Level	**6**	**Credits**	**16**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is to prepare students to understand and apply the generic principles of business management and demonstrate a good understanding of relevant knowledge, skills and values required of management students in the context of a developing country.		
Content	Refer to the Rules and Regulations of the Faculty of Management for information		

BMA03B3	**BUSINESS MANAGEMENT 3B**		
NQF Level	**6**	**Credits**	**16**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is to prepare students to understand and apply the generic principles of business management and demonstrate a good understanding of relevant knowledge, skills and values required of management students in the context of a developing country.		
Content	Refer to the Rules and Regulations of the Faculty of Management for information		

CAE01A1	**COSTING AND ESTIMATING 1A**		
NQF Level	**6**	**Credits**	**15**
Refer to the Rules and Regulations of the Faculty of Economic and Financial Sciences for more information on the modules above.			

CAE01B1	**COSTING AND ESTIMATING 1B**		
NQF Level	**6**	**Credits**	**15**
Refer to the Rules and Regulations of the Faculty of Economic and Financial Sciences for more information on the modules above.			

EUC01A1	END-USER COMPUTING 1A		
NQF Level	**5**	**Crediits**	**16**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is to introduce the students to basic IT (information technology) terms, skills and the basic components of a computer. The students will be able to manipulate files and use word processing application to solve business problems and to use presentation software.		
Content	Mouse Training; Basic Concepts of MSWord; Navigating in a Document; Additional Editing Techniques; Character and Paragraph Formatting; Bullets and Numbering; Tables; Controlling Page Appearance; Modifying Margins and Page Breaks; Tools and Printing; Applying a Style; Mail Merge; Basic Concepts of MS PowerPoint; Drawing Tools; Organisational Charts; Slide Master; Slide Show		

EUC01B1	END-USER COMPUTING 1B		
NQF Level	**5**	**Credits**	**16**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	At the end of this module the students will be able to use spreadsheet applications and database application software to solve business problems. The students will also be able to search the internet and utilize e-mail.		
Content	Excel Introduction; Correcting Data & Navigating; Modifying a Workbook; Formatting a Worksheet; Formatting a Worksheet (Borders and Shading); Formulas; Working with Functions; Creating a Simple Charts; Formatting a Chart; Overview of Access; Creating a Tables; Working with Tables; Using Select Queries; Creating and Using Forms; Creating and Using Reports		

OPM11A1	OPERATIONS MANAGEMENT 1A		
NQF Level	**5**	**Credits**	**16**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	To introduce first year students to the science of operations management		
Content	*The following are covered during Module A of the course:* 1 - Appreciate the role and scope of the function in the context of the production of goods and services in either profit oriented or not-for-profit endeavours. 2 - Motivate the responsibility of the Operations /Production Manager in terms of formulation and execution of corporate.		

	3 - Appreciate the need to develop and implement a product strategy that meets the demands of the market. 4 - Select and apply a suitable forecasting technique to facilitate decision-making. 5 - Convey the main considerations relative to the planning of capacity for a given production system. 6 - Determine the best way to meet forecasted demand by adjusting controllable production variables to minimise cost over the planning period. 7 - Appreciate the need and importance for short term scheduling within the parameters of the aggregate and capacity plans. 8 - Appreciate that Project management is an integrated management methodology allowing for the employment of dedicated resources for a restricted time and specific objective. 9 - Appreciate the role of the Human resource (HR) in OM.

OPM11B1	**OPERATIONS MANAGEMENT 1B**		
NQF Level	**5**	**Credits**	**16**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	To introduce first year students to the science of operations management.		
Content	Appreciate the strategic and operational implications of location selection. Develop an economic layout that will meet the firm's competitive requirements. Appreciate the essential characteristics of the supply chain in OM. Appreciate the role of investment in inventory in the execution of a business strategy. Recognize MRP as a dependant inventory management technique. Grasp the philosophy of Just-In-Time (JIT) as a factor in pursuing a competitive advantage. Appreciate the necessity for maintenance to ensure reliability of production systems		

OPM22A2	**OPERATIONS MANAGEMENT 2A**		
NQF Level	**6**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	Upon the completion of this module a student shall possess a sound understanding and the ability to construct and analyse an aggregate production plan. The student is also able to understand the importance of quality and inventory management and use the seven tools of total quality management.		
Content	Understand the concept of aggregate planning and the various aggregate planning strategies; Construct and understand aggregate production plan; Discuss aggregate planning in services; Discuss the importance of quality, the four types of quality costs; Discuss the seven		

	tools of TQM and the seven concepts for an effective TQM program; Discuss TQM in services; Discuss the functions of inventory and how inventory is managed; Discuss inventory models for independent demand.

OPM22B2	**OPERATIONS MANAGEMENT 2B**		
NQF Level	**6**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	Upon the successful completion of this module a student shall possess a sound understanding of the just in time and lean production concepts, materials requirements planning and short term scheduling. A student will thus be able to construct a basic materials requirements plan and do short term scheduling.		
Content	Describe or define Just in Time and lean production; The JIT requirements and goals of JIT partnerships; JIT in services; The nature and strategies of aggregate planning; The transportation method of linear programming; Aggregate planning in services; Scheduling issues in short term scheduling; Loading and sequencing jobs; Theory of constraints and scheduling services.		

OPM33A3	**OPERATIONS MANAGEMENT 3A**		
NQF Level	**6**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is to develop students who can demonstrate focused and fundamental knowledge on the various concepts used in project management and the ability to use project management concepts to handle daily tasks. A student will also be able to understand how operations can be improved, how to prevent operations from failing and the various ways in which an operations can recover from failure.		
Content			

OPM33B3	**OPERATIONS MANAGEMENT 3B**		
NQF Level	**6**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	Upon the successful completion of this module a student shall possess a sound understanding of supply chain management and be able to analyse case studies efficiently and offer solutions to solve the problems identified in the case study. A student will also be able to do simple material requirements planning on a basic business planning and control system.		

Content	Understand what is supply chain management and its related activities; How can the relationships in the supply chain affect the way it works; The different supply chain objectives needed in different circumstances; Analyse case studies and offer solutions; Prepare and analyse materials requirements planning using a basic business planning and control software.

OPP3YR3	**OPERATIONS MANAGEMENT PRACTICE 3**		
NQF Level	**6**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	A student who has completed his / her experiential training will show and provide that he / she have acquired the necessary knowledge to apply and integrate the concepts to all areas contributing to operations management. This includes understanding and applications of concepts, such as quality, planning, scheduling, productivity, etc. On a practical level the student will be able to analyse and apply these concepts in an organisation to achieve optimal performance.		
Content	This practical component encompasses all the applied operations management principles discussed and explained in the National Diploma in Operations Management curriculum		

OPT22A2	**OPERATIONS MANAGEMENT TECHNIQUES 2A**		
NQF Level	**6**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is to provide students with the knowledge, numerical and analytical skills and value orientation essential for effective and efficient applications of quantitative techniques to production and other problems.		
Content			

OPT22B2	**OPERATIONS MANAGEMENT TECHNIQUES 2B**		
NQF Level	**6**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is to provide learners with the knowledge and applications of some quantitative techniques models applied in operations.		
Content	Understand the Queuing Models and its application to solving practical problems, involving waiting line with the aim of minimizing cost associated to waiting line; Formulation of various Linear Programming (LP) problems; Determine the optimal solution mix by use of the graphical method and simplex technique; Determine the appropriate		

	Network Model to use: and solve network related problems; Understand and be able to formulate Project Management networks.

OPT33A3	**OPERATIONS MANAGEMENT TECHNIQUES 3A**		
NQF Level	**6**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	Upon the successful completion of this module a student shall possess sound understanding of be able to recognize and implement applicable manufacturing / service planning and control system quantitative / qualitative strategies for an organisation. The purpose of this module is to expose learners to theoretical (conceptual) and practical (problem-solving) techniques used to handle operations management problem in industry and commerce for todays and future organisations. All organisations - be they private, public or NGOs - are involved in producing a product or service that has to be 'sold' or consumed by some customer. Operations Management Techniques provides decision making techniques and models needed for assisting in the efficient running of organisations. The course will seek to pinpoint the need for an integrated framework that incorporates the design, organisation, planning, control and continuous improvement of all value-adding operations of any organisation. To achieve such a task, Operations Management techniques focuses on optimising all internal processes and resources in the context of resources constraints. The overriding aim is for the organisation to offer products or services that are cost competitive, of consistently high quality, and meet the dynamic delivery objectives of flexibility, dependability and speed. As a result, most of the Operations Management technique principles can be used in any organisation be it in private, public or not-for-profit sectors.		
Content	Formulation of various Linear Programming models (LP) ; Determine the optimal solution mix applying LP models; Perform LP Sensitivity Analysis for LP models; Formulate and solve Integer Programming models.		

OPT33B3	**OPERATIONS MANAGEMENT TECHNIQUES 3B**		
NQF Level	**6**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	Upon the successful completion of this module a student shall possess sound understanding of be able to recognize and implement applicable manufacturing / service planning and control system quantitative / qualitative strategies for an organisation. The purpose of this module is to expose learners to theoretical (conceptual) and practical (problem-solving) techniques used to handle operations management problem in industry and commerce for todays and future organisations. All organisations - be they private, public or NGOs - are involved in producing a product or service that has to be 'sold' or consumed by some customer.		

	Operations Management Techniques provides decision making techniques and models needed for assisting in the efficient running of organisations. The course will seek to pinpoint the need for an integrated framework that incorporates the design, organisation, planning, control and continuous improvement of all value-adding operations of any organisation. To achieve such a task, Operations Management techniques focuses on optimising all internal processes and resources in the context of resources constraints. The overriding aim is for the organisation to offer products or services that are cost competitive, of consistently high quality, and meet the dynamic delivery objectives of flexibility, dependability and speed. As a result, most of the Operations Management technique principles can be used in any organisation be it in private, public or not-for-profit sectors.
Content	Quality Management Techniques; Simulation; Maintenance and reliability techniques ; Dynamic Programming

ORE22A2	**ORGANISATIONAL EFFECTIVENESS 2A**		
NQF Level	**6**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is provide the students with a sound understanding of the concepts, techniques and applications of management services techniques for the improvement of productivity in organisations. South African businesses need improvement on quality, processes, performance and layout to ensure organisational efficiency and effectiveness. The student will be able to know on how to function as an advisor to management, supervisory levels and staff within the organisation. The student also will be able to identify and investigate factors that hamper productivity in the organisation, offer alternatives and formally report such findings and recommendations. He or she will also able to select the appropriate direct work measurement technique(s) to measure the work content of a given task, taking into consideration the human factor and the impact of technology on the human environment.		
Content	Role of management services – introduction to management services; Productivity concepts and calculations; Restricted work - Time study; Activity sampling; Rated activity sampling; Production study; Presentations ; Report writing		

ORE22B2	**ORGANISATIONAL EFFECTIVENESS 2B**		
NQF Level	**6**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is provide the students with a sound understanding of the concepts, techniques and applications of management services techniques for the improvement of productivity in organisations.		

	South African businesses need improvement on quality, processes, performance and layout to ensure organisational efficiency and effectiveness. The student will be able to know on how to function as an advisor to management, supervisory levels and staff within the organisation. The student also will be able to identify and investigate factors that hamper productivity in the organisation, offer alternatives and formally report such findings and recommendations. He or she will also able to select the appropriate direct work measurement technique(s) to measure the work content of a given task, taking into consideration the human factor and the impact of technology on the human environment.
Content	Measurement of Indirect Work; Analytical and Comparative Estimating; Synthesis; Labour Control; Form design; Presentations; Report writing

ORE11A1	**ORGANISATIONAL EFFECTIVENESS 1A**		
NQF Level	**5**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is provide the learners with a sound understanding of the concepts, techniques and applications of management services techniques for the improvement of productivity in organisations. South African businesses need improvement on quality, processes, performance and layout to ensure organisational efficiency and effectiveness The learner will be able to know on how to function as an advisor to management, supervisory levels and staff within the organisation. The learner also will be able to identify and investigate factors that hamper productivity in the organisation, offer alternatives and formally report such findings and recommendations. He or she will also able to use method study to make improvements on the performance of employees, taking into consideration the human factor and the impact of technology on the human environment.		
Content	Role of management services – introduction to management services; Productivity; Presentations; Report writing; Ergonomics - Environmental factors and climatic conditions; Method study		

ORE11B1	**ORGANISATIONAL EFFECTIVENESS 1B**		
NQF Level	**5**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is provide the learners with a sound understanding of the concepts, techniques and applications of work measurement techniques for the improvement of productivity in organisations. South African businesses need improvement on quality, processes, performance and layout to ensure organisational efficiency and effectiveness. The learner will be able to know on how to function as an advisor to management, supervisory levels and staff within the organisation. The		

	learner also will be able to identify and investigate factors that hamper productivity in the organisation, offer alternatives and formally report such findings and recommendations. He or she will also able to use work measurement study to make improvements on the performance of employees, taking into consideration the human factor and the impact of technology on the human environment.
Content	General Remarks on work measurement; Time study – the equipment; Time study – selecting and timing the job; Time study – rating; Time study – from study to standard time; The use of standard time

ORE33A3	**ORGANISATIONAL EFFECTIVENESS 3A**		
NQF Level	**6**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is to provide the learners with a sound understanding of the concepts: individuals and groups and their impact to organisational effectiveness. South African businesses need improvement on their structures, systems, workflow, job designs and human resources to ensure organisational efficiency and effectiveness. A learner who has completed this module will be able to know and apply the necessary knowledge and skills to assist and advise management by having a better understanding of the interventions used in dealing with factors affecting organisational effectiveness		
Content	Individuals and Groups		

ORE33B3	**ORGANISATIONAL EFFECTIVENESS 3B**		
NQF Level	**6**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is to provide the learners with a sound understanding of the concepts: individuals and groups and their impact to organisational effectiveness. South African businesses need improvement on their structures, systems, workflow, job designs and human resources to ensure organisational efficiency and effectiveness. A learner who has completed this module will be able to know and apply the necessary knowledge and skills to assist and advise management by having a better understanding of the interventions used in dealing with factors affecting organisational effectiveness.		
Content	Individuals and Groups		

QAS22A2	**QUALITY ASSURANCE 2A**
Refer to the Learning Guide for more information on the module.	

QAS22B2	**QUALITY ASSURANCE 2B**

Refer to the Learning Guide for more information on the module.

STAQTA1	**QUANTITATIVE TECHNIQUES A**
Refer to the Rules and Regulations of the Faculty of Sciences for more information	

STAQTB1	**QUANTITATIVE TECHNIQUES B**
Refer to the Rules and Regulations of the Faculty of Sciences for more information	

SAD01A1	**SYSTEMS ANALYSIS AND DESIGN 1A**		
NQF Level	**5**	**Credits**	**16**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is to be able to identify opportunities for and utilise the computer as a business tool as well as describe common elements of information systems and the movement of data through the system		
Content			

SAD01B1	**SYSTEMS ANALYSIS AND DESIGN 1B**		
NQF Level	**5**	**Credits**	**16**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of this module is to provide fundamental knowledge of the areas covered for those working in, or entering the workplace in the area of Systems Development.		
Content			

WPD11A1	**WORK PLACE DYNAMICS 1A**		
NQF Level	**5**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of the module is to develop academic students who can demonstrate a focused knowledge base and theory of Work place dynamics as a production management function within the organization by remembering and applying the issues of organization behaviour, productivity, efficiency and effectiveness in terms of the Individual, Groups and the Organization and how they can co-exist in the business environment.		
Content	What is organization dynamics; Foundations of individual behaviour; Values, attitudes and job satisfaction; Personality and emotions; Perceptions and individual decision making; Basic motivation; Group behaviour and team work; Leadership and trust; Communication; Power and politics; Conflict and negotiations		

WPD11B1	WORK PLACE DYNAMICS 1B		
NQF Level	**5**	**Credits**	**15**
Calculation Criteria	Minimum Full Period Mark for Examination Admission – 40% Full Period Mark Weight – 50% Examination Mark Weight – 50%		
Purpose	The purpose of the module is to develop academic students who can demonstrate a focused knowledge base and theory of Work place dynamics as a production management function within the organization by remembering and applying the issues of organization behaviour, communication, conflict management, negotiation process, human resource practices, motivation, organisation culture, change and stress management in terms of the Individual, Groups and the Organization and how they can co-exist in the business environment..		
Content	Basic communication; Conflict and negotiation; Human Resource practice; Motivation; Organisational culture; Change an stress management		

EB25.2 BENGTECH AND BACHELORS MODULES

EB25.2.1 ALPHABETICAL LIST WITH PREREQUISITES

NAME	YM or SM	CODE	PRE-REQUISITE	CODE
Active Citizenship 1A	SM	ACSHUA1		
Advanced Engineering Materials 3B	SM	AMAMTB3	Physical Metallurgy 2B	PMTMTB2
Advanced Planning Theory 3B	SM	APTTRB3		
Algorithms/Programming 1A	SM	ALGELA1		
Algorithms/Programming 1B	SM	ALGELB1		
Analysis Of Prices And Estimating 3	YM	APECOY0	Construction Technology 1B, Construction Technology 2, Descriptive Quantification 1B, Descriptive Quantification 2	CTCCO1B, CTCCOY0, DQUAN1B, DQUANY0
Analytical Techniques 2A	SM	PSTMTA2	Engineering Chemistry (Metallurgy) 1B	CETM1B1
Applied Strength Of Materials 2B	SM	ASMMIB2	Strength of Materials 1B	STRMIB1
Applied Thermodynamics 2B	SM	ATDCHB2	Chemical Thermodynamics 2A	CTDCHA2
Architectural Design 1B	SM	ARCTRB1		
Autocad 1B	SM	ACDMIB1		
Automatic Control 3B	SM	AUCMIB3		

Automation 3A	SM	AUTELA3		
Automation 2B	SM	AUTMIB2		
Basic Science (Applied Mechanics) 1A	SM	APMCIA1		
Building Structures 2	YM	SCTCOY0	Construction Science	PHYB1Y1
Building Structures 3	YM	SCTCO3Y	Building Structures 2	SCTCOY0
Capstone Civil Design Project Gp1 3B	SM	CDPCIB3	All previous semester modules in the group	CMGCIA3, PJMCIA3, RCDCIA3, RCSCIA3, SMDCIA3
Capstone Civil Design Project Gp2 3B	SM	CDSCIB3	All previous semester modules in the group	CMGCIA3, PJMCIA3, RCDCIA3, RCSCIA3, SMDCIA3
Casting Design And Simulation 3B	SM	CDSMTB3	Foundry Technology 3A	FOUMTA3
Chemical Engineering Fundamentals 2A	SM	CEFCHA2	Chemical Engineering Fundamentals 1B	CEFCHB1
Chemical Engineering Fundamentals 1B	SM	CEFCHB1	Engineering Chemistry (Chemical) A1, Engineering Mathematics A1	CETE1A1, MATE1A1
Chemical Engineering Laboratory 2A	SM	CELCHA2		
Chemical Engineering Laboratory 2B	SM	CELCHB2	Chemical Engineering Laboratory 2A	CELCHA2
Chemical Engineering Laboratory 3B	SM	CELCHB3	Chemical Engineering Laboratory 2B	CELCHB2
Chemical Process Technology 1A	SM	CPTCHA1		
Chemical Process Technology 1B	SM	CPTCHB1	Chemical Process Technology 1A	CPTCHA1
Chemical Thermodynamics 2A	SM	CTDCHA2	Engineering Chemistry (Chemical) 1A	CETE1A1
Chemistry For Miners 1B	SM	CHMMNB1		
Civil Engineering Drawing 1A	SM	CDRCIA1		
Civil Engineering For Planners 1B	SM	CIPTRB1		
Coal Processing 3A	SM	CPRMTA3	Mineral Processing 2B	MPRMTB2
Complementary Studies 3A	SM	CPSHUA3		
Complementary Studies 2B	SM	CPSHUB2		
Computer Aided Design 1B	SM	CADMIB1		
Computer Aided Design (Civil) Gp1 3B	SM	CADCIB3	All previous semester modules in the group	CMGCIA3, PJMCIA3, RCDCIA3,

				RCSCIA3, SMDCIA3
Computer Aided Drawing 1B	SM	CDRCIB1		
Computer Aided Structural Design Gp2 3B	SM	CASCIB3	All previous semester modules in the group	CMGCIA3, PJMCIA3, RCDCIA3, RCSCIA3, SMDCIA3
Computer Application: Introduction To Autocad 1B	SM	CPATRB1		
Computer Applications: Advanced Autocad 3A	SM	CPATRA3		
Computer Applications:GIS 2A	SM	CPATRA2		
Computer Skills 1A	SM	CPSELA1		
Concrete Technology 2A	SM	CRTCIA2		
Construction Accounting 2	YM	CACCOY0		
Construction Drawing 1A	SM	CDRCOA1		
Construction Economics 3	YM	CECCOY0	Economics 1A and 1B	ECO01A1, ECO01B1
Construction Law 3A	SM	CLWCOA3	Construction Law 2B	CLWCOB2
Construction Law 2B	SM	CLWCO2B		
Construction Management 2	YM	CMGCOY0	Construction Management 1A	CMGCO1A
Construction Management 3	YM	CMGCO3Y	Construction Management 2	CMGCOY0
Construction Methods And Safety 1B	SM	CMSCIB1		
Construction Science 1	YM	PHYB1Y1		
Construction Technology 1B	SM	CTCCO1B	Construction Drawing 1A	CDRCO1A
Construction Technology 2	YM	CTCCOY0	Construction Technology 1B	CTCCO1B
Construction Technology 3	YM	CTCCO3Y	Construction Technology 2	CTCCOY0
Contract Management Gp1 3A	SM	CMGCIA3	Documentation 2B	DOCCIB2
Control Systems 3B	SM	CSTELB3		
Corrosion Technology 3A	SM	CORMTA3	Engineering Chemistry (Metallurgy) 1B	CETM1B1
Digital Systems 2A	SM	DIGSTA2		
Digital Systems 1B	SM	DIGST1B		
Digital Systems 2B	SM	DIGSTB2		
Documentation 2B	SM	DOCCIB2	Management (Human Capital) 2A	MGTCIA2
Economics For Planners 2A	SM	ECPTRA2		
Electrical Project 3A	SM	PJEELA3		

Electrical Project 2B	SM	PJEELB2		
Electrical Project 3B	SM	PJEELB3		
Electrochemistry 2B	SM	ECHMTB2	Engineering Chemistry (Metallurgy) 1B	CETM1B1
Electronic Circuits 2A	SM	ELCELA2		
Electronic Circuits 1B	SM	ELCELB1		
Electrical Engineering 1A	SM	ELTENA1		
Electrical Engineering 1B	SM	ELTENB1		
Electrotechnology 2A	SM	ELTELA2		
Engineering Chemistry (Chemical) 1A	SM	ECCSCA1		
Engineering Chemistry (Chemical) 1B	SM	ECCSCB1		
Engineering Chemistry (Metallurgy) 1A	SM	ECMSCA1		
Engineering Chemistry (Metallurgy) 1B	SM	ECMSCB1		
Engineering Communication Skills 1A	SM	ECSHUA1		
Engineering Communication Skills 1B	SM	ECSHUB1		
Engineering Drawing 1A	SM	EDRMIA1		
Engineering Drawing 1B	SM	EDRMIB1		
Engineering Geology (Civil) 1B	SM	GCISCB1		
Engineering Geology (Construction) 2B	SM	GLGB2B2		
Engineering Geology (Metallurgy) 2A	SM	GMESCA2		
Engineering Geology (Metallurgy) 2B	SM	GMESCB2		
Engineering Geology (Mining) 2A	SM	GMISCA2		
Engineering Management (Chemical) 3A	SM	EMGCHA3		
Engineering Management (Industrial) 3A	SM	EMGMIA3		
Engineering Management (Mine) 3A	SM	MGTMNA3		
Engineering Management (Mine) 2B	SM	MGTMNB2		
Engineering Mathematics 1A	SM	MATE1A1		
Engineering Mathematics 2A	SM	MATE2A2	Engineering Mathematics 1B	MATE1B1
Engineering Mathematics 1B	SM	MATE1B1	Engineering Mathematics 1A	MATE1A1
Engineering Physics (Chemical) 1A	SM	PHYSCA1		

Engineering Physics (Electrical) 1B	SM	PHYSCB1		
Engineering Physics 1A	SM	PHASCA1		
Engineering Physics 1B	SM	PHASCB1		
Engineering Statistics 1A	SM	STASCA1		
Engineering Statistics 1B	SM	STASCB1		
Engineering Statistics 1B	SM	STAE1B1		
Engineering Work Study 1B	SM	EWSMIB1		
Entrepreneurship 3B	SM	ENTMIB3		
Environmental Engineering 3B	SM	ENVCHB3		
Environmental Management 1A	SM	ENVMNA1		
Environmental Management 2B	SM	EMVMNB2		
Environmental Science And Management 3B	SM	ESMTRB3		
Ethics And Community Studies 3B	SM	ETHHUB3		
Facility Lay Out And Materials Handling 2B	SM	FACMIB2		
Ferroalloy Production 3B	SM	FAPMTB3	Pyrometallurgy 3A, Metallurgical Thermodynamics 2B	PYRMTA3, MTDMTB2
Ferrous Metallurgy 3A	SM	FMEMTA3	Electrochemistry 2B, Metallurgical Thermodynamics 2B	ECHMTB2, MTDMTB2
Final Year Project 3A	SM	PJIMIA3		
Final Year Project 3B	SM	PJIMIB3		
Fluid Mechanics 2A	SM	FLMMIA2		
Fluid Mechanics 3A	SM	FLMMIA3	Fluid Mechanics 2A	FLMMIA2
Foundry Technology 3A	SM	FOUMTA3	Physical Metallurgy 2B	PMTMTB2
Fundamentals Of Metallurgy 1B	SM	METMTB1		
Geography For Planning 1A	SM	GEPTRA1		
Geotechnical Engineering 2A	SM	GTECIA2		
Geotechnical Engineering 2B	SM	GTECIB2	Geotechnical Engineering 2A	GTECIA2
Heat & Mass Transfer 2A	SM	HMTMTA2	Engineering Physics 1A, Engineering Chemistry (Metallurgy) 1B	PHYE1A1, CETM1B1
History And Principles Of Planning 1A	SM	PLNTRA1		
Housing Development 2B	SM	HDETRB2		
Hydraulic Machines 2B	SM	HYMMIB2	Fluid Mechanics 2A	FLMMIA2
Hydraulics 2A	SM	HYDCIA2	Science (Fluid Mechanics) 1B	FLMCIB1

Hydrology 2B	SM	HYOCIB2		
Hydrometallurgy 3A	SM	HMEMTA3	Electrochemistry 2B, Metallurgical Accounting 2A	ECHMTB2, MEAMTA2
Industrial Accounting 2B	SM	IACMIB2		
Industrial Minerals 3B	SM	INMMTB3	Engineering Geology (Metallurgy) 2B	GMESCB2
Information Systems 2B	SM	INFMIB2	Computer Skills 1A	CPSELA1
Innovation And Entrepreneurial Skills 3B	SM	IESCHB3		
Introduction To Computer Studies 1A	SM	CPSTRA1		
Economics (Construction) 1	YM	ICECOY1		
Introduction To Land Surveying 1B	SM	LSVTRB1		
Introduction To Reactor Design 3A	SM	IRDCHA3	Engineering Mathematics 2A	MATE2A2
Investigative Project 3B	SM	IPJCHB3	All second year modules	ATDCHB2, CEFCHA2, CELCHA2, CELCHB2, CTDCHA2, MATE2A2, PFFCHA2, PRCCHB2, PRDCHB2, TPRCHA2, UNOCHB2
Land Economics And Tenure System 2B	SM	LATTRB2		
Legal Principles: Development Control And Settlement Disputes 2B	SM	LDCTRB2		
Legal Principles: Planning Laws And Administration 2A	SM	LPLTRA2		
Logistics Engineering 3B	SM	LOGMIB3		
Machine Design 2B	SM	MADMIB2	Mechanical Engineering Design 2A	MDSMIA2
Machines 3A	SM	EMAEL3A		
Management 1B	SM	MGTCIB1		
Management (Human Capital) 2A	SM	MGTCIA2	Management 1B	MGTCIB1
Management In Planning 3B	SM	MGTTRB3		
Manufacturing Systems Design 2A	SM	MFDMIA2	Mechanical Manufacturing Engineering 1B	MANMIB1
Material Science 2A	SM	MATMIA2		

Material Testing 2A	SM	MTTMTA2	Engineering Physics 1B, Metallurgy Engineering Practice 1B	PHYE1B1, MPRMTB1
Material Testing 2B	SM	MTTMTB2	Material Testing 2A	MTTMTA2
Measurement Mathematics 1A	SM	MEASCA1		
Measurement Mathematics 1B	SM	MEASCB1		
Descriptive Quantification 1B	SM	DQUANB1		
Descriptive Quantification 2	YM	DQUANY2	Descriptive Quantification 1B	DQUANB1
Descriptive Quantification 3	YM	DQUANY3	Descriptive Quantification 2	DQUANY2
Mechanical Deformation Technologies 3A	SM	MDEMTA3	Physical Metallurgy 2B, Mechanical Metallurgy 2B	PMTMTB2, MMEMTB2
Mechanical Engineering Design 2A	SM	MDSMIA2	Mechanical Engineering Drawing 1A	MDRMIA1
Mechanical Engineering Design Project 3A	SM	PJMMIA3	Machine Design 2B, Mechanical Engineering Design 2A	MADMIB2, MDSMIA2
Mechanical Engineering Design Project 3B	SM	PJMMIB3	Mechanical Engineering Design Project 3A	PJMMIA3
Mechanical Engineering Drawing 1A	SM	MDRMIA1		
Mechanical Manufacturing 1B	SM	WKSMIB1		
Mechanical Manufacturing And Workshop Practice 2A	SM	WKSMIA2	Mechanical Manufacturing 1B	WKSMIB1
Mechanical Manufacturing Engineering 1B	SM	MANMIB1		
Mechanical Metallurgy 2A	SM	MMEMTA2	Engineering Physics 1B	PHYE1B1
Mechanical Metallurgy 2B	SM	MMEMTB2	Mechanical Metallurgy 2A	MMEMTA2
Mechanics Of Machines 3A	SM	MEMMIA3	Theory of Machines 2B	TMAMIB2
Mechatronics & Control 2B	SM	MCCELB2		
Metallurgical Accounting 2A	SM	MEAMTA2	Fundamentals of Metallurgy 1B, Engineering Chemistry (Metallurgy) 1B	METMTB1, CETM1B1
Metallurgical Project 3B	SM	PEMMTB3	Project Methodology 3A	PRMMTA3
Metallurgical Thermodynamics 2B	SM	MTDMTB2	Engineering Chemistry (Metallurgy) 1B, Fundamentals of Metallurgy 1B	CETM1B1, METMTB1
Metallurgy Engineering Practice 1B	SM	MPRMTB1		
Mine Design And Valuation Project 3B	SM	DVPMSB3		
Mine Engineering 2A	SM	MINMNA2		
Mine Equipment 2B	SM	MEQMNB2		

Mine Planning And Design 3A	SM	MPDMNA3		
Mine Surveying 1A	SM	MSVMSA1		
Mine Surveying 3A	SM	MSVMSA3		
Mine Surveying 2B	SM	MSVMSB2		
Mine Surveying 3B	SM	MSVMSB3		
Mine Surveying (Practice) 1B	SM	SWKMSB1		
Mine Surveying (Practice) 2B	SM	SWKMSB2		
Mine Surveying Workshop 3A	SM	SWKMSA3		
Mine Surveying Workshop 3B	SM	SWKMSB3		
Mineral Beneficiation 2A	SM	MBEMNA2		
Mineral Processing 2A	SM	MPRMTA2	Fundamentals of Metallurgy 1B	METMTB1
Mineral Processing 2B	SM	MPRMTB2	Mineral Processing 2A	MPRMTA2
Mineral Reserve Evaluation 2A	SM	MREMSA2		
Mineral Resource Evaluation 3A	SM	MREMSA3		
Mineral Resource Evaluation 2B	SM	MREMSB2		
Mineral Resource Legislation 3A	SM	MRLMSA3		
Mining 3A	SM	MINMNA3		
Mining Coal 2A	SM	COAMNA2		
Mining Economics Valuation 2B	SM	MEVMSB2		
Mining Legislation 3A	SM	MLEMNA3		
Mining Metal 2A	SM	MMEMNA 2		
Mining Surface 2A	SM	SMMMNA 2		
Mining Technical Services 2B	SM	MTSMNB2		
Multistage Operations 3A	SM	MSOCHA3	Unit Operations 2B	UNOCHB2
Networks 2B	SM	NETELB2		
Non-Ferrous Metallurgy 3A	SM	NFMMTA3	Electrochemistry 2B, Metallurgical Thermodynamics 2B	ECHMTB2, MTDMTB2
Operational Research 2B	SM	OPRMIB2		
Particle Technology 3A	SM	PTECHA3	Process Fluid Flow 2A	PFFCHA2
Physical Metallurgy 2A	SM	PMTMTA2	Fundamentals of Metallurgy 1B	METMTB1
Physical Metallurgy 2B	SM	PMTMTB2	Physical Metallurgy 2A	PMTMTA2
Planning Design: Advanced Strategic And Spatial Planning 3B	SM	ASSTRB3		
Planning Design: Introduction To Planning Survey 1B	SM	PLSTRB1		

Planning Design: Neighbourhood Design And Site Planning 2A	SM	NDSTRA2		
Planning Design: Spatial Planning /SDF 3A	SM	SPSTRA3		
Planning Design: Techniques Of Drawing 1A	SM	DRWTRA1		
Planning Design: Urban Renewal 2B	SM	URBTRB2		
Population And Urbanization Studies 1B	SM	PUSTRB1		
Powder Metallurgy And Ceramic Material 3B	SM	PMCMTB3	Physical Metallurgy 2B	PMTMTB2
Power Systems 3A	SM	POWSTA3		
Power Electronics 3B	SM	POWERB3		
Pre-Stressed Concrete Design Gp2 3B	SM	PSCCIB3	Reinforced Concrete Design Gp2 3A	RCDCIA3
Principles Of Management & Economics 3B	SM	PMEMTB3		
Principles Of Sustainability 3B	SM	SUSCIB3		
Process Automation 3A	SM	PCAELA3		
Process Control 2B	SM	PRCCHB2		
Process Control 3B	SM	PRCCHB3	Process Control 2B	PRCCHB2
Process Control (Metallurgy) 3B	SM	PRCMTB3		
Process Design 3A	SM	PRDCHA3	Process Design 2B	PRCCHB2
Process Design 2B	SM	PRDCHB2	Chemical Engineering Fundamentals 1B, Transfer Processes 2A	CEFCHB1, TPRCHA2
Process Design (Metallurgy) 3B	SM	PRDMTB3	Heat and Mass Transfer 2A, Process Engineering 2B	HMTMTA2, PREMTB2
Process Engineering 2B	SM	PREMTB2	Engineering Physics 1B	PHYE1B1
Process Fluid Flow 2A	SM	PFFCHA2		
Production Engineering 2A	SM	PDEMIA2	Mechanical Manufacturing Engineering 1B	MANMIB1
Production Of Iron And Steel 3A	SM	PISMTA3	Metallurgical Thermodynamics 2B	MTDMTB2
Production Technology 3A	SM	PDTMIA3	Production Engineering 2A	PDEMIA2
Project Engineering 3A	SM	PENMIA3		
Project Management (Civil) 3A	SM	PJMCIA3	Documentation 2B	DOCCIB2
Project Management (Electrical) 3A	SM	PJMELA3		
Project Management (Metallurgy) 3B	SM	PMGMTB3		

Project Methodology 3A	SM	PRMMTA3		
Project Planning And Management 3B	SM	PPMTRB3		
Project Research 3A	SM	PRSMIA3		
Pyrometallurgy 3A	SM	PYRMTA3	Metallurgical Thermodynamics 2B	MTDMTB2
Quality Assurance 2A	SM	QUAMIA2		
Quality Management Systems 3A	SM	QMSMIA3	Quality Assurance 2A	QUAMIA2
Quality Techniques 2B	SM	QUAMTB2	Engineering Mathematics 1B	MATE1B1
Quantitative Techniques In Planning 2A	SM	QTPTRA2		
Refractory Technology 3B	SM	REFMTB3	Production of Iron and Steel 3A, Metallurgical Thermodynamics 2B	PISMTA3, MTDMTB2
Refrigeration And Air Conditioning 3B	SM	RACMIB3	Thermodynamics 3A	TRDMIA3
Regional Analysis And Development Planning 3A	SM	RADTRA3		
Reinforced Concrete Design Gp1 3A	SM	RCSCIA3	Structural Analysis 2B	STRCIB2
Reinforced Concrete Design Gp2 3A	SM	RCDCIA3	Structural Analysis 2B	STRCIB2
Research Techniques In Planning 3A	SM	RESTRA3		
Rock Mechanics 3A	SM	RMEMNA3		
Rock Mechanics 2B	SM	RMEMNB2		
Rural Land Use And Development Planning 2B	SM	RLUTRB2		
Science (Fluid Mechanics) 1B	SM	FLMCIB1	Engineering Mathematics A1	MATE1A1
Sensors And Devices 2A	SM	SENELA2		
Site Surveying 2A	SM	SSVMSA2		
Sociology And Planning 3A	SM	SOCTRA3		
Software Engineering 2A	SM	SWEELA2		
Soil Mechanics 2A	SM	SMECIA2		
Special Study Project 3B	SM	SSPMNB3		
Steam Plant 2B	SM	SPLMIB2		
Strength Of Materials 3A	SM	STRMIA3	Applied Strength of Materials 2B	ASMMIB2
Strength Of Materials 1B	SM	STRMIB1		
Stress Analysis 3B	SM	SANMIB3	Strength of Materials 3A	STRMIA3
Structural Analysis 2B	SM	STRCIB2	Theory of Structures 1B	TSTCIB1
Structural Analysis Gp2 3A	SM	STRCIA3	Structural Analysis 2B	STRCIB2

Structural Analysis Gp2 3B	SM	STRCIB3	Structural Analysis Gp2 3A	STRCIA3
Structural Geology 2B	SM	SGEMNB2		
Structural Steel Design Gp2 3A	SM	SSDCIA3	Structural Analysis 2B	STRCIB2
Structure And Properties Of Alloy 2A	SM	ALLMTA2	Fundamentals of Metallurgy 1B	METMTB1
Survey Draughting 1A	SM	SDRMSA1		
Surveying 1A	SM	SURCIA1		
Surveying 1B	SM	SURCIB1	Surveying 1A	SURCIA1
Surveying 1B	SM	SUCCOB1		
System Dynamics 3B	SM	SYSMIB3	Automation 2B	AUTMIB2
Technical Graphics 1A	SM	TGRMIA1		
Technology Management 3B	SM	TMGELB3		
Theory Of Machines 2B	SM	TMAMIB2	Engineering Physics 1B	PHYE1B1
Theory Of Structures 1B	SM	TSTCIB1	Basic Science ( ) 1A	APMCIA1
Thermodynamics 2A	SM	TRDMIA2	Engineering Physics 1B	PHYE1B1
Thermodynamics 3A	SM	TRDMIA3	Thermodynamics 2A	TRDMIA2
Thermofluids 1B	SM	THFMIB1		
Timber And Masonry Design Gp2 3A	SM	SMDCIA3	Structural Analysis 2B	STRCIB2
Tourism And Recreation Planning 3B	SM	TOUTRB3		
Transfer Processes 2A	SM	TPRCHA2		
Transportation Engineering 2A	SM	TRACIA2	Surveying 1B	SURCIB1
Transportation Engineering 2B	SM	TRACIB2	Transportation Engineering 2A	TRACIA2
Transportation Gp1 3A	SM	TRACIA3	Transportation Engineering 2B	TRACIB2
Transportation Planning 2A	SM	TRATRA2		
Turbo Machines 3B	SM	TRMMIB3		
Underground Mining Methods 2A	SM	UMMMNA 2		
Unit Operations 2B	SM	UNOCHB2	Transfer Processes 2A	TPRCHA2
Urban Land Use And Development Planning 2B	SM	ULUTRB2		
Ventilation 3A	SM	VENMNA3		
Ventilation 2B	SM	VENMNB2		
Water & Waste Water Engineering Gp1 3B	SM	WWWCIB3		
Water Reticulation Design Gp1 3A	SM	WRDCIA3	Hydraulics A2	HYDCIA2
Signals and Systems 2A	SM	SIGSTA2		
Signals and Systems 3A	SM	SIGSTA3		
Welding Technology 3B	SM	WLDMTB3		

Workshop Practice 1B	SM	WKSMNB1		
Workshop Skills 1A	SM	WKSEL1A		
Workshop Skills 1B	SM	WKSEL1B		

EB25.2.2 MODULE LIST WITH DESCRIPTIONS

BACHELOR & BENGTECH MODULES

EB25.2.2 MODULE LIST WITH DESCRIPTIONS

BACHELOR & BENGTECH MODULES

AMAMTB3	**Advanced Engineering Materials 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To enable the student to interpret specifications and prepare estimates of cost for buildings during the design stages and price items of Bills of Quantities with the aid of drawings and specifications for tendering purposes		
Content	Specification, Estimating, Costing, Compiling unit rates, Sub-contractors and suppliers, Analysis of prices		

APTTRB3	**Advanced Planning Theory 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The student will be introduced to principles and theories relating to development panning in such plans. The student will also be introduced to planning at a metropolitan scale within the international context.		
Content	Strategic Planning, Integrated Development Planning, Spatial Development Frameworks, Metropolitan Planning Module Outcomes The student will have an understanding of the Principles that are important in achieving well performing settlements such as: ? Principle of Reinforcement ? Principle of Continuity ? Principle of Discontinuity ? Principle of Externalisation ? Principle of Concentration Along Routes ? Principle of Accommodating Sameness and Diversity The student will have an understanding of a number of planning guidelines within the context of the minimalist approach with specific reference to the following: ? Movement System ? Green Space System ? Urban Agriculture ? Social Services and Public Facilities ? Economic Services ? Public utility services		

ALGELA1	**Algorithms/Programming 1A**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		

Purpose	Create simple computer algorithms and programs using the procedural paradigm and the C programming language.
Content	Computer architecture: The CPU, primary memory, secondary memory, and address and data bus; Data types (variables) and their scope; ASCII (American Standard Code for Information Interchange) character code: Alphabetic, numeric and special characters; Arithmetic operators and statements: precedence order of arithmetic operators; Function development: parameter/argument passing; Keyboard entry and monitor (screen) output; Mathematical functions: trigonometric etc.; Control flow by use of sequence, selection and iteration: for loop, while loop, if then else, switch statement; Logical operators and their position in the precedence table; String manipulation functions: strcmp, strlen, strstr etc.

ALGELB1	**Algorithms/Programming 1B**		
NQF Level	6	**Credits**	7
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Create intermediate complexity computer algorithms and programs through sequence, selection and iteration. The use of functions so as to modularise program structure.		
Content	Pointers; Indirection (dereferencing); Pointer arithmetic; Freestore memory; Passing arguments to functions by address (pointers); Arrays of basic type on the stack; Array access through subscripting; Basic type arrays on the heap; Data representation using array subscripts; Array access through pointer dereferencing; Two-dimensional arrays (basic data type); Passing stack and heap arrays to functions as arguments; The list data structure; The stack data structure; The bubble sort; The sequential search; Text files; System calls open, write, read and close; File storage of arrays of basic data type; Records; (Called structures in C); Arrays of records on the stack/heap; Array of pointers and optimum heap memory usage.		

APECOY0	**Analysis Of Prices And Estimating 3**		
NQF Level	7	**Credits**	20
Year module, year 3			
Calculation Criteria	Final Mark = (40%) Year mark + Exam Mark (60%)		
Purpose	To enable the student to interpret specifications and prepare estimates of cost for buildings during the design stages and price items of Bills of Quantities with the aid of drawings and specifications for tendering purposes		
Content	Specification, Estimating, Costing, Compiling unit rates, Sub-contractors and suppliers, Analysis of prices		

PSTMTA2	**Analytical Techniques A2**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark- Semester Mark (100%)		
Purpose	0		

Content	0

ASMMIB2	**Applied Strength Of Materials 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide knowledge for analysing and solving advanced stress problems in the mechanics of solid materials field.		
Content	Pressure Vessels (thick cylinders); Temperature Stress; Strain Energy; Area Moment of Inertia; Bending Stress; Shear Stress.		

ATDCHB2	**Applied Thermodynamics 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The course introduces learners to the fundamental concepts in thermodynamics and includes applications to Engineering situations, in particular the production of steam, compressed air and chilled water-utilities in a chemical plant. Upon completion of this course the learners will be able to: a) Understand how the science pf thermodynamics originated and evolved; b) Understand the fundamental concepts essential to the study of thermodynamics; c) Identify the different types of thermodynamics systems and the working fluids used; d) Distinguish between the different types of thermodynamic processes and perform calculations using the equations developed; e) Understand how a steam power plant functions, the ideal cycle for steam plant, and perform calculations for the criteria of performance for steam plants; f) Understand how steam and gas turbines function, and solve problems using the equations developed; g) Understand the theory behind nozzles and perform relevant calculations; h) Understand how compressors are designed, how they function, and perform relevant calculation using the equations derived; i) Understand how refrigerators and heat pumps are designed, how they function, and perform calculations for the coefficient of performance for these machines.		
Content	The Heat Engine cycle: T-s diagram, Reversible processes on the T-s diagram, Carnot cycle, Absolute temperature scale, Carnot cycle for perfect gas. Steam cycles, and Gas Turbine cycles: Rankine cycle, Rankine cycle with superheat, Enthalpy-entropy chart, The reheat cycle, The Joule cycle, The practical gas turbine cycle, Modifications to the basic cycles. Nozzles, and Rotodynamic Machinery: Nozzle shape, Critical pressure ratio, Maximum mass flow, Nozzles off the design pressure ratio, Nozzles efficiency, The steam nozzles, Rotodynamic machines for steam and gas turbine plant, The impulse steam turbine. Positive Displacement Machines: Reciprocating compressors, Reciprocating compressors including clearance, Multi-stage compression, Steady-flow analysis, Rotary machines, Vacuum pumps Air motors. Refrigeration and Heat Pumps: Reversed heat engine cycles, Vapour-compression cycles, Refrigeration load, The pressure-enthalpy diagram, Compressors type,		

	Refrigerants. Acquisition of the above knowledge and understanding is through a combination of lectures and tutorial classes, and laboratory work. This course will be assessed by tests, assignments and an examination.

ARCTRB1	**Architectural Design 1B**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Upon completion of this course the learners will be able to: a) Understand how the science pf thermodynamics originated and evolved; b) Understand the fundamental concepts essential to the study of thermodynamics; c) Identify the different types of thermodynamics systems and the working fluids used; d) Distinguish between the different types of thermodynamic processes and perform calculations using the equations developed; e) Understand how a steam power plant functions, the ideal cycle for steam plant, and perform calculations for the criteria of performance for steam plants; f) Understand how steam and gas turbines function, and solve problems using the equations developed; g) Understand the theory behind nozzles and perform relevant calculations; h) Understand how compressors are designed, how they function, and perform relevant calculation using the equations derived; i) Understand how refrigerators and heat pumps are designed, how they function, and perform calculations for the coefficient of performance for these machines.		
Content	Steam cycles, and Gas Turbine cycles: Rankine cycle, Rankine cycle with superheat, Enthalpy-entropy chart, The reheat cycle, The Joule cycle, The practical gas turbine cycle, Modifications to the basic cycles.		

ACDMIB1	**Autocad 1B**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To provide advanced knowledge in the use of software to create mechanical components, assemblies and drawings and to explore the capabilities of a 3D solid modelling software.		
Content	Introduction to assemblies; Advanced assembly modelling, content libraries; Assembly drawing –creating and editing parts list; Presentation file and animation; Parametric design; Sheet metal designs; Introduction to Design accelerator; Introduction to FEA in Inventor.		

AUCMIB3	**Automatic Control 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To provide advanced knowledge for analysing and controlling mechanical engineering technology and manufacturing processes.		

Content	Mathematical models; Transfer functions; Transient response; Basic feedback loops; Frequency response; PID-applied control systems; PLCs, Pneumatics and Hydraulics

AUTELA3	**Automation 3A**		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This subject aims to integrate control systems theory, sensors and devices into a practical process of automation.		
Content	Refrigeration and Heat Pumps: Reversed heat engine cycles, Vapour-compression cycles, Refrigeration load, The pressure-enthalpy diagram, Compressors type, Refrigerants.		

AUTMIB2	**Automation 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide advanced knowledge for analysing and solving automation problems in the field of manufacturing engineering and service industry.		
Content	Manufacturing models and metrics; Introduction to Automation; Industrial control systems; Hardware components for automation and process control; Numerical control; Industrial robots (robot programming and simulation); Discrete control using Programmable logic controllers and personal computers; Pneumatics and hydraulics; PLC programming; Practical: Designing and simulating Pneumatic circuits.		

APMED01	**Applied Mechanics 1A**		
NQF Level	5	**Credits**	14
Year module, year 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Obtain fundamental knowledge, analytical and practical skills required to solve problems related to statically determinate force systems acting on particles and bodies in space. Apply methods based on graphical, algebraic and trigonometric solutions to define force systems and determine unknown properties.		
Content	Statics of particles and rigid bodies under coplanar force systems which may or may not be in equilibrium. Centroids and centres of gravity. Static friction. Linear and relative motion of bodies. Work and energy.		

CDPCIB3	**Building Economics, Property Valuation and Management 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (50%) + Exam Mark (50%)		
Purpose	The learner will understand the basic building procuremnet processes, the duties of players in the bulding industry, the		

	basics of take off and bills of quantities. Learners are expected to attain basic knowledge and understadning of valuations of land and buildings. The course will also expose the students on how to apply property management principles.
Content	The main components of the course are to introduce students to basic buidling economics principles. Accordingly the course focuses on equipping students with a working knowledge of the economics of aspects of buidling design decisions and the initial cost and financing of building projects. The students must also have basic knowledge of valuation methods and management principles of immovable properties. Students will know the basics of Preparing a construction budget; Cost planning to ensure value for money design and engineering; Preparation of construction estimates; Administration of cost control during the course of construction projects for both clients and contractors; Negotiation of Final Accounts; Dispute Resolution services; Advice on development budgets; the process of obtaining the value of land and buildings managing property; [process of leasing property, maintaining and handling all the day-to-day activities that are centered around the piece of real estate; seeking out tenants to occupy the space, collecting monthly rental payment, maintaining the property, and upkeep of the grounds.

CDPCIB3	**Capstone Civil Design Project Gp1 3B**		
NQF Level	7	**Credits**	28
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The Capstone Project – Civil 3B give the student the opportunity to demonstrate his/her competency to perform creative design through completing a typical Civil Engineering design problem similar to industry. This module fulfils an integration function where all the previous knowledge gained in the courses as well as additional information obtained from other sources can be used to solve the design problem at hand.		
Content	Seek Engineering Solutions in groups (typically 2 – 3 students). Analysis Different Conceptual Preliminary Designs on the Basis of Sustainable Development. Submission of the Planning Report. Design Documentation. Compilation of Tender Document. Submission of the Final Design Report. Non-Technical Skills (such as teamwork, oral & visual presentation, reporting, economic principles, and professional ethics). Project Management. Typical Projects may Include Planning of a Town where all the Services must be provided.		

CDSMTB3	**Casting Design And Simulation 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The main purposes of the module is to teach learners how to use computer-based technologies for metal casting design and casting simulation		

Content	The module covers the principles of casting design and casting simulation, design of metal casting using 3d CAD software, simulation of metal casting process using MAGMA software, and improvement of metal casting process Module name Principle of Management and Economics Purpose statement The purpose of this module is to introduce 3rd year learners to the fundamental of general management, finance and micro-economics theory. Content

CEFCHA2	**Chemical Engineering Fundamentals 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This course introduces the student to the fundamental knowledge area of chemical engineering - material and energy balances on single and multiple-unit processes. The outcomes to be achieved are : a) The student will be able to formulate and solve steady state material balances, energy balances and combined material and energy balances on system which includes one or more of the following recycle, multiple units, chemical reactions; b) Be able to use basic engineering units in both SI and imperial systems in solving problems and be able to interconvert between unit system c) Developing problem solving skills; and d) Becoming familiar with methods to determine physical properties and the behavior of gases and liquids.		
Content	Material and energy balances: write material and energy balances for single and multiple unit processes, without chemical reactions. Be able to handle processes which include recycle, bypass and purge streams. Material and energy balances for reactive systems: Fuel combustion systems, reactive systems involving chemical reactions, purge, recycle and bypass streams. Use of steam tables and psychometric charts: enthalpy changes, heat balances, humidity and saturation, percentage saturation, relative saturation or relative humidity, enthalpy of humid air, and humid heat capacity, dew point, wet and dry bulb temperatures, adiabatic vaporization and adiabatic saturation temperature. Acquisition of the above knowledge and understanding is through a combination of lectures and tutorials, field visits, teamwork projects, individual professional development project. The course will be assessed by: tests, assignments and an examination.		

CEFCHB1	**Chemical Engineering Fundamentals 1B**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This course is designed to give first year students an introduction to concepts, principles and practices to the field of chemical engineering. Upon completion of this course the learner will be able to : (a) Convert between units SI and engineering units (b) Solve overall mass and energy balances (c) Engage more effectively in solving different types of problems (d) Develop an understanding of the basic purposes		

	of the various unit operations encountered in chemical processes (d) Draw flow sheet in order to describe processes. (e) Calculate heat of reactions using heat of combustion and heat of formation (f) Write and solve energy balance equations for open and closed systems
Content	Basic Chemical Engineering concepts: units and dimensions. Introduction to material and energy balances: material balances in single and multiple unit processesand energy balances. Process variables: (flow-rate, pressure, temperature, concentration), conversion of units. Batch and continuous processing. Outline of key unit operations: fluid flow, heat transfer, reactions, separations, etc. Measurements and calculations relating to typical engineering equipment: pipes, tanks, etc. Systems of units and conversions. Relationship between mass flow rate, volumetric flow rate, density and cross-sectional area, etc. Dimensional analysis. Conservation of mass and energy: total and component balances, Process flow diagrams, solve material balance problems using, algebraic method and tie-element method, write and solve total and component balance equations, calculate the degrees of freedom of a problem, describe and make basic calculations involving re-cycling, by-pass and purge streams. Types of energy, energy balances in closed and open systems, adiabatic systems, calculate standard heat of formation of compounds, standard heat of reaction and standard heat of combustion Acquisition of the above knowledge and understanding is through a combination of lectures and tut classes, teamwork projects, individual professional development project, industrial trip. This course will be assessed by completion of a portfolio consisting of: assignments, tutorials and an examination.

CELCHA2	**Chemical Engineering Laboratory 2A**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Develop problem-solving skills through a series of short and long experiments related to Process Fluid Flow and Transfer Processes. By completing the laboratories in the engineering undergraduate curriculum, the learner will be able to: a) Apply appropriate sensors, instrumentation, and or software tools to make measurements of physical quantities; b) Devise an experimental approach, specify appropriate equipment and procedure, implement these procedures and interpret the resulting data to characterise an engineering material, component or system; c) Demonstrate competence in selection, modification and operation of appropriate engineering tools and resources; d) Demonstrate the ability to collect, analyse and interpret data and to form and support conclusions. Make order of magnitude judgments and use measurement unit systems and conversion; e) Identify health safety and environment issues related to technological processes and deal with them responsibly; f) Communicate effectively about laboratory work with a specific audience, both orally and in writing, at levels ranging from executive summaries to comprehensive technical		

	reports; g) Work effectively in teams, including structured individual and joint accountability, assign roles, responsibilities, and task, monitor progress, meet deadlines and integrate individual contributions into a final deliverable; h) Behave with highest ethical standards, including reporting information objectively and interacting with integrity
Content	Six practicals will be selected from the list given in this section: Laboratory induction: Objectives of laboratory work, laboratory safety, laboratory rules and regulations. Multi-effect evaporator: Natural and force circulation studies; Forward feed: backward feed and parallel feed operation. Overall energy and material balance for single / multi-effect systems. Liquid and Gas diffusion coefficient: Determination of mass transfer rate and diffusion coefficients for liquid-gas and liquid systems under different conditions. Batch drier: Determine of drying rate curves. Overall material and energy balances. Slurry Pipeline and Mixing tank: Determination of energy losses across various fittings and pipe sizes for multi-phase systems; hydrodynamic studies for multi-phase systems; mixing studies for different type of impellers. Thermofluids: Pressure and temperature profiles across pipelines and various pipe fittings for compressible fluids only. Comparison of flow measuring techniques-orifice plate, venture, pilot tube. Determination of resistance coefficient of different fittings. Pump Rig: Determination of characteristic curves for different speed s and impeller sizes; Studies of pumps in series and parallel etc. Fluid Friction apparatus: Determination of energy losses across various fittings and pipe sizes for non-compressible fluid only; and resistance coefficients (K) values of typical fitting Convection Apparatus: Determination of heat transfer coefficients and heat transfer studies for natural and forced convection systems, using clindrical fins, longitudinal and flat plates. Heat Exchanger: Evaluation and comparison of four different types of heat exchangers , brazed plates, Plate and Frame double pipe heat and shell and tube. Acquisition of the above knowledge and understanding is through a combination of lectures and tutorial classes, laboratory work, teamwork projects and individual projects. This course will be assessed by completion of a portfolio consisting of random tests, practical assignments and reports.

CELCHB2	**Chemical Engineering Laboratory 2B**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Develop problem-solving skills by experimentation through a series of short and long experiments related to Chemical Process Control, Applied Thermodynamics and Unit processes.		
Content	Gas absorption: Absorption of carbon gas stream into water or caustic soda solution. Study pressure drop across packed column; residence Time Distribution across packed column. Process control: Level, Flow and Temperature control. Membrane Rig: Study the principles of reverse osmosis, nano filtration and ultrafiltration and the effect of operating conditions on the performance. Refrigeration Bench: Carnot cycle		

	efficiency and theory, Vapour compression refrigeration cycle, Reversed Carnot Cycle, etc. Steam Plant: Boiler, Orsat analysis i.e. flue gas analysis and fuel efficiencies: Boiler efficiency; dryness fraction. Turbine efficiency. Cooling tower analysis. Overall mass and energy balance. Stage compressor bench: Evaluation of compressor efficiencies for single stage, double stage, with and without intercooling This course will be assessed by completion of a portfolio consisting of random tests, practical assignments and reports.

CELCHB3	**Chemical Engineering Laboratory 3B**		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Develop problem-solving skills through a series of short and long experiments related to Process Fluid Flow and Transfer Processes.		
Content	Pressure Filtration Unit: Filtration, washing, drying, compression cycle, cake filtration and filter medium resistance with different slurries and mediums; Ball/Rod Mill: Size reduction with ball mill /rod mill with varying mill speed, ball size and milling times. Dry or wet milling; Hydro cyclone Rig: Solid classification using hydro cyclones and studies of immiscible Liquid-Liquid separation; Solids Handling Bench: Particle size distribution analysis. Angle of response; hopper flow , cyclone separation, mixing of solids; shaking tables; Slurry pipeline and mixing tank: Determination of energy losses across various fitting and pipe sizes for multi-phase systems; hydrodynamic studies for multi-phase system; mixing studies for different types of impellers; Fluidisation Bench: Studies in pneumatic and hydraulic fluidisation Pressurised Batch Reactor: Lab scale evaluation of rate expression for endothermic or exothermic reactions; evaluation of catalytic reactions; Corrosion Kit: Corrosion rates of materials under different conditions. Acquisition of the above knowledge and understanding is through a combination of lectures and tutorial classes, laboratory work, teamwork projects and individual projects. This course will be assessed by completion of a portfolio consisting of random tests, practical assignments and reports.		

CPTCHA1	**Chemical Process Technology 1A**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This course is designed to give first year students an overview of the process industries and the unit processes and operations involved. Upon completion of this course the learner will be able to : a) Identify the major process industries in SA; b) Discuss the interdependence between industries, and the impact of industry on regional and national economy and the environment; d) Understand the application of chemistry on an industrial scale; e) Understand the applications of unit processes and unit		

	operations in the process industry; f) Understand basic chemical plants flow sheets
Content	Process industry in SA: An overview of the chemical and allied industry in SA and its impact on the economy. Inorganic chemical industries: Sulphuric acid, Phosphoric acid, Fertilizers (Ammonium sulphate, Ammonium nitrate, Urea, SSP and TSP). Natural products industries: Vegetable Oil, Soaps and Detergents, Coal Chemicals, Cement, Renewable energy sources. Petrochemical Industries: Petroleum refining and Petrochemicals. Polymerization industries: Polyethylene, Polypropylene, PVC polyester Synthetic fibres and Rubber. Introduction to industrial process flow sheets: Logical understanding of simple processing steps sequence for some basic industries. Acquisition of the above knowledge and understanding is through a combination of lectures and tutorials classes, field visits, teamwork projects, individual professional development project, and industrial trips. This course will be assessed by completion of a portfolio consisting of: assignments and projects, tests, tutorials and a 3 hour examination.

CPTCHB1	**Chemical Process Technology 1B**		
NQF Level	6	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This course is designed to give first year students an overview of the process instrumentation and equipment used in the chemical and allied industries. Upon completion of this course the learner will be able to : a) An understanding of basic process instrumentation; b) Application of process measuring instruments for process control; c) Develop an understanding of the major types of equipment and employed the process industries, d) Appreciation of the importance of safety, health and environmental issues in process industries; e) Develop an understanding of the piping system and transportation of fluids in process industries; f) Discuss the interdependence between industries, and the impact of industry on regional and national economy and the environment.		
Content	Process instrumentation: Temperature measurement, Pressure measurement, Flow measurement, Level measurement, Composition analysis for solids, liquids and gases (theory and practicals). Piping System: Pumps, Valves, Pipes, Compressors and Turbines. Process Equipment: Vessels and Reactors, Heat Exchangers, Boilers, Cooling Towers, Furnaces, Cyclones, Crushers and Mills, Screens and Sieves, Magnetic Separators; Filters, Flotation Equipment, Conveyor Belts. Mineral processing: Hydrometallurgy basics, Pyro metallurgy basics Coal beneficiation basics. Safety, Health, and Environmental Hazards in the process industry: PPE, hazards, Hazard Management and Control, cleaner production Acquisition of the above knowledge and understanding is through a combination of lectures and tut classes, field visits, teamwork projects, individual professional development project, industrial trips. This course will be assessed by completion of a portfolio consisting		

	of: assignments and projects, tests, tutorials and a 3 hour examination.

CTDCHA2	**Chemical Thermodynamics 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The design and operation of chemical engineering operations requires quantitative estimates of chemical, physical and phase properties of streams containing pure components or mixtures. To determine the required properties of these process streams require the extensive use of appropriate correlations or interpolation and extrapolation of limited data. Consequently, chemical engineers must be well acquainted with the fundamentals of chemical thermodynamics and the manner in which it can be applied. Upon completion of this course the learner will be able to : a) Understand the theory of and evaluate properties of real gases; b) Calculate heat effect in the reactors; c) Establish relationships amongst the various thermodynamics properties; d) Develop fundamental property relations for homogeneous fluid mixtures of variable compositions and derive equations applicable to mixtures of ideal gases and ideal solutions; e) Understand the theory of systems of variable composition exhibiting non-ideal behaviour; f) Understand the theory of vapour/liquid phase behaviour and calculate temperatures, pressures, and phase compositions for systems in vapour/liquid equilibrium (VLE) at low to moderate pressures; g) Calculate the maximum conversion and equilibrium product distribution in reactors.		
Content	Review of basics concepts: 1st law of thermodynamics Entropy, Entropy changes of an ideal gas, mathematical statement of 2 nd law, Entropy balance for open systems, 3rd law of Thermodynamics. Properties of pure Fluid: PVT behavior of Pure substances, Viral EOS, Cubic EOS, generalized correlations for gases and liquids. Heat Effects: Sensible heats effects, Latent Heats of pure substances, standard heats of reaction, formation, and combustion. Thermodynamics Properties of real Fluids: Properties Relations for homogeneous phases, Residual Properties, Residual Properties by EOS, Two phase systems, generalized property correlations for gases. Properties of Mixtures: Introduction to VLE theory, theory of solution thermodynamics, Applications, Heats of mixing Acquisition of the above knowledge and understanding is through a combination of lectures, tutorial classes, field visits, teamwork project, individual professional development project and industrial training. The course will be assessed by tests, tutorials and an examination.		

CHMMNB1	**Chemistry For Miners 1B**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		

Purpose	The purpose of this module is to provide developed level of knowledge of chemistry as applicable to the Mining discipline.
Content	Uses of Science and Mining. Structure of Matter Gases and Dust. Energy - Rates of Reaction and Equilibrium. Acids, bases and salts. Electricity and Chemistry. Organic Chemistry

CDRCIA1	**Civil Engineering Drawing A1**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of Drawing 1 A is for the student to become competent in the use of a drawing board and associated instruments in order to understand and produce accurate engineering drawings according to the latest standards.		
Content	Introduction to engineering drawing. Drawing equipment and use of instruments. Lettering and line work. Title blocks for engineering drawings. Dimensioning drawings. Geometric construction, Ellipse, Hyperbola, Parabola Multi-view drawings. Viewing planes. Orthographic projection. Sectional views of objects. Pictorial views. Isometric construction. Construction drawings. Plan layouts. Floor plans. Elevation. Detailing of drawings.		

CIPTRB1	**Civil Engineering For Planners 1B**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Acquaint the student with the relevance of Civil Engineering to Town and Regional Planning. Provide the learner with an understanding of civil engineering factors and aspects		
Content	Roads, Services – electrical; water supply; soil water removal; surface drainage, Geotechnical aspects that effect town and regional planning, Solid Waste Removal – Types of waste and methods of removal and disposal. Module Outcomes For successful completion of Civil Engineering for Planners – 1, the student should demonstrate that he / she can : understand the basic domain knowledge regarding the civil engineering infrastructure for planning and development of cities like : roads, water supply, storm water, soil water, geotechnical, electrical services, solid waste etc		

CPRMTA3	**Coal Processing 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide learners with the skills necessary to assess the efficiency of the various unit operations on coal processing plants. Learners will be able to solve operational plant problems involving both yields and qualities of products emanating from		

	the plants by recommending changes to operational parameters and standards.
Content	Coal formation, coal reserves, RSA coal fields and their exploration, coal preparation (coal handling and storage, comminution and screening, beneficiation, sampling, coal classification, coal concentration, fine treatment process, dewatering), different qualities for coal industry, coal usage and plant planning and design.

CADMIB1	**Computer Aided Design 1B**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of this module is to provide knowledge required for drawing and interpretation of mechanical drawing and preparation for use of CAD in Mining applications		
Content	Introduction to the CAD Programmes Advanced sketch tools: Introduction to Revolve features.. Introduction to 3D environment; Model parts from given Isometric projection. Creating parts from orthographic projection drawings. Edit views and insert dimensions. Introduction to assembly environment and constraints. Create parts and assemblies.		

CDRCIB1	**Computer Aided Drawing B1**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of Computer Aided Drawing 1B is to introduce students to AutoCAD software as a drafting tool in Civil Engineering.		
Content	Introduction To Autocad. 2d Drawing. 3d Drawing. Application Of Autocad In Civil Engineering. Architectural Drawing. Structural Detailing.		

CPATRB1	**Computer Application: Introduction To Autocad 1B**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Introduction to the Computer Drafting environment as to help him/her in becoming computer drawing literate; to apply these skills optionally during assignments and in the day-to day work environment drawing concept plans as well as layouts accurately.		
Content	The students are briefed on the background and origin of drawing on computers Accessing The Program, Setting Up The Environment, Creating And Opening Drawings, Drawing Tools, Editing Functions:, Setting And Changing Drawing View's, Inserting Pictures, Setting And Applying Formats To A Drawing, Setting And Adding Dimensions, Modifying Properties, Tools, Printing A Drawing: Module Outcomes . ? Demonstrate the		

	ability to use more advanced tools to speed up his drawing. ? Demonstrate the ability to edit entity attributes. ? Understand and apply different scales. ? Demonstrate the ability to prepare a print layout. ? Demonstrate the ability to save his work appropriately on removable disks.

CPATRA3	**Computer Applications: Advanced Autocad 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Introduction to the Computer Drafting environment as to help him/her in becoming computer drawing literate; to apply these skills optionally during assignments and in the day-to day work environment drawing concept plans as well as layouts accurately. This literacy is also essential as background to Geographic Information Systems.		
Content	The students are briefed on the background and origin of drawing on computers The relevancy of drawings to the Town Planning profession is explained Looking at samples of what can be done with Cad Accessing The Program, Setting Up The Environment, Creating And Opening Drawings, Drawing Tools, Editing Functions:, Setting And Changing Drawing View's, Inserting Pictures, Setting And Applying Formats To A Drawing, Setting And Adding Dimensions, Modifying Properties, Tools, Printing A Drawing: Module Outcomes ? Demonstrate the ability to access and shut down a computer. ? Demonstrate the ability to set up his drawing environment. ? Demonstrate the ability to use drawing tools. ? Demonstrate the ability to use editing tools. ? Demonstrate the ability to use more advanced tools to speed up his drawing. ? Demonstrate the ability to edit entity attributes. ? Understand and apply different scales. ? Demonstrate the ability to prepare a print layout. ? Demonstrate the ability to save his work app		

CPATRA2	**Computer Applications:GIS 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	0		
Content	0		

CPSELA1	**Computer Skills A1**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of Computer Skills 1A is to let students become computer literate in software used frequently for their studies in Civil Engineering Technology.		
Content	Introduction To Windows. Introduction to Microsoft. Microsoft Word. Microsoft Excel. Microsoft Access. Microsoft Powerpoint Microsoft Outlook Microsoft Office Integration.		

CACCOY0	**Construction Accounting 2**		
NQF Level	6	**Credits**	18
Year module, year 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Accounting: Make the routine recording, adjusting and closing entries required in the construction accounting process, Select a suitable accounting policy from alternative available, in context of a given set of circumstances Financial management: Understand the basics of financial management and apply this to a construction business		
Content	Accounting; The purpose of accounting, Records and first entries, Business transactions, Bank transactions, Transactions up to trial balance, Closing entries up to trial balance, Contract accounts, Sole owners and partnership accounts, Limited companies and close corporation accounts, Construction accounting computer programmes. Financial management: Various corporate and financial goals in managing the firm, capital markets and their structure and roles, interaction of firm decisions and capital markets, corporate value, value creation and management process, risk, and how risk is measured, securities are valued,		

CDRCO1A	**Construction Drawing 1A**		
NQF Level	5	**Credits**	10
Semester module, year 1, semester 1			
Calculation Criteria	**Final Mark = Semester Mark (40%) + Exam Mark (60%)**		
Purpose	The Purpose of the Course is to develop students who can produce drawings accurately and to a given scale both isometric and orthographic		
Content	Introduction to Course Competency in the drafting of different types of drawing elements - Visual awareness of different views of an object and the drawing thereof - Professional reproduction and compilation of different plans and layouts - Technology trends		

CECCOY0	**Construction Economics 3**		
NQF Level	7	**Credits**	20
Year module, year 3			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Appreciate the importance of microeconomic and macroeconomic principles in the analysis of the construction industry, Demonstrate the link between the construction industry and the wider economy,		
Content	Review of economics principles, Value engineering, Financial calculations, Market valuations, Market analysis, Introduction to Property law, Introduction to town planning principles, Life cycle costing, Viability and feasibility studies		

CLWCO3A	**Construction Law 3A**		
NQF Level	7	**Credits**	10

Semester module, year 3, semester 1	
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)
Purpose	On completion of the course the student will have a broader understanding of basics of law of contract as well be in a position to analyze simple case studies. Trades and Model Bills of Quantities.
Content	Understanding of standard form of contracts such as JBCC Principal Building Agreement Latest edition Nominated and selected subcontract and JBCC minor works, Procurement systems

CLWCOB2	**Construction Law 2B**		
NQF Level	6	**Credits**	10
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To have a broad understanding of Law in general and the philosophy of law		
Content	Definition and origins of SA law, Law of contract, Contract of sale, contract of insurance, Contract or law of Agency, Alternate dispute resolution (ADR)		

CMGCO1A	**Construction Management 1A**		
NQF Level	5	**Credits**	10
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose is to enable the student have insight in the operation of the construction sector and the organisations involved and their processes and practice.		
Content	The professional sector in the construction industry, The CIDB, Organizations involved in the construction industry, Parties involved in the construction process, Construction companies and there organizational structures. Safety Health and Environment (SHE) in Construction		

CMGCO1B	**Construction Management 1B**		
NQF Level	5	**Credits**	10
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Introduction to the Quantity Surveyor as a Professional in the Construction Sector		
Content	To introduce the principles, processes and methods of Measurement and documentation of builders' work. Students acquire basic knowledge on the evolution of quantity surveying and the mathematical principles to be used as a basis for taking-off quantities		

CMGCOY0	**Construction Management 2**		
NQF Level	6	**Credits**	18
Year module, year 2			

Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)
Purpose	The purpose is to provide a solid base of managerial theories to students that will form the foundation of future studies.
Content	Theories of management, Work Study, Procurement of work, Introduction to production management, Productivity, Production planning and development, Product standardization and grading, Theories of plant location, Factory building, Inspection, Human resource management. Industrial psychology. Safety health and Environment management in construction

CMGCO3Y	**Construction Management 3**		
NQF Level	7	**Credits**	20
Year module, year 3			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To build on the knowledge of Construction law in previous modules to develop a construction professional who is able to apply law of construction contracts correctly		
Content	MBSA rules, Standard documentation – building and civil conditions of contract, Contract documents, Legality of minutes, correspondence and diaries, Arbitration , Labour law		

CTCCO1B	**Construction Technology 1B**		
NQF Level	5	**Credits**	10
Semester module, year 1, semester 2			
Calculation Criteria	**Final Mark = Semester Mark (40%) + Exam Mark (60%)**		
Purpose	To introduce the students to the technology of construction in the building and civil engineering sectors at the ground level		
Content	Soils, site clearing and establishment, setting out and levelling, foundations, concrete, formwork., mortars., openings, windows and doors, paint, glass and other materials, timber, pitched roofs, flat roofs, timber construction, floors and timber framed structures, Civil engineering materials and methods, Plant, Safety Health and Environment (SHE) in construction		

CTCCOY0	**Construction Technology 2**		
NQF Level	6	**Credits**	18
Year module, year 2			
Calculation Criteria	**Final Mark = Semester Mark (40%) + Exam Mark (60%)**		
Purpose	To provide the students with technological insight into building services. To introduce the Students to Building Information Management as a Technological tool To understand the technology of providing a safe work environment to service contractors		
Content	Theory of Electricity for Construction Students: Theory of Refrigeration and Air-conditioning for Construction Students: Theory of Plumbing and Drainage for Construction Students: Theory of Lifts for Construction Students: Safety health and environment technologies Building information management		

CTCCO3Y	**Construction Technology 3**		
NQF Level	7	**Credits**	20
Year module, year 3			
Calculation Criteria	**Final Mark = Semester Mark (40%) + Exam Mark (60%)**		
Purpose	The purpose of this module is to provide students with the in-depth knowledge of advanced construction technology and the application of construction technology and construction science in order to manage the construction of complex construction projects from foundation until completion including various finishes.		
Content	Building: Concrete structures, Steel framed structures, Formwork, Brick cladding to concrete structures, Block work, Ceilings and drywall partitions, Ironmongery, Aluminium windows, Lightweight composite claddings, Specialized wall coating, Application of the building regulations, Materials, Site investigation, Underground water, Sheet piling, Foundation piling.		

CMGCIA3	**Contract Management Gp1 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100)		
Purpose	The primary purpose of Contract Management 3A is to give students an in- depth knowledge of the Civil Engineering construction domain.		
Content	General Safety Rules (OSH Act). Risk Management. Total Quality Management. Equipment Management. Temporary Works. Determining Quantities. Cost Estimating. Income and Spending. Taxation. Prices and Products.		

CSTELB3	**Control Systems 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this module is to develop an understanding of control systems theory		
Content	Programmable Logic Controllers; Introduction to Control; Introduction to Block Diagram Algebra; Reduction of multiple subsystems; Transfer Functions; Transient Responses of Systems; Modelling in the frequency domain; Frequency response and stability of systems: Bode diagrams; PID Applied control systems; Steady State errors.		

CORMTA3	**Corrosion Technology 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The primary purpose of this module as an integral part of the National Diploma is to provide the students with an understanding of corrosion processes of metals and counter		

	techniques which will serve as a fundamental basis for the students' further in Metallurgy
Content	Define of Corrosion, cost of corrosion, thermodynamics, kinetics of corrosion, Pourbaix diagrams, polarization, Evans diagrams, Electrochemical nature of corrosion, non-galvanic nature of corrosion, types of corrosion, natural occurring environments, man-made environments, modifying the environment (inhibitors and other agents), types of corrosion, influence of external factors, materials selections, designing against corrosion, countering methods, coating systems (organic and alternative and metallic coatings), electrochemical methods of preventions, Inhibitors, water treatment. Economics of corrosion. Module Name.

DIGSTA2	**Digital Systems 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this module is to develop the skill of the candidate in the application of 8 bit embedded controller technology.		
Content	Introduction to the principles of the 8-bit embedded controller, program memory organization, data memory organization, the register set; Program structure, interrupts, basic peripherals, ports, timers and design implementation and testing. Assembly language, instruction set, C programing techniques, input and output interfacing, interrupts, timers and counters and analogue to digital convertion.		

DIGSTB1	**Digital Systems 1B**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this module is to develop the skill of the candidate in combinational and sequential logic.		
Content	Introduction to the principles of Combinational logic, numbering systems, codes, gates, flip flops, truth tables, circuit design techniques; Introduction to the principles of sequential logic, counters, shift registers, multiplexers, synchronous design techniques, design implementation and testing.		

DIGSTB2	**Digital Systems 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this module is to develop the skill of the candidate in the application of16-bit embedded controller Technology.		
Content	Introduction to the principles of 16-bit embedded control, program memory organization, data memory organization, register set and hardware structure. Program structure, interrupts, advanced peripherals, ports, ADC, capture and		

	compare unit, PWM, UART, interrupt structure, C programing techniques and design implementation and testing

ECPTRA2	**Economics For Planners 2A**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of the module is to provide the student with an understanding of: Different economic approaches/theories Planning implications of such theories in general and South Africa in particular Knowledge of the difference between macro versus micro economics and the factors of production: Natural resources as a factor of production.		
Content	Introduction to Economics. The History of Economics – Predominant Theories and Approaches. Outline of what modern Economics is about (Macro / Micro). Implications and effects of Economics on Urban and Regional Planning. Module Outcomes ? Understand different economic approaches / theories ? Understand the Planning implications of such theories in general and South Africa in particular ? Understand the difference between macro versus micro economics and the factors of production. ? Understand the difference among the predominant economic theories and their implication for town and regional planning.		

PJEELA3	**Electrical Project 3A**		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Development of relatively large scale project in liaison with the Electric and Electronic Engineering Technology department with specific reference to focus and research areas.		
Content	Design process; Planning the implementation; Mechanical drafting; Printed circuit board or vero board planning; Construction and soldering; Testing to specification; Laboratory report.		

PJEELB2	**Electrical Project 2B**		
NQF Level	7	**Credits**	7
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The design and construction of an electrical technology based project.		
Content	Design process; Planning the implementation; Mechanical drafting; Printed circuit board or vero board planning; Construction and soldering; Testing to specification; Laboratory report.		

PJEELB3	**Electrical Project 3B**		
NQF Level	7	**Credits**	28

Semester module, year 3, semester 2	
Calculation Criteria	Final Mark = Semester Mark (100%)
Purpose	Continuation of previous “Project” module (Year 3 Semester 1)
Content	Design process; Planning the implementation; Mechanical drafting; Printed circuit board or vero board planning; Construction and soldering; Testing to specification; Laboratory report.

ECHMTB2	**Electrochemistry 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Provide a general and comprehensive Electrochemistry foundation for Extractive Metallurgy discipline		
Content	Non faradic Processes, The Nature of the Electrode-Solution Interfaces, Mass Transfer-Controlled Reactions, Semi-empirical treatment of Nernstian Reaction with Coupled Chemical Reactions, Basic Electrochemical Thermodynamics, Interfacial Potential Differences, Liquid Junction Potentials, Selective electrodes, Review of Homogeneous Kinetics, Essential of Electrode Reaction, Implications of Butler-Volmer, Model for one-step, one-electron process, Multistep Mechanisms, Microscopic Theories of Charge Transfer, Derivation of a General Mass Transfer Equation, Migration, Mixed Migration and Diffusion near an Active Electrode, Diffusion		

ELCELA2	**Electronic Circuits 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Design and construct various electronic circuits like power supplies, protection circuits and amplifiers. Calculate solutions to electrical engineering problems by means of applying fundamental theory. Work safely with electricity by applying safety precautions. Describe the functioning and construction of electronic circuits. Identify, distinguish and explain the function of the different types of electrical components. Apply rules of logic to solve problems		
Content	Electron theory; Waveform and signal fundamentals; Power supplies; Basic up to Switched Mode Power Supplies; Amplifier specifications and characteristics; Bipolar junction transistor DC and small signal amplifier analysis; Field effect transistor DC and small signal analysis; Power amplifiers; Oscillator fundamentals; Feedback fundamentals; Practical experience through laboratory work		

ELCELB1	**Electronic Circuits 1B**		
NQF Level	6	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		

Purpose	Design, analyse, combine and assemble various electronic circuits like amplifiers and filter networks, Investigate and evaluate different means of non-destructive testing of components and circuits, Derive and prepare various solutions to electrical engineering problems by means of applying fundamental and advanced theory. Technologic and scientific reasoning when applying rules of logic to solve problems.
Content	Differential Amplifiers: analysis, common mode rejection ratio (CMRR), temperature compensation and methods to improve CMRR; Operational Amplifiers. Characteristics, combinational circuits, offset voltages and currents, slew rate and gain bandwidth product; Amplifiers and feedback: Modeling of voltage (Av), current (Ai), transconductance (gm) and transresistance (rm) amplifiers, various feedback systems; Cascaded and multistage amplifier design, simulation software; High frequency effects. analysis of feedback resistance, capacitance, inductance, input resistance, output resistance, voltage and current; Filter Networks. Multi order filters design, Special types of filters for industry specific application; Phase Lock Loops. Design, operation and application of the phase lock loop; Oscillator circuits and applications, criteria for oscillation, design and construction; Feedback. Feedback topologies, effects of feedback on amplifiers, practical feedback applications and calculations, effect of feedback on gain, bandwidth and stability, design of amplifiers using feedback to achieve desired in and output impedances; Practical experience through laboratory work

ELTENA1	**Electrical Engineering 1A**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Provide basic knowledge of electrical engineering.		
Content	Basic Electrical Units; Direct Current Circuits; Storage Cells.		

ELTELA2	**Electrotechnology 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Introduce the candidates to the fundamental concepts and principles of AC circuits.		
Content	AC generation; Calculations on waveforms of AC voltages and current. (Sinusoidal and complex waveforms); Voltage-current relationship; AC applied to series and parallel combinations of pure resistances, inductors and capacitors; Calculate impedance, current and voltage components and power factor, using complex numbers; Resonance and its practical uses; Phasor diagrams; Real, reactive and apparent power in AC RLC circuits; Capacitance required to improve power factor; Short transmission line in practice; The equivalent circuit of short transmission line. Voltage regulation of short line; Phasor diagrams.		

EDRMIA1	**Engineering Drawing 1A**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of this offering is for the learner to become competent in the use of a drawing board and associated instruments to understand and produce accurate mechanical engineering drawings according to the latest version of SABS 0111. Chemical Engineering Drawing focuses on the drawing of single components as well as drawing of chemical symbols and basic chemical plant flowsheets.		
Content	1st and 3rd angle Orthographic Projection; Isometric Drawing; Sectional Drawings; Assembly drawings; Sectional Drawings of assemblies; drawing Portfolio for final evaluation.		

EDRMIB1	**Engineering Drawing 1B**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of this offering is for the learner to become competent in the use of a drawing board and associated instruments to understand and produce accurate mechanical engineering drawings according to the latest version of SABS 0111. Chemical Engineering Drawing focuses on the drawing of single components as well as drawing of chemical symbols and basic chemical plant flowsheets.		
Content	1st and 3rd angle Orthographic Projection; Isometric Drawing; Sectional Drawings; Assembly drawings; Sectional Drawings of assemblies; drawing Portfolio for final evaluation.		

GLGB22B	**Engineering Geology (Costruction) 2B**		
NQF Level	6	**Credits**	10
Semester module, year 2, semester 2			
Calculation Criteria	**Final Mark = Semeter mark 40%, Examination mark 60%**		
Purpose	Refer to the Rules and Regulations of the Faculty of Science for more information on the module.		
Content			

EMGCHA3	**Engineering Management (Chemical) 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The main objective of the course is for the learner to become competent in achieving objectives and managing people in a production environment. Upon completion of this course the		

	learner will be able to : a) Generate vision and objectives for a production operation; b) Devise short-term and long-term strategies for various functions; c) Apply financial techniques to estimate and evaluate the profitability of a venture; d) Apply a variety of project management activities; e) Understand and apply people management skills; f) Design a quality management system; g) Be familiar with professional ethics and requirements of continuing professional development.
Content	Planning: Vision and mission statement, setting objectives and targets, forecasting, resource planning, devise short-term and long-term strategy, time schedules (Gantt chart). Control: Meeting targets, work ethic and discipline, labour relations (negotiation), Managing quality, service delivery, performance management, record keeping and recording, report-writing. Project management: Project stakeholders, tasks of project manager, conflict management, work breakdown structure, project time management. People management: Authority, power and responsibility, leadership style, managing relationships, team work, stress management, professional ethics and practice. Financial management: Accounting and financial basics, profit and loss, operational budgeting and cost elimination, time value of money, capital budgeting and financial viability evaluation (IRR, NPV). Simulation: Monte Carlo method. Acquisition of the above knowledge and understanding is through a combination of lectures, and tutorial classes, teamwork project, individual professional development project. The course will be assessed by tests, formal presentations, tutorial and written assignments, and an examination.

EMGMIA3	**Engineering Management (Industrial) 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide a deeper understanding of management principles and concepts. Management comprises planning, organizing, staffing, leading or directing, and controlling an organization. To provide the student with a basic understanding of the legislation introduced to give effect to the constitutional right to fair labour practices.		
Content	Management in Engineering; South African Labour Relations Act, EEA, OHSA, BCEA; Strategic planning; Change management; Innovation, Creativity and Teamwork; Ethics; Risk management.		

MGTMNA3	**Engineering Management (Mine) 3A**		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To introduce students to the knowledge and skills required to manage a mining operation at the middle to senior management level.		
Content	Marketing, Sales and Communications Management. Financial Resource Management.		

	Professional Responsibility, Ethics and Legal Issues.

MGTMNB2	**Engineering Management (Mine) 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To introduce students to the knowledge and skills required to manage a mining operation at the middle to senior management level.		
Content	General management. Leadership and Organisational management. Strategic Planning and Change management. Product, services and process development. Engineering projects and process management.		

MATE1A1/MATE1B1	**Engineering Mathematics**		
NQF Level	5	**Credits**	2 x 14
Semester module, year 1, semester 1&2			
Calculation Criteria	**Final Mark = Semeter mark 40%, Examination mark 60%**		
Purpose	Refer to the Rules and Regulations of the Faculty of Science for more information on the module.		
Content			

STAE1B1	**Engineering Statistics 1B**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	**Final Mark = Semeter mark 40%, Examination mark 60%**		
Purpose	Refer to the Rules and Regulations of the Faculty of Science for more information on the module.		
Content			

EWSMIB1	**Engineering Work Study 1B**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The primary purpose of this module is to build and expand knowledge on the principles and methodolgy of work study and give learners a broad perspective on production.		
Content	Work measurement; Method study; Techniques for recording information -Process charts and diagrams; Development of improved methods; Development of individual tasks and group		

	work; Activity sampling; Ergonomics; Productivity; Objective matrix; Twenty keys of Workplace improvement,VSM, Basic Lean.

ENTMIB3	**Entrepreneurship 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide advanced knowledge and skills useful for the development and evaluation of business plans and for solving real-world business problems.		
Content	Entrepreneurship and the entrepreneurial process; Identification of different business models; Creativity and opportunity identification in business; Introduction to business plans; Financial planning and sources of finance; Networking and support in business; Resource requirements and legal issues in business; Franchising.		

ENVCHB3	**Environmental Engineering 3B**		
NQF Level	6	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This course provides an introduction to environmental and safety issues relating to the operation of chemical plants. Upon completion of this course the learner will be able to: a) Demonstrate a basic knowledge of environmental laws and regulations; b) Understand the concept of sustainable development; c) Demonstrate a basic knowledge of waste minimisation and cleaner production principles; d) Be able to incorporate applicable safety and environmental consideration into problem solving and design; e) Demonstrate a basic knowledge of EIA'S and LCA; f) Be able to identify pollutants in the process waste streams, and select methods to minimise pollution in process waste streams; g) Be able to quantify the environmental effects of engineering systems; h) Be able to propose method (BAT) or alternatives to control the environmental effects of engineering systems; i) Propose methods to improve energy efficiency in engineering systems		
Content	Environmental and safety legislation: SA and international legislation to be reviewed. Fundamentals of Toxicology and Occupational Hygiene. Water, Air and Land pollution: Assess various pollutants and activities and their impact on the environment. Environmental Impact Assessment: Stages of EIA's, assessment of impact, scoping reports. Waste Minimisation and cleaner production, BACT: analyses of current practices case studies. Acquisition of the above knowledge and understanding is through a combination of lectures and tutorial classes, laboratory work, teamwork projects and individual projects. This course will be assessed completion of a portfolio consisting of assignments, technical reports, test and an examination.		

ENVMNA1	**Environmental Management 1A**

NQF Level	5	**Credits**	14
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide a developed level of knowledge of the effects of industrial activities on the environment as well as the processes, technology, legislation, closure and financial provisions required to prevent, manage and mitigate these effects		
Content	Meeting the challenge of human survival on earth. Structure and composition of the ecosphere. The dynamics of ecosystems functioning. Classificationand organisation in the ecosphere Human habitation of the earth. The environment as a resource Degradation of the environment. Environmental conservation Managing our natural resources Evaluating the environment and development projects. Perceptual and ethical considerations in solving environmental crises.		

EMVMNB2	**Environmental Management 2B**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To enable the student to integrate various aspects and perspectives of environmental management in the engineering field. Environmental impact assessment (EIA, social impact assessment (SIA) will be used to identify the development of environmental problems and impacts which need to be mitigated or rehabilitated.		
Content	Environmental impact assessment: Principles and practice of integrated environmental management, legal framework, case studies.		

ESMTRB3	**Environmental Science And Management 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The learner will be introduced to the science of the environment related to the environment as a systems, resources, it's conservation as well as the management and evaluating the environment. Theory as background and more Urban & Regional Planning specific aspects and implications would be focused on when considering new development proposals		
Content	The environmental crisis humans are faced with according to the Systems approach as research model Module Outcomes ? The student must have an understanding related to the environmental crisis humans are faced with according to the Systems approach as research model ? The student must understand matters related to an ecosystem regarding related to structure and composition ? The student must understand eco-dynamics ? The student must have an understanding		

	related to classification and organization in the ecosphere ? The student must have an understanding related to the role of humans in the ecosystem ? The student must understand the environment as a resource ? The student must have an understanding regarding environmental degradation ? The student must have an understanding towards environmental conservation ? The student will have an understanding related to resource management ? The student must have an understanding towards Managing and evaluating the environment ? The student must

ETHHUB3	**Ethics And Community Studies 3B**		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of Ethics And Community Studies 3B is to educate the students on the ethics of the Civil Engineering profession and in dealing with moral issues in practice.		
Content	Responsibilities of a Civil Engineer. Avoiding risks and promoting safety on Civil Engineering projects. Problem solving between professional entities. Fulfilling the expectations of employers. Civil Engineer's moral actions. Ethics in an Civil Engineering project Discussions of case studies FIDIC, ECSA, SAICE and other professional bodies and their role in Civil Engineering		

FACMIB2	**Facility Lay Out And Materials Handling 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To introduce the basics of facilities lay out design and materials handling.		
Content	Introduction to Manufacturing Facilities Layout and Materials Handling; Sources of Information for Facilities Design; Process Design; Flow Analysis Techniques; Activity Relationship Analysis; Auxiliary Services Requirements Space; Materials Handling and Storage Systems; Materials Handling Equipment; Area Allocation; Facilities Design-The Layout.		

FAPMTB3	**Ferroalloy Production 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Ferrous materials have served the world since the dawn of civilisation in the Iron Age. It is thus extremely important that any metallurgist understands the production of Iron and Steel as the foundation for a solid metallurgical career. The production of Iron and Steel course is designed to raise the competence of students in understanding the physical chemistry of iron and steel smelting and empower them to be able to fit in broad ferrous metallurgical industry such as integrated iron and steel plants, foundry and metal forming.		

Content	Sources of Information for Facilities Design; Process Design; Flow Analysis Techniques; Activity Relationship Analysis; Auxiliary Services Space Requirements; Materials Handling and Storage Systems; Materials Handling Equipment; Area Allocation; Facilities Design-The Layout.

FMEMTA3	**Ferrous Metallurgy 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	In this module learners are introduced the manufacturing of iron and steel using the blast furnace (BF) and basic oxygen furnace (BOF)		
Content	Burden preparation, Coke making, Agglomeration processes, Blast furnace process and chemistry, Thermodynamic considerations, Control of unwanted elements, Calcination of limestone, BOF steel making and chemistry, Slag properties and formation, Alloy additions and calculations, Refractory linings.		

PJIMIA3	**Final Year Project A3**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To use the knowledge gained in previous courses to complete a a project. This project will provide students with an opportunity to demonstrate, and the University to assess, acquired competencies to apply knowledge, understanding, abilities and skills towards becoming a competent practicing technologist.		
Content	Understanding, analysing, planning and solving a broadly defined industry related problem. Develop a solution by using relevant Industry Engineering design methodology. If additional knowledge is required to complete the project the student will acquire it independently.		

PJIMIB3	**Final Year Project B3**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To use the knowledge gained in previous courses to complete a project. This project will provide students with an opportunity to demonstrate, and the University to assess, acquired competencies to apply knowledge, understanding, abilities and skills towards becoming a competent practicing technologist.		
Content	Understanding analysing, planning and solving a broadly defined industry related problem. Develop a solution by using relevant Industrial Engineering design methodology. If additional knowledge is required to complete the project the student will acquire it independently.		

FLMMIA2	**Fluid Mechanics 2A**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Provide basic knowledge to analyze and solve fluid mechanics problems in the mechanics and technology fields.		
Content	Fluid Mechanics and Fluid Properties; Forces in Static Fluids; Static Pressure; Static Forces on Submerged Surfaces; Buoyancy and Stability of Floating bodies; Fluid dynamics. Continuity and Energy Equations; Application of Continuity and Energy Equations.		

FLMMIA3	**Fluid Mechanics 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide and develop basic knowledge of different classes of fluid flow, fluid properties and fluid systems. Students will be expected to systematically apply knowledge of engineering science, engineering mathematics and natural science to solve broadly- defined problems.		
Content	Advanced pipe flow and simulation, Dimensional Analysis and Modelling, Integral Analysis of Fluid Flow, Differential Analysis of Fluid Flow, Environmental Fluid Mechanics, Introduction to Computational Fluid Dynamics		

FOUMTA3	**Foundry Technology 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	In this module learners are introduced to the manufacturing of metallic components by metal casting		
Content	Subject areas covered are Greensand moulding, Resin bonded sand moulding, Core-making, Precision casting, Casting alloys and Melting of casting alloys and an introduction into sand testing for casting purposes. Module name		

METMTB1	**Fundamentals Of Metallurgy 1B**		
NQF Level	6	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Purpose: To introduce the first year university metallurgy students to the fundamentals of metallurgy from which further more in-depth studies towards the university technology programmes in metallurgy can proceed.		
Content	Introduction to materials, Classification methods of materials, The atomic structure/ how it differs from element to element,otation forQuantuelectrons, Chemical bonds, Crystal & Amorphous Structure, packing factors and density, Crystal Grains and classifications, XRF and Spectrographic analysis,		

	Co-ordinates, directions and planes in atomic crystal structures, Defects in Atomic structures, Introduction to mechanical properties of materials, Introduction to (binary) Phase Diagrams of metals , The Fe-FeC phase diagram (0 to 7% C) Extraction Metallurgy. Mineral processing and extraction metallurgy (Ores and minerals and Run-of-mine), Processing approach and method (Ore handling, Removal of harmful materials, Ore transportation, Ore storage, Ore feeding), Liberation and comminution, Size separation (Screening and Classification), Separation and Concentration Technique, Sorting, Gravity and Dense medium separation Concentration (Sluice, Reichert cones, Spirals, Froth flotation and Magnetic separation), Dewatering (Sedimentation, Filtration, and Drying), Tailings disposal Geology. Minerals (Characteristics and physical properties of minerals, Common rock-forming minerals, Properties and composition of the main rock-forming minerals, and Non-rock forming minerals (ore/industrial minerals) and their classification). Igneous Rocks (Origin of igneous, Different igneous rock types, Various volcanic products, Mode of occurrence of igneous rocks, and Classification of igneous rocks). Sedimentary rocks (Characteristics, origin, importance, distribution and physical properties of sedimentary rocks, Sedimentary rocks classification and their mode of formation and properties, Common features of sedimentary rocks, and Diagenesis and the processes involved in the consolidation of sediments). Metamorphic rocks (The characteristics and physical properties of metamorphic rocks, Metamorphic rocks classification based on their mode of formation and properties, The three types of metamorphism and the resulting rock types)

GEPTRA1	**Geography For Planning 1A**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Acquaint the student with Maps, Scales, Plans, Aerial Photographs. Provide the student with an understanding of geographical phenomena such as Introduce the student to population characteristics Acquaint the student with the Rural and Urban Environment Introduce the student to Economic Geography		
Content	Interpreting Maps and Contours, Soils; Hydrologic System; Environment and Climate Population characteristics; Composition; Population Pyramids The dynamic relationship between the rural and urban environment. Settlement Patterns; Agriculture; Problems, Challenges; Opportunities The dynamics of the urban environment; Problems, Challenges; Opportunities; Economic development in South Africa and the Gauteng Province. Module Outcomes For successful completion of Geography for Planners – 1, the student should demonstrate that he / she can : understand the basic domain knowledge regarding the site analysis, physical environment, population, rural environment, urban environment, economic geography etc		

GTECIA2	**Geotechnical Engineering 2A**

NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The primary purpose of this module is to introduce learners to the principles and methodology of Soil Mechanics.		
Content	Problem soils. Origin of soils. Phase relationships. Soil classification. Site investigation. Compaction. Groundwater flow. Safety. Permeability.		

GTECIB2	**Geotechnical Engineering 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of Geotechnical Engineering 2B is to introduce students to geotechnical principles in order to determine the soil properties.		
Content	Two-dimensional flow. Effective stress and seepage. Strength of soils. Lateral earth pressures. Earth pressures and retaining walls. Slope stability. Bearing capacity. Stress distribution. Settlement. Software applications.		

HMTMTA2	**Heat & Mass Transfer 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This module deals with the heat and mass transfer. It covers calculations related to heat recovery with regards to decrease heat consumption, heating up of metallurgical equipments such as furnaces		
Content	Burners, Heat exchangers, Heat recovery, Thermal equipments, Arc furnaces, Induction furnaces and Filtering.		

PLNTRA1	**History And Principles Of Planning 1A**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The student will be introduced to Ancient history/Principles of Planning over time as well as modern Principles of Planning as to help him/her understand Planning Principles related to the Stone age, Dark age, Iron age and modern civilization.		
Content	Ancient cities and their different components in terms of Planning Geography, Infrastructure, Engineering, Social, Economic, Architecture. Environment: Efficient movement, Conservation, Health, Safety, Sustainability Theorists: Burgess, Hoyt, Harris & Ullman's The development of different cities over time and the different elements involved. Ancient culture, what it is and how it is created, Medieval period (Dark ages) , Classical period- Greece and Roman civilization, Renaissance: Washington D.C 1708, Modern city Module Outcomes At the end of successful completion of topics / learning units, the		

	students / learner must have: ? Ability to collect, tabulate, present and analyze information regarding periodic and geographical classification of settlements / cities ? Ability to select appropriate methods of presenting different cities over time ? Ability to identify correlations between different cities and their characteristics over time ? Understanding related to basic town planning con

HDETRB2	**Housing Development 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Introduce the student to policies and procedures with regard to public sector and private sector housing at national, provincial and local level in South Africa. Provide the learner with an understanding of housing aspects such as: Policies; Delivery; Affordability, Housing finance and housing standards, The physical and environmental implications and impacts of various types of housing. Convey and discuss the relevance of different housing types at varying densities to Town and Regional Planning policies, layout design and neighbourhood formation.		
Content	Evolution of the housing policy in South Africa, policies and procedures with regard to public sector and private sector housing at national, provincial and local level in South Africa, relevant housing legislation, e.g. the Housing Act (1997), post Apartheid democratic, inclusive policies, e.g. 'Breaking New Ground' (2005), Affordability and Delivery of RDP Houses, Statutory housing bodies, housing finance, subsidies and housing standards, Physical and environmental implications and impacts of various types of housing. Module Outcomes Develop and improve students' understanding of the issues surrounding housing and alternative approaches in the provision thereof. ? Understand housing as a social good ? Understand main post-apartheid housing policies ? Understand housing institutions ? Understand housing finance ? Understand approaches to urban development ? Understand housing standards ? Understand mixed income housing		

HYMMIB2	**Hydraulic Machines 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide and develop knowledge and understanding of internal pipe flow, external flow, open channel flow and hydraulics circuit design. Students will be expected to investigate, diagnose, solve and report on broadly defined fluids flow problems by applying knowledge of mathematics, statics and dynamics of a fluids.		
Content	Types of flow (Revision); Internal Pipe flow (Steady / Incompressible); Internal Pipe flow (Unsteady / Incompressible); Internal Pipe Flow (Compressible / Gasses); External Flow; Open-Channel flow; Hydraulic components and circuit design.		

HYDCIA2	**Hydraulics 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Hydraulics 2A build upon the knowledge gained in Science (Fluid Mechanics) 1B and further describe the basics of hydraulics and its application in Civil Engineering.		
Content	Fundamentals of water properties. Water pressure and pressure forces. Water flow in pipes. Water pumps and pumping systems. Open channel flow. Hydraulic similitude and model studies. Hydraulic structures.		

HYOCIB2	**Hydrology 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of Hydrology 2B is to develop a basic understanding of the hydrology concepts and its application in Civil Engineering.		
Content	Introduction to Hydrology. Water budget. Hydrological cycle. Surface water hydrology. Groundwater hydrology. Well hydraulics.		

HMEMTA3	**Hydrometallurgy 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	After completion of this module the learner should be able to supervise the efficient extraction and refining of metals from ores, making use of hydrometallurgical processes in a metallurgical plant		
Content	Introduction to hydrometallurgy, Process route, Solution production, The chemistry of leaching, Kinetics of leaching, Leaching process variables, Leaching technology,Solid / Liquid separation, Solution purification and concentration, Ion Exchange / Solvent extraction, Recovery of metals from solution, Gold extraction and Platinum extraction.		

IACMIB2	**Industrial Accounting 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide understanding of financial management and accounting techniques for preparing and interpreting financial statements, designing and evaluating costing systems appropriate for various types of organizations and processes, recording and reporting information necessary for effective cost management.		
Content	Introduction To Cost Management Accounting; Cost Terms, Concepts And Classification; System Design: Job Order		

	Costing; Systems Design Process Costing; Cost Behaviour: Analysis And Use; Cost - Volume - Profit Relationship; Variable Costing: A Tool for Management; Activity-Based Costing: A Tool To Aid Decision Making; Profit Planning and Budgeting; Standard Costing; Time Value Of Money, Bond Valuations, Share Valuations; Capital Budgeting And Project Evaluation; Risk; Cost Of Capital, Short Term Financing & Credit Management.

INMMTB3	**Industrial Minerals 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	In this module learners are introduced to minerals that are mined and processed from mainly natural sources for the value of their non-metallurgical properties, which provides for their use in an extremely wide range of industrial and domestic applications.		
Content	Diamonds, Fluospar, Phosphates, Vermiculite, Zircon, Manganese, Titanium		

INFMIB2	**Information Systems 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To introduce principles of the design and development of management information systems used for decision making in engineering, finance, project management and business.		
Content	Systems, roles and development methodologies; Understanding and modelling organisational systems; Project management; Information gathering: Interactive and unobtrusive methods; Agile modelling and prototyping; Using data flow diagrams; Analysing systems using data dictionaries; Process specification and structured decisions; Object-oriented systems analysis and design using UML.		

IESCHB3	**Innovation And Entrepreneurial Skills 3B**		
NQF Level	6	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The course provides third year students with understanding of how innovation leads to the emergence of new knowledge which forms the basis of development of new products, services and processes; and further introduces the students to the entrepreneurial concepts and skills necessary to successfully commercialise such products, services and processes. Upon completion of this course the learner will be able to: a) Understand the role of innovation and entrepreneurship in economic development; b) Be able to understand how technology development and innovation influence business; c) Develop knowledge on how to outline the intellectual property choices available to innovative companies and entrepreneurs; d) Understating of entrepreneurship and entrepreneurial ideas.		

	How to evaluate business opportunities and develop an idea into a business opportunity through entrepreneurial process. e) Write clear business reports and develop a business plan and how to pitch a business idea for funding purposes.
Content	Introduction to Innovation: Understand innovation as a core business process and how innovation can be managed, distinguishing some key characteristics of successful innovation and successful innovators. Technology and Innovation: Understand how technology and Innovation are the key factors of business development and growth in today's world. Intellectual Property: How to protect Intellectual Property; and understanding the concept of freedom to operate exclusive rights. Different methods to protect an innovative idea. Principles of Entrepreneurship: Understanding the process of entrepreneurship. Understanding the difference between idea and opportunity. How to perform product and market analysis. Product development. Introduction to Business and Financial Plan and Pitch: Gain knowledge on how to develop a winning business plan. How to source funding for new business. How to pitch a business idea to funders. This course will be assessed by completion of a portfolio consisting of: Class tutorials, Group and individual assignments and projects (assessment through reports and presentations), Tests (at least 2 per semester), Final Examination (3 hours closed book).

CPSTRA1	**Introduction To Computer Studies 1A**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To create documents for use in the engineering and the built environment, using the computer as a tool; To be able to use computer hardware for town and regional planning applications.		
Content	Provide knowledge required for presentation and communication of information and data The introduction to an Computer environment as to help him/her in becoming computer literate; to apply these skills optionally during assignments and in the day-to day work environment writing reports, compiling graphs and presenting information. Students have the opportunity to be lectured in Windows and Microsoft Office software currently utilized in the South African as well as International market. These are: Windows Environment, Ms-Dos, Microsoft Word, Microsoft Excel, Microsoft Powerpoint Module Outcomes For successful completion of Computer Skills -1 : ? The student must understand the components of a computer. ? The student must understand how to access a computer and the Desktop environment. ? The student must be able to use Microsoft Explorer in managing both fixed and transportable disk with regard to information. ? The student must understand alternative file managing programs. ? The stude		

ICECOY1	**Economics (Construction) 1**		
NQF Level	5	**Credits**	20
Year module, year 1			

Calculation Criteria	Final Mark = Semester Mark (100%)
Purpose	The Purpose of this Course is to provide the student with a foundation in Both Micro and Macroeconomics that will be used student to identify different types of markets and the effect of these on the Construction Sector. What effects do Micro and Macro Economics have of the Construction Sector
Content	Micro-economics: Introduction to Economics. Economic Resources. The role of the market. Shifts in demand and supply. Elasticity . Output supply by firms. Market Structures Macroeconomics Major sectors, markets and flows in the mixed economy. Measuring the performance of the economy. Basic macroeconomic model. Keynesian model including government and the foreign sector. The monetary sector. Unemployment and the Phillips curve

INCEL3A	**Instrumentation and Control 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = semester mark (40%) + Exam mark (60%) Semester Mark = Theory tests + Practicals		
Purpose	To provide the student with knowledge areas in instrumentation and control utilized in Electrical and Electronic Engineering environments.		
Content	Process instrumentation and Control which grasps the knowledge of Flow measurement, Temperature, Pressure, Pumps, Strain Gauges, and how these instruments operate. Basic PLC knowledge (PLC training kit). Basic differentiation and types of switches and PID control system with Pumps, Actuator, and Transducer knowledge. Design of instrument usage and systems with the use of PLC's.		

LSVTRB1	**Introduction To Land Surveying 1B**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The introduction of Surveying into the Urban Planning environment and techniques used as to help him/her becoming competent in the use of these techniques related to both an Urban and Regional scale.		
Content	Basic principles of surveying, S.A lo system and co-ordinate calculations, instruments, distance measurement, levelling, tacheometry, areas and volumes, setting out of works, practical levelling, practical taped traverse, practical tacheometric surveying, practical setting out Module Outcomes ? The student must understand what survey embraces. ? The student must understand the different types of surveys that can be done to capture physical features of the earth. ? The student must understand the co-ordinate system ? The student must understand trigonometric system. ? The student must understand the use of trick-beacons and where to get information. ? The student must understand the use of constants with regard to location. ? The student must understand units of measure.		

IRDCHA3	**Introduction To Reactor Design 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The course provides a fundamental understanding of reaction engineering. On completion of this course, the learner should be competent to: a) Identify, evaluate and analyse elementary and non-elementary chemical reaction systems; b) Perform preliminary design and optimisation calculations of homogenous isothermal and reaction systems; c) Perform preliminary design and optimization of multiple reaction systems; d) Identify and evaluate non-ideal chemical reaction systems; e) Conduct, evaluate analyse and report on experimental work done to obtain relevant data for chemical reaction systems		
Content	Mole balance: Apply mole balance equation to batch reactor, CSTR, PFR and PBR. Conversion and reactor sizing: Size reactors either single or in series given rate of reaction as a function of conversion Rate law and stoichiometry: Set up stoichiometry for batch and flow systems. Express concentration as a function of conversion. Calculate equilibrium conversion for gas and liquid phase reactions. Write combined mole balance and rate law. Isothermal reactor design: Size batch reactor, CSTR, PFR and PBR given rate law and feed conditions. Account for effects of pressure drop on conversion in PBRs. Collection and analysis of rate data: Use equal area differentiation, polynomial fitting and numerical difference formulas to analyse experimental data to determine rate law. Multiple reactions: Choose reaction system that would maximize selectivity of desired product. Determine species concentration in a batch reactor. Non-elementary reaction kinetics: Different types of polymerisation reactions and rate laws. Michealis-Menton enzyme inhibition. Material balances on cells, substrate and products in bioreactors. Acquisition of the above knowledge and understanding is through a combination of lectures and tutorial classes, laboratory work and mini projects. This course will be assessed completion of a portfolio consisting of assignments and an examination.		

IPJCHB3	**Investigative Project 3B**		
NQF Level	7	**Credits**	28
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of this subject is to develop student's understanding of the methods of research through the identification, planning and execution of an appropriate research project in a chosen subject area. Upon completion of this course the learner will be able to : a) Define the problem clearly and to tackle any difficulties; b) Carry out a critical assessment of the published literature in areas appropriate to the area of the research. Identify and apply relevant theory to the problem; c) Write an initial feasibility study reviewing the published literature, using suitable citation and referencing formats; d) Record and		

	analyse results; e) Draw appropriate conclusions from the results; f) Discuss the purpose of a research project and its significance in relation to relevant previous work reported in literature; g) Communicate the work and its outcomes in a variety of formats - report, poster and academic paper, h) Carry out literature search using library and IT facilities
Content	An investigate project (plant investigation, product development, process evaluation, process development) is undertaken by the student. The scope of the project must include the following: Formulate the project; Describe and justify the theoretical framework and methodology to address the project; Conduct and manage the project; Analyse the information gained/results of the project; Produce a report of the completed work.The course will be assessed continuously with multiple assessments: project proposal presentation, written proposal, progress presentation and reports, final report and presentation.

LATTRB2	**Land Economics And Tenure System 2B**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To introduce the student to the economic importance of land as a resource and the soci- spatial distribution of land management.		
Content	Non-elementary reaction kinetics: Different types of polymerisation reactions and rate laws. Michealis-Menton enzyme inhibition. Material balances on cells, substrate and products in bioreactors. Acquisition of the above knowledge and understanding is through a combination of lectures and tutorial classes, laboratory work and mini projects. This course will be assessed completion of a portfolio consisting of assignments and an examination.		

LDCTRB2	**Legal Principles: Development Control And Settlement Disputes 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The history of Planning Legislation in SA., Existing South African Land Use Management Systems, Current Town Planning Schemes, The importance of the Environmental Conservation Act in planning, Application procedures and requirements in respect of the following applications:, Township Establishment Rezoning/Amendment Scheme, Removal of restrictive conditions of title, Consent Use, Subdivision/Consolidation.		
Content	Introduction on the reasons for planning and the need for town planning controls, History of planning legislation in SA, Existing South African land use management systems, Which legislation is involved in town and regional planning, Town planning schemes, Generic/typical components of land use management applications, Typical requirements of good applications and memorandums, Environmental legislation, The compilation of different land use management applications. Module Outcomes		

	? Understand the reasons for planning and Need for town planning controls ? Be able to discuss the historical evolution of planning legislation in South Africa ? Demonstrate the application and purpose of different Planning Legislation in South Africa ? Summarise the legislation most often used in Land Use Management. ? Draft, Implement and Apply Town Planning Schemes/Land Use Schemes ? Compile and asses Land Use Management applications in terms of the different Legislation ? Basic knowledge on relevance of E

LPLTRA2	**Legal Principles: Planning Laws And Administration 2A**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose is thus to introduce the students to the basics principles of the Law of Property in order to empower the students with legal knowledge in their field of studies and to equip him/her for the course “Legal Procedures II”.		
Content	Basic Understanding of the South African Legal System, Sources of Planning Law, Tools employed in Planning Law, Principles and purpose of planning law, Public participation, Removal or Amendment of Restrictive Conditions, General Principles contained in the SPLUMA Act, Immovable Property and Ownership, Co-Ownership and Common Ownership, Servitudes, Mineral Right and Real Security, General Principles of Contract, Survey of land Module Outcomes At the end of this module the student should be able to do the following: ? Understand the South African Legal System as it relates to property ? Identify and discuss the sources of Planning Law ? Differentiate between the main groups/categories of tools employed in Planning Law ? Demonstrate the principles and purpose of Planning Law ? Discuss the different methods to remove or amend restrictive conditions ? Explain the General Principles contained in the SPLUMA ? Understand immovable property and ownership ? Explain servitudes, Understand securi		

LOGMIB3	**Logistics Engineering 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To present basic principles of logistics engineering, and the associated management processes such as supply chain management.		
Content	Introduction to logistics; Reliability, maintainability and availability measures; Measures of logistics and system support; The system engineering process; Logistics and supportability analysis; Logistics in system design and development phase; Logistics in the production / construction phase; Logistics in the system utilisation, sustaining support and retirement phases.		

MADMIB2	**Machine Design 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			

Calculation Criteria	Final Mark = Semester Mark (100%)
Purpose	To provide advanced knowledge and understanding required to select components, analyze and solve power transmission and mechanical engineering systems. The student will be required to gain procedural and non-procedural techniques to design broadly defined components, systems, works, products or processes to meet desired needs normally within applicable standards, codes of practice and legislation.
Content	Design Process Philosophy and Design Matrix Evaluation Decision-Making, Gear design, Variables stresses in machines parts, Welded joints, Rolling contact bearing, Pressure vessels.

EMAELA3	**Machines 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The candidate is introduced to the physics and theory of transformers, induction motors and synchronous machines. These skills shall be utilized to analyse the functioning and performance of these electromagnetic converters.		
Content	Hydrodynamic Bearings; Seals; Lubrication; Gears; Welding.		

MGTCIB1	**Management 1B**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of Management 1B is to give learners an overview of the various parties and organizations involved in a Civil Engineering project and their role thereof and to introduce them to the basic management principles.		
Content	Parties to the Industry. Types of enterprise. Entrepreneurial Aspects of business. Theories of Management. Work study. Productivity. Human behavior. Organizational behavior. Personnel Management. Principles of Engineering Economics.		

MGTTRB3	**Management In Planning 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Public Administration, Public Economics, The Balanced Scorecard – measuring and managing business strategy , Financial Perspective, Customer Perspective, Internal-Business-Process Perspective, Learning and Growth Perspective, Linking Balanced Scorecard Measures to your Strategy, Structure and Strategy, Management – Planning, Organising, Budgeting and Controlling, Marketing, The Marketing Plan, Professional practice, Professionalism , Business ethics, Code of conduct, Office administration, Information Technology in the office environment, Personal management e.g. time management; stress management		

Content	Introduction – overview of the subject, Public Administration and Public Economics, The Balanced Scorecard, Management and marketing, Professional Practice, Office administration, The following weeks will be spent on in-depth lecturing, self-study of and assignments on the various aspects of the subject as outlined above. Module Outcomes Have an understanding of the organization, purpose, function and/or application of : ? Public Administration ? Public Economics ? The Balanced Scorecard in the public and private working environment ? Management ? Marketing ? Professional practice in the public and private working environment ? Office administration.

MFDMIA2	**Manufacturing Systems Design 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To introduce learners to the principles, theory and practice of manufacturing systems design in modern organisations.		
Content	Introduction to Manufacturing Systems; Single Station Manufacturing Cells; Manual Assembly Lines; Automated Production Lines; Automated Assembly Lines; Cellular Manufacturing; Flexible Manufacturing Systems.		

MATMIA2	**Material Science 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide students with a wider and more detailed understanding of mechanical and metallurgical aspects of materials.		
Content	The electron, molecules and bonding; Crystal structure and defects; Mechanical properties of engineering materials; Microstructure and properties of steel Ceramics and Composites; Plastics and polymers.		

MTTMTA2	**Material Testing 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To introduce the student to, and develop competence in metallurgical testing in both analytical and destructive testing methods.		
Content	Mechanical properties of engineering materials; Microstructure and properties of steel; Ceramics and composites; Plastics and polymers.		

MTTMTB2	**Material Testing 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		

Purpose	To prepare the student for the engineering environment by developing competence in metallurgical concepts and processes and to give the student basic knowledge and sufficient theoretical background in Materials Testing Metallurgy and develop competence in metallurgical testing in both non-destructive and destructive testing methods.
Content	Using and operating equipment and accessory measurement systems, workshop tools and procedures to conduct tensile, hardness, dye penetrant and ultrasonic tests as well as interpreting data associated with fatigue, brittle fracture, creep, radiography and magnetic particle testing for the production of defect free components. Module name

MBWCOY2	**Descriptive Quantification 2**		
NQF Level	6	**Credits**	20
Year module, year 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Enable students to critically evaluate and analyse the quality of information supplied on drawings. Demonstrate competence in the application of Rules and Principles of measurement. Apply knowledge on the usage of the Standard System, Model Preambles to Trades and Model Bills of Quantities. Demonstrate and apply knowledge and skill to the entire process of bill production from taking-off to squaring and checking, followed by the processes of abstracting and billing for a simple structures		
Content	Introduction to the Standard System of Measuring Builders Work in SA. Rules and Principles of measurement. Detailed measurement of simple buildings all relevant trades. Compilation of relevant bills of quantities Detailed measurement of: load-bearing multi-storey structures. framed reinforced concrete structures , structural steelwork, Compilation of the entire process of Bill production from taking-off to squaring and checking, followed by the processes of abstracting and billing		

MBWCOY3	**Descriptive Quantification 3**		
NQF Level	7	**Credits**	20
Year module, year 3			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Enable students to critically evaluate and analyse the quality of information supplied on drawings. Demonstrate competence in the application of Rules and Principles of measurement. Apply knowledge on the usage of the Standard System, Model Preambles to Trades and Model Bills of Quantities. Demonstrate and apply knowledge and skill to the entire process of bill production from taking-off to squaring and checking, followed by the processes of abstracting and billing for a simple structures		
Content	Introduction to the Standard System of Measuring Builders Work in SA. Rules and Principles of measurement. Detailed measurement of simple buildings all relevant trades. Compilation of relevant bills of quantities Detailed measurement of: load-bearing multi-storey structures. framed reinforced concrete structures , structural steelwork, Compilation of the		

	entire process of Bill production from taking-off to squaring and checking, followed by the processes of abstracting and billing

MDEMTA3	**Mechanical Deformation Technologies 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide theoretical background in Mechanical Deformation Technology concepts at a basic level.		
Content	The aim of the subject is to give the student basic knowledge and sufficient theoretical background in Mechanical Deformation Technology to better understand metallurgical concepts and processes. Learners must be able to understand the physical and mechanical properties of metals and alloys, the effect of composition and thermal treatment on the processing of metals and alloys. You are also expected to be able to perform calculations relating to the various processes. Semester 2 Module name		

MDSMIA2	**Mechanical Engineering Design 2A**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To provide basic knowledge and understanding required to select components, analyze and solve power transmission and mechanical engineering systems. The student will be required to gain knowledge and understanding of the application of engineering management principles to their own work, as a member and leader of a team and to manage a project.		
Content	Introduction to Design Process; Engineering Standards; Engineering material selection; Keys and Keyways; Couplings; Review of Limits and Fits and Stress Concentrations; Shaft design; Plain and Rolling Element Bearings; Splines; Fasteners and Bolted Connections.		

PJMMIA3	**Mechanical Engineering Design Project 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To provide advanced knowledge and guidance to design components, machinery and installations in the mechanical engineering field. The student will be expected to demonstrate knowledge and understanding of the application of engineering management principles to their own work, as a member and leader of a team and to manage a project, and perform procedural and non-procedural design of broadly defined components, systems, works, products, or processes.		
Content	An industry related design project using standard engineering design principles, processes and procedures.		

PJMMIB3	**Mechanical Engineering Design Project 3B**

NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Provide advanced knowledge to design machinery and installations in the mechanical engineering manufacturing field.		
Content	A project proposal solving practical problems in the student work place / work integrated learning. All projects must be industry related.		

MDRMIA1	**Mechanical Engineering Drawing 1A**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Provide basic knowledge of engineering drafting principles and to develop the skills for use of computer software to create 3D mechanical components and 2D drawings that meet the SABS 0111standards.		
Content	Introduction to the principles of drawing; Orthographic projection: 1st angle, 3rd angle and Isometric/pictorial views; Introduction to Inventor software; 2D environment sketch tools in part file; 3D environment features and tools; Drawing environment in Inventor.		

WKSMIB1	**Mechanical Manufacturing 1B**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Provide and develop knowledge of engineering material in processes, tools and equipment for manufacturing different component or products using proper precautions and specified safety rules to avoid accidents. Student will be expected to be able to use engineering tools and instruments in carrying out manufacturing activities.		
Content	~~I~~Introduction to Manufacturing; Industrial Safety; Hand and Power tools, Materials (Metals, Polymers, Composites and Powder); Heat Treatment, Tolerances.		

WKSPIB1	**Workshop Practice 1B**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To enable students to use engineering tools and instruments in carrying out manufacturing activities.		
Content	Use of basic hand tools, drilling, tapping, bending and assemble.		

WKSMIA2	**Mechanical Manufacturing 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			

Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)
Purpose	To provide and develop understanding of various fabrication techniques by taking proper measurements and employing the correct manufacturing processes, materials, tools and equipment. To provide a connection between academic learning and workshop practice. Students will be expected to demonstrate use of the different machinery and equipment in shaping and forming existing raw materials into suitable usable form.
Content	Casting; Bulk Deformation of Metals (Forging, Rolling, Extrusion, Wire and Bare Drawing; Sheet Metal Work; Welding; Powder Metallurgy; Power tools and Machine operations.

WKSPIA2	**Workshop Practice 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To enable the students to identify, differentiate and select a suitable process for manufacturing of desired components by fabrication and assembly.		
Content	Use of power tools and machinery.		

MANMIB1	**Mechanical Manufacturing Engineering 1B**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide and develop knowledge of engineering materials, their properties and testing, and of a wide range of manufacturing processes including their working principle, process mechansm, and applications. To enable the students to identify, differentiate and select a particular process for manufacturing of desired shape or geometry in various materials.		
Content	Introduction to Manufacturing, Materials and Industrial Safety; Casting; Welding; Bulk Deformation Porocesses such as Forging, Extrusion, Rolling, Bending, and Drawing; Sheet Metal Work; Machining Processes such as Turning, Drilling, and Milling; Powder Metallurgy.		

MMEMTA2	**Mechanical Metallurgy 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	In this module learners are introduced to the mathematical framework of mechanical metallurgy fundamentals and single crystal theory.		
Content	The module covers states of stress in both two and three dimensions, Mohr's circle of stress (two and three dimensions) and Mohr's circle of strain, elastic stress-strain relationships and		

	calculations, theory of plasticity, yielding criteria, crystal geometry, concepts of slip and lattice defects and also single crystal deformation concepts. Module name

MMEMTB2	**Mechanical Metallurgy 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This module provides the learner with a sound understanding of structural aspects of flow and fracture with focus on the atomic level and how metallurgical structure may influence these processes		
Content	The module covers dislocation theory, strengthening mechanisms, cold worked structure. special strengthening processes, fracture mechanics, griffith theory, metallographic aspects of fracture, fractography, dislocation theories of brittle fracture Module name		

MEMMIA3	**Mechanics Of Machines 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide advanced knowledge to solve complex engineering problems in dynamics.		
Content	Vibration (Free & Damped); Whirling of Shaft; Balancing (Reciprocating mass); Cams; Gyroscopes (Coriolis); Crank Effort Diagrams.		

MCCELB2	**Mechatronics & Control 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	An introduction to the synergy of mechanical systems and actuators with electronics and electronic sensors, computer embedded control, pneumatics, hydraulics, optics and telecommunication technology. Ability to apply this rather new technology to solve well defined control problems. Make use of control theory to analyse and calculate control system responses.		
Content	A close integration of mechanical components, electronic sensors, actuators and computer based controllers; Design, testing and operation of machinery and equipment; Embedded controllers; Programmable logic controllers; Block Reductions and frequency domain modelling; Pneumatics; Mechanical actuators; Mechanical transfer functions; Introduction to control systems; Feedback control strategies; PID Control strategy; System stability and controllability; Time response, steady-state error and stability; Frequency response using bode plot diagrams; Phase compensators; Robotics.		

MEAMTA2	**Metallurgical Accounting 2A**

NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This module deals with monitoring of the valuable metals throughout the entire metallurgical plant in order to make decisions with regards to operation since the values of recovery and grade obtained from accounting procedure are indications of process efficiency.		
Content	Collection of data, Sampling, Measuring and monitoring, Standards of accounting and procedures, and Accounting methods.		

PEMMTB3	**Metallurgical Project B3**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To demonstrate the depth and breadth of knowledge gained in the study of metallurgy and the ability of the student to apply this knowledge and the techniques taught throughout the course.		
Content	Towards the end of the BET programme, the students will be required to compile a written project based on experimental research. The work should demonstrate sound metallurgical depth of understanding. The technical problems will be industrial based and the students will set out to solve the individual problem following systematic research approach. The oral presentation will complement the written report in contributing towards the final mark. It is expected that the course will explore the intricacies of report writing as well as preparing technical papers for journals and conference proceedings.		

MTDMTB2	**Metallurgical Thermodynamics 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Introduction of basic thermodynamic functions and their application to processes in extraction metallurgy		
Content	Heat capacity; gases and condensed phases, Enthalpy and the first law of thermo- dynamics; heat of reaction; Carnot cycle; heat balances, Entropy and the second law of thermodynamics; order and probability, Free energy and equilibrium constant; feasibility of reactions, Reactions under non-standard conditions; application to industrial processes.		

MPRMTB1	**Metallurgy Engineering Practice 1B**		
NQF Level	6	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To prepare the student for the engineering environment by developing competence in basic engineering workshop skills and tool use. Students will be taught how to prepare for and		

	carryout workshop and laboratory tasks as well as the importance of workspace restoration upon completion.
Content	Using and caring for hand tools, using and caring for power hand-tools, measurement systems, workshop safety, preparing for a workshop project, working through a project, evaluating the results of a project, restoring the workshop environment. YEAR 2 Semester 1 Module name

DVPMSB3	**Mine Design And Valuation Project 3B**		
NQF Level	7	**Credits**	49
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	0		
Content	Design a mine and calculate a resource and reserve statement based on broadly defined survey and geology information. Start from a borehole based resource. Design and stake out shaft area. Survey and construct a surface plan. Design and construct an underground working plan for resource and mining layouts.		

MINMNA2	**Mine Engineering 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To present the knowledge base required by mining engineering technology studentsto develop an understanding of the Engineering disciplines that are an integral part of a mining operation.		
Content	Electrical Power. Machinery Components. Basic thermodynamics. Fluid flow science. Engineering materials.		

MEQMNB2	**Mine Equipment 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To present the knowledge base required ny mining students to develop an understanding of the engineering equipment that are an integral part of a mining operation. This module will involve further development and application of content learned in MINMNA2		
Content	Electrical motor types and applications. Hoists, chairlifts and shaft sinking. Conveyors. Pumps and Compressors. Drills and Drilling technology. Transport. Mineral Processing		

MPDMNA3	**Mine Planning And Design 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide the skills required to successfully design and plan a mining project supported using a mine design package. On completion, the student should be able to demonstrate understanding to identify and apply processes, concepts, methodologies, and tools for mine planning, design and optimisation.		
Content	Introduction. Strategic Planning. MRM. Design Criteria. Technology. Estimations. Infrastructure. Equipment and manpower. Costing. Risk.		

MSVMSA2	**Mine Surveying 2A**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To introduce students to mineral survey calculations and the imprtance thereof.		
Content	Solutions of Triangles, Volumes of Solids and Irregular Dumps and properties of a circle. Co-ordinate system and the plotting data. Join, Triangulation and Resection. Levelling and calculation of elevations Major and Minor dips		

MSVMSA3	**Mine Surveying 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	0		
Content	Mine Surveying 3 Systems, setting out of pre-determined positions, heighting, . Inertial navigation systems. Earth satellite orbits, geometry of sensors and sensor systems (airborne, spaceborne and terrestrial), camera calibration, acquisition of images (including flight planning), image media and formats incl. image compression, principles of analogue and digital photography, ortho- rectification, mosaicing and georeferencing, digital elevation models . Ground Control, Laser scanning		

MSVMSB2	**Mine Surveying 2B**

NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	0		
Content	Measurement science, distance measurement (optical, mechanical and electro-optical), angular measurement, measuring equipment (distance and angular, including sources and management of instrument errors, calibration and expected precision), spatial reference systems, distance and direction from coordinates, position determination using observed angles/directions, distances, or combinations of these, areas, volumes, interpretation of maps/plans, design and setting out of horizontal and vertical curves, cross and longitudinal sections, cut and fill calculations, preparation of maps/plans, 2-D coordinate transformations, control surveys, topographic surveys		

MSVMSB3	**Mine Surveying 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	0		
Content	The nature of observations and data acquisition, types of errors, means, norms ,accuracy, precision, reliability, probability, confidence intervals, distributions and probability density functions, auto- and cross-correlation, hypothesis testing, least squares theory, simple and multiple regression, distribution functions, law of error propagation, least squares adjustments of survey observations(parametric and condition equation case), network adjustment (including free networks), adjustment of coordinate transformations, design of survey networks, statistical analysis of results and interpretation of data.		

SWKMSB1	**Mine Surveying (Practice) 1B**		
NQF Level	6	**Credits**	7
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	In lieu of WIL the workshops are designed to familiarize and expose the student to a simulated real-world surveying process, including working in a team, meeting deadlines and ensuring the health and safety of the survey crew.		
Content	Basic surveying techniques, setting up an instrument over and under a reference point, leveling, basic underground traverse, measuring with a tape. Plotting and constructing a plan		

SWKMSB2	**Mine Surveying (Practice) 2B**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 2			

Calculation Criteria	Final Mark = Semester Mark (100%)
Purpose	In lieu of WIL the workshops are designed to familiarize and expose the student to a simulated real-world surveying process, including working in a team, meeting deadlines and ensuring the health and safety of the survey crew.
Content	Basic surveying techniques, leveling and balancing a leveling run, traversing and error detection. Triangulation, staking out a basic curve. Placing grade lines, constructing long and cross sections. Plotting and constructing a plan and sections.

SWKMSA3	**Mine Surveying Workshop 3A**		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	In lieu of WIL the workshops are designed to familiarize and expose the student to a simulated real-world surveying process, including working in a team, meeting deadlines and ensuring the health and safety of the survey crew.		
Content	Intermediate surveying techniques including baseline measurement, triangulation, traverse networks, resection. Staking out points such as a borehole. Tacheometry. Plotting and constructing a plan and calculating contours, areas and volumes.		

SWKMSB3	**Mine Surveying Workshop 3B**		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	In lieu of WIL the workshops are designed to familiarize and expose the student to a simulated real-world surveying process, including working in a team, meeting deadlines and ensuring the health and safety of the survey crew.		
Content	Advanced surveying techniques including EDM calibration, triangulation and resection including error adjustment, inertial surveying techniques. Shaft surveying. Plotting and constructing a plan and calculating contours, areas and volumes.		

MBEMNA2	**Mineral Beneficiation 2A**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this module is to provide knowledge to graduates required for decision making related to Mineral Beneficiation and processing.		
Content	Material handling for ore treatment. Preparation of ores. Unit machines for processing. Pyro-metallurgy. Flow sheets, Copper, PGM, diamonds and gold.		

	Process control. Residue and effluent control Environmental issues from treatment processes. Blending and stockpililing/ reclamation Coal benefication and coal processing. Determination of washabiltiy and efficiency. Rank of Coal and forms of utilisation Environment issues from coal treatment.

MPRMTA2	**Mineral Processing 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Provide a general and comprehensive knowledge on the understanding and appreciation of the various mineral processing units operations for the solving of mass balance and efficiency in industrial operations		
Content	Introduction, processing flowsheets, Ore storage, Ore transportation, Feeding, Communition, Crushers, Grinding mills, Industrial screening, Classification, Dewatering, Plant problems.		

MPRMTB2	**Mineral Processing 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Equip learners with knowledge and confidence to supervise and manage mineral concentration operations in mineral processing plant.		
Content	Introduction, Gravity concentration, Froth flotation, Dense Medium Separation, Magnetic separation, High tension/ Electrostatic separation, Residue disposal, Sampling.		

MREMSA2	**Mineral Reserve Evaluation 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	0		
Content	Sampling Theory, sampling procedures, sampling and assay errors, ore flow,		

MREMSA3	**Mineral Resource Evaluation 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	0		
Content	financial mine planning, classical statistics, non-spatial estimation techniques, data analysis, classical estimation methods, geostatistical estimation methods, oregenisis, structural geology, SAMREC code		

MREMSB2	**Mineral Resource Evaluation 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	0		
Content	pay limits, ore reserves, ore/metal accounting factors,		

MRLMSA3	**Mineral Resource Legislation 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	0		
Content	Mineral rights, law of the Certficate of Competency, land use systems and types,land use planning and control, environmental and physical influences, community dynamics, social impacts, integrated environmental management, environmental impact analysis, mining property valuation, SAMREC, SAMVAL, PLATO act, MHSA. MRPDA Land ownership and land tenure (including indigenous systems), rights in land (including servitudes, leases, statutory rights), nature and function of the cadastre, cadastral surveying systems, South African cadastral survey system and the Land Survey Act and Regulations, curvilinear boundaries, case law on boundaries, registration systems, Deeds registration, conveyancing, division of land, consolidation of land, legislation applicable to land ownership and division of land, sectional titles (including Sectional Titles Act and Regulations). professional ethics, different types of professional practices, partnerships and partnership law, structuring a practice, client relationships, SA survey profession and SA Council for Professional and Technical Surveyors (including legislation and rules), social responsibility.		

MINMNA3	**Mining 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide basic mining engineering concepts so that the student can utilise this knowledge I terms of mining practice that is effective and promotes a safe work environment		
Content	Setting up a mine. Mine Access I: Vertical Access. Mine Access II: Near-vertical Access. Mine Access III: Horizontal Access. Unit operations of Mining. Rock Breaking I: Rock Penetration. Rock Breaking II:Rock Fragmentation. Material Handling Transportation.		

COAMNA2	**Mining Coal 2A**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this module is to provide knowledge and applied practice in Underground Coal mining.		
Content	Introduction to coal mining. Coal mining method selection. Bord and pillar mining. Drill and blast (coal). Contiuous miners, road headers, shearers, ploughs. Surface infrastructure Group projects.		

MEVMSB2	**Mining Economics Valuation 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide students with the ability to identify and solve problems in Mine Valuation, factors governing the exploitation of minerals and the importance of mining profitably.		
Content	Knowledge of Mine Valuation in solving valuation related problems. Irregular sampling and the calculation of Destiny, Tonnes and Contents. Ore Reserves. Ore Flow. Pay Limits. Life of a Mine and Policy Change. Ore Blending		

MLEMNA3	**Mining Legislation 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide the student with knowledge of the need to have a good understanding of the Mine Health and Safecty Act, the minerals Petroleum Resources and Development Act and other mining related legislature.		
Content	Introduction to Mining Legislation. What informs the enactment of Mining Legislation. The Mine Health and Safety Act. Tools for applying Mine Health and Safety Act Minerals Petroleum Reseource and Development Act. Minerals Petroleum Reseource and Development Act. Content structure. Mining charter and Social and Labour Plan. Other Acts and Legislation. Mine Manager’s Certificate.		

MMEMNA2	**Mining Metal 2A**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this module is to provide basic mining engineering concepts so that the student can utilise this knowledge in terms of mining layout that are cost effective and promote a safe work environment.		
Content	Introduction. Mine access and development. Production mining. Unsupported mining. Tabular metalliferous. Cave mining.		

SMMMNA2	**Mining Surface 2A**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To establis an understanding of the various aspects of surface mining design, including surface mining methods and their suitability to various ore body geometries.		
Content	Introduction to surface mining Surface mining methods. Surface mine blast design. Loading shovels. Haulage and truck productivity Surface mine planning.		

MTSMNB2	**Mining Technical Services 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	0		
Content	Purpose of rock engineering, elastic theory, stresses and strains - compression, tension, shear, Young's Modulas, Poissons Ratio, strength of support materials - rock types etc, convergence, distribution of stress around openings, fracture around openings, effects of geology, factors governing rock behaviour, energy release rate, excess shear stress		

MSOCHA3	**Multistage Operations 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This course provides an introduction to the key separation processes used in the chemical industry, the principles upon which they are based, and their limitations and advantages. The separation processes considered are distillation, absorption and solvent extraction Upon completion of this course the learner will		

	be able to: a) Be able to plot the relevant equilibrium curves and graphical representation of systems under consideration; b) Be able to set up and solve single-stage and multi-stage calculations; c) Be able to determine number of stages required for tray-type and packed type distillation, absorption and extraction columns; d) Be able to solve relevant binary problems for batch and continuous systems; e) Understand the implications of non-ideal phase behavior (e.g. azeotropes and partial miscibility); f) Understand the implications of process variables (pressure, temperature, available utilities, construction materials, etc.) on the design and operation of the various processes.
Content	Distillation: Multicomponent distillation, Multiple feed and side streams distillation, Changing the material balance, Changing the energy balance, Temperature and composition profiles, Flooding and weeping in columns, Equilibrium Data, Feed and Product compositions, Light and heavy components, Calculation of number of plates required for a given separation, Minimum reflux ratio, Short Cut Design Methods. Gas absorption: Principles of absorber and stripper operations, equilibrium data, minimum liquid to gas flow / gas liquid flow, no of stages required for absorber / stripper, Rate expressions and mass transfer coefficients for packed columns, Group/Kremser Method, Tray Efficiency, Sizing and Hydraulics. Liquid-liquid extraction: Solvent extraction theory, ternary equilibria and bimodal curves, solvent selection, no of stages required for separation. Leaching: General Principles, Mass Transfer, Equipment for Leaching, Counter Current Washing of Solids, Calculation of Number of Stages, Number of Stages by Graphical Methods.Crystallization: Growth and properties of crystals, Saturation and nucleation, Effects of impurities on crystal formation, Yield of Crystals, Vacuum Operation, Caking of Crystals, Effects of temperature on solubility, Surface and Interfacial Tension, Polymer crystallization - Chain Folding, Polymer crystallization- Growth Theories, Polymer crystallization- Surface nucleation and entropic barrier models. Adsorption and ion exchange: Adsorption isotherms, batch adsorption, design of fixed bed adsorption columns, equilibrium relationships in ion exchange, design of ion exchange columns. Acquisition of the above knowledge and understanding is through a combination of lectures and tutorial classes and laboratory work. This course will be assessed by tests, assignments, tutorial assignments and an examination.

NETELB2	**Networks 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The candidate is introduced to the OSI model and the TCP/IP suite. Within this model, the candidate is equipped with the skills to configure various switches and routers for connecting LANs and WANs including troubleshooting techniques.		
Content	The OSI model; Configuration of LANs and WANs; TCP/IP protocol suite – from IPv4 to IPv6, addressing to application		

	layer; Troubleshooting networks; Routing – includes protocols, routing tables; Switching – includes design, VLAN's and configuration, layer 3 switching and ACL's.

NFMMTA3	**Non-Ferrous Metallurgy 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Provide a general and comprehensive knowledge of the main processes involved in the production of non-ferrous and precious metals		
Content	Introduction, Copper, Lead, Zinc, Platinum, Gold and Uranium		

OPRMIB2	**Operational Research 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide learners with several quantitative techniques to assist in the analysis, design and improvement of performance or operation of systems. Problem formulation, mathematical modelling and optimization are central to the practice of Operations Research. Students need to be able to identify and solve for the optimal solution.		
Content	Quantitative -Methods and the Decision-Making Process; Probability Theory; Decision making by means of the probability theory, decision trees and normal distribution; Linear Programming; Forecasting; Transportation; Integer Programming; Network analysis; The Queuing Theory; Markov Analysis; Introduction to simulation (very basic, what it is about not actually doing simulation).		

PTECHA3	**Particle Technology 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The main objective of the course is the development of the fundamentals of fluid mechanics, and its application to chemical engineering operations. Upon completion of this course, the learner will be able to: a) Be able to demonstrate knowledge of properties of particulate materials; b) Be able to describe the principles of particles of size measurement, particle size distribution, specific surface area and particle size reduction; c) Be able to select processes and specify equipment for size reduction of particulate materials and for separation on basis of particle size; d) Demonstrate knowledge of physical separation principles and equipment for mixtures of particulate solids; e) Demonstrate knowledge of principles of separation of solid from fluids; f) Be able to select processes and specify equipment for solid liquid separation processes such as filtration, settling and cyclone separation; g) Apply laboratory or pilot plant equipment to separate materials		

Content	Characterisation of particles: Particles density and bulk density, size distribution, characteristic angles. Size reduction and storage of solids: Types of crushers and separators. Energy requirements. Solid-liquid separation: Particle dynamics. Operation principles and calculations in the following separation operations: Flocculation and coagulation; Sedimentation; Cyclones; Filtration; Membrane technology- MF, UF, NF, RO. Fluidization: Characteristics of fluidized systems, Properties of gas solid and liquid solid systems, Effect of fluid velocity on pressure gradient, Resolving minimum fluid velocity, Tabulating minimizing fluid velocity in terms of terminal falling velocity. The course will be assessed by tests, formal presentations, tutorial and written assignments, and an examinations.

PMTMTA2	**Physical Metallurgy 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The primary purpose of this module as an integral part of the National Diploma is focusing on cementing the theoretical and practical knowledge acquired from the modules of Fundamental metallurgy, Engineering materials, Structures and properties of alloys, Mechanical metallurgy, Material testing and Quality techniques with a clear and strong background of the fundamentals behind the phase transformations involved in the processing and service (behaviour) of metals and alloys. Quantitative aspects are now introduced		
Content	The module covers structures-properties-processing-performance framework and materials characterization techniques, Binary phase diagrams, Ternary phase diagrams, Diffusion in substitutional solid solutions, Diffusion in interstitial solid solutions, Annealing, Precipitation hardening, Iron-Carbon system and the Hardening of steel. In addition learners undertake an investigative project through which learners are exposed to problem identification, formulation and solving in the broad field of physical metallurgy and mechanical metallurgy. Module name		

PMTMTB2	**Physical Metallurgy 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The primary purpose of this module as an integral part of the National Diploma is to provide the students with an understanding of physics which will serve as a fundamental basis for the students' further in Metallurgy		
Content	This module of advanced physical metallurgy connects globally the processing and behaviour of metals and alloys to the fundamentals behind phase transformations within these materials. These fundamentals revolve essentially around thermodynamics, kinetics, diffusion theory and structures-properties of interfaces whereas the processing and behaviour of metals and alloys often involve transformations such as		

	solidification, diffusional and diffusioneless transformations in the solid state. This module is designed to develop the learner to think at a higher cognitive level than before and to improve particularly the problem solving skills in the field. Sets of problems and or case studies are provided at the end of each learning unit. Part A Thermodynamics of condensed phases and phase diagrams Thermodynamics of interfaces: structures and properties of crystal interfaces, and microstructures Part B Solidification of metals and alloys Solid-state diffusional transformations in metals and alloys Solid-state diffusionless transformations in metals and alloys Part C Elasticity and plasticity Introduction to dislocations dislocations and plastic deformation Interactions of dislocations and solute atoms Fracture Fracture mechanics Thermally activated plastic deformation Part D Practical forms an integral part of this module, as it will give the learner the opportunity to investigate the practical applications of the theory, and to develop his experimental skills. The learner will have a certain amount of freedom in formulating procedures and aims. Thus, a project proposal including the relevant literature review has to be presented for a verbal approval by the lecturer prior the commencement of the project. A programme plan must be submitted individually for approval in the beginning of the semester. The project must be performed individually and completed within a semester of registration. 2 to 4 hours of study and work per week need to be allocated to the project for about 12 weeks. Regular feedback should be given to the lecturer. The project report must be handed in before the classes closed. A 15 min oral presentation will be prepared and given to the rest of the learners. A poster of the project will also be submitted. YEAR 3 Semester 1 Module name

ASSTRB3	**Planning Design: Advanced Strategic And Spatial Planning 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The student will be introduced to the Strategic Planning process. The purpose of this module is further to provide the student with an understanding of the Integrated Development Planning process as well as the Integrated Development Plan (IDP) as a legal requirement for Development Panning in South Africa. The module is further aimed at ensuring that the students achieve competency in the drafting of Spatial Development Frameworks and thus enabling students to implement principles and theories relating to development panning in such plans. The student will also be introduced to planning at a metropolitan scale within the international context.		
Content	Strategic Planning, Integrated Development Planning, Spatial Development Frameworks, Metropolitan Planning Module Outcomes 1. Strategic Planning processes and implementations The student will have an understanding of Strategic planning with specific reference to the following: a. the term Strategic planning. b. the Strategic planning process. c. the Advantages		

	as well as disadvantages of the strategic planning process. 2. Integrated Development Planning The student will have an understanding of the process involved in the compilation of a Spatial Development Framework plan and will be able to follow such process in the compilation of a Spatial Development Framework project. 3. Metropolitan Planning The student will have a basic understanding of the way metropolitan planning is conducted within the international context.

PLSTRB1	**Planning Design: Introduction To Planning Survey 1B**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The student must be introduced to Survey and Analysis methods and techniques so as to help him/her to become competent in their use related to both an Urban and Regional scale.		
Content	The use of samples to conduct a survey, pilot projects, questionnaires, different survey types most commonly found in the Town Planning environment. Constructing a report and its outline, forecasts, alternative methods of collecting data. Module Outcomes For successful completion of Survey and Analysis-1, the student should demonstrate that he/she can: ? define concepts and terms relevant to planning research ? be knowledgeable of different types of surveys used by planners, complete surveys to correctly collect, interpret and visualise data. ? undertake various types of surveys, e.g. a Transportation Survey and a Land Use Survey. ? perform research and analysis on planning themes		

NDSTRA2	**Planning Design: Neighbourhood Design And Site Planning 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The student will have knowledge regarding the principles and art of Site Planning of both an Urban and Regional nature and be competent in design related to the provision of new development layouts and upgrading areas by developing under utilized vacant land		
Content	The process of design and decision making, the components of the design, the site in its context, constraints and opportunities presented by the site, generate a concept plan, activity systems, hierarchical system of roads parking layouts, interface uses, residential layouts street patterns, office parks, industrial parks and estate planning. Urban design projects, proportions and scale. Module Outcomes ? Be able to identify the factors which impact on the design, location theory application, highest level of accessibility and potential, constraints and opportunities are recognized. ? Draft a concept plan, which is produced, reflects the optimum use of the site for different functions. ? Draft a freehand representation of a concept plan. ? Design of residential planning layouts with economic considerations of subdivision and access roads, mixed housing development with		

	community facilities ? Understand the criteria for assessment that include competent/stand layout, correct circulation

SPSTRA3	**Planning Design: Spatial Planning /SDF 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The student will have knowledge regarding the SDF principles and art of Site Planning of both an Urban and Regional nature and be competent in design related to this.		
Content	The process of design and decision making, the components of the design, the site in its context, constraints and opportunities presented by the site, generate a concept plan, activity systems, hierarchical system of roads parking layouts, interface uses, residential layouts street patterns. Module Outcomes ? Be able to identify the factors which impact on the design, location theory application, highest level of accessibility and potential, constraints and opportunities are recognized. ? Draft a concept plan, which is produced, reflects the optimum use of the site for different functions. ? Draft a freehand representation of a concept plan. ? Design of residential planning layouts with economic considerations of subdivision and access roads, mixed housing development with community facilities ? Understand the criteria for assessment that include competent/stand layout, correct circulation provision in terms of design and hierarchical consideration, land use distribution based on corre		

DRWTRA1	**Planning Design: Techniques Of Drawing 1A**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The student must be introduced to technical drawing methods and techniques so as to help him/her to become competent in their use related to planning design at various scales. The student should become competent in both freehand and instrument drawing techniques.		
Content	Basic drawing and sketching skills through the use of layouts, forms and objects to grasp fundamentals, 3-dimensional visual awareness through the use of hands-on object orientation, reproducing and scaling of existing development layouts, Site development plans and drawings form office practice, building a topographical model and introducing computer aided drawing. Module Outcomes ? Define concepts and terms relevant to technical drawing ? Understand the different methods and techniques that may be used when designing and drawing to scale. ? Complete drawings to scale as well as free hand neatly, accurately and presented correctly according to set standards. ? Build a contour or topographical model to scale.		

URBTRB2	**Planning Design: Urban Renewal 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			

Calculation Criteria	Final Mark = Semester Mark (100%)
Purpose	To introduce the student to the Urban & Regional Planning renewal processes as applied in South Africa.
Content	Introduction to regional planning, Definitions, Models of urban growth, Guidelines for planning and design of settlements, Theories, Current situation of settlements and possible ways to improve, Local government municipal systems act, 2000 (act 32 of 2000), Evaluation of spatial development frameworks & IDP Module Outcomes ? Understand the reasons for planning ? Understand the problems with laissez-faire approach ? Explain the Various Types of Planning. ? Explain Spatial Planning ? Illustrate the planning process ? Differentiate between Strategic Planning in the Private and Public sectors ? Understand the different models of urban growth. ? Understand the performance qualities and Urban Structure principles. ? Understand the proviso's of the Local Government: Municipal Systems Act, 2000 (Act 32 of 2000) relating specifically to Integrated Development Planning and Spatial Development Frameworks. ? Understand the process involved in the compilation of a Spatial Development Framework. ?

PUSTRB1	**Population And Urbanization Studies 1B**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The student must be introduced to the spatial and socio-economic consequence of rapid population growth and consequences on resources.		
Content	In addition the course intends to preparing students for advanced studies in major global trends in population studies and identify the timing and pace of this trend. Module Outcomes For successful completion of Population and Urbanisation, the student should demonstrate that he/she can: ? be able to understand the demography transition theories ? have the ability to debate about relationship between population and development ? be able to argue fertility trends, cultural / economic bias and family planning ? manage multi-stakeholder design methods and tools that incorporate lifecycle cost analysis		

PMCMTB3	**Powder Metallurgy And Ceramic Material 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This module introduces the student to Powder metallurgy and its related technology laying a sound foundation in powder metallurgy basic and preparing the successful student for entry into powder metallurgy career opportunities.		
Content	Powder processing has tremendous benefits as an alternative shaping route to casting and machining. Well documented limitations associated with casting, inter alia, macro-segregation, alloy content constrained by solubility, shrinkage cavities and porosity can be circumvented by powder processing		

	to produce sound and complex compacts. The course presents all aspects of powder metallurgy that include; powder production, characteristics, binders, powder-binder mixing, and compaction, debinding and sintering. Students are expected to understand the procedures that lead to dense sintered compacts as well as processes of general powder pressing and metal injection moulding. Module name

POWSTA3	**Power Systems 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The candidate is introduced to power electronics and high power electronic components.		
Content	Power Electronics, power diodes, power transistors, silicon controlled rectifiers, single phase converters (rectifiers etc.) and choppers (dc to dc converters).		

POWERB3	**Power Electronics 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The candidate is introduced to power systems which includes power distribution and the protection of power systems.		
Content	Symmetrical components, Milliman theory, illumination, Fault analysis, earthing, protective relays, power economics, power generation, Power factor correction, Transmission lines.		

PMEMTB3	**Principles Of Management & Economics 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this module is to Introduce 3rd year learners to the fundamental of general management, finance and micro-economics theory.		
Content	Management areas, Management functions, Basics of financial management, Time Value of money, Discounted cash flow, Introduction to microeconomics		

SUSCIB3	**Principles Of Sustainability 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of Principals Of Sustainability 3B is to introduce the basic concepts related to sustainability and the strategic framework analysis approach required for accounting for natural (environmental), social/political and economic systems issues for identifying appropriate engineering solutions towards sustainable development.		

Content	Introduction/definition and concept/systems thinking. Principles of sustainability (system conditions for a sustainable society). Human impact on sustainable natural systems. Social/political system issues in sustainability. Environmental system issues in sustainability. Economic system issues in sustainability. Frameworks for strategic sustainable development (Triple Bottom line etc.). Decision making tools in sustainable development (MCA etc.).

PCAELA3	**Process Automation 3A**		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of the module is to gain insight into the interface between the measured variable and the automatic control of that variable.		
Content	Process Overview and Definition, Closed Process and open ended Process, Integrated Process and Systems Theorem; Process Integration and Synthesis, Defining process variables and operation; Input and Output variable operation, Signal conditioning and conversion; Levels of automation, Integration and manual process, Advantages and disadvantages; Automation models, Modulated design, Fuzzy Logic and mathematical modelling, Batch and continuous process, Control parameters and tuning, Automation of slow feedback systems, Analyzers and feed-forward as well cascaded loop control; Robotics; HMI; Plant modelling; Systems integration and management reporting; Risks and Safety.		

PRCCHB2	**Process Control 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This course introduces students to various instrumentations, control theory, controller tuning and stability, various control strategies, alarms and interlocks, pumps, valves and HAZOP. Upon completion of this course the learner will be able: a) Identify and draw the various symbols of a P&I Diagram; b) Identify the various types pumps and valves and understand the basic operation and selection procedure; c) Understand the principle of various flow, temperature, pressure and liquid level measurements; d) Understand the theory of control, including control objectives, control mechanisms, design aspects and hardware elements and mathematical models; e) Understand different control strategies and be able to select and apply the best control strategy for a given circumstance; f) Understand and conduct basic HAZOP studies		
Content	Instrumentation: Principles of various temperature, pressure, level and flow measuring instruments are discussed. P&ID: Different process flow diagrams and basic symbols used to draw a P&ID are covered. Control theory: The different controller modes of proportional, integral and derivatives are discussed with their relative advantages and disadvantages. Control		

	strategies: Feedback, feed forward, cascade, split range, ratio, override and auctioneering control strategies are studied. Alarms, interlocks and safety trips: Design principles of alarms and interlock are discussed. HAZOP: Learner are taught the purpose of and how to conduct a HAZOP study. Acquisition of the above knowledge and understanding is through a combination of lectures and tutorial classes and laboratory work. This course will be assessed completion of a portfolio consisting of assignments, tutorials and an examination.

PRCCHB3	**Process Control 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This course introduces the student to the theory and applications in process control. The basic principles covered in the level three course is expanded to enhance the student's understanding of process control and the design of control systems. Upon completion of this course the learner will be able to : a) Develop mathematical models for different chemical processes; b) Solve first order and second order ODE's; c) Approximate the transient behavior of elements in a feedback control loop; d) Predict the stability of open and closed loop systems; e) Design and optimize simple feedback loops to control process equipment and systems; f) Write simple programs for PLC's.		
Content	Mathematical Modelling Principles: The modelling procedure, modelling examples, linearization, numerical solutions of ODE's, the nonisothermal chemical reactor. The Laplace transform, I/O models and transfer functions, block diagrams. Modelling and analysis for Process Control: Basic system elements, series structures of simple systems, parallel structures of simple systems, recycle structures, staged processes, multiple input-multiple output systems. Dynamic Behavior of Typical Process Systems: Control performance measures, approaches to process control. Desired features of feedback control, block diagram of the feedback loop, proportional mode, integral mode, derivative mode, the PID controller, analytical expression for a closed loop response. The feedback loop and the PID Algorithm: PID Controller Tuning for Dynamic Performance. Defining the tuning problem, determining good tuning constant values, correlations for tuning constants. Fine-tuning the controller tuning constants. PID controller Tuning for Dynamic Performance Stability Analysis and Controller Tuning: The concept of stability, stability of linear systems, stability analysis of linear & linearized systems, stability analysis of control systems, Principles, the Bode method, Ziegler Nicholas closed loop. PLC's: Basic introduction and programming of PLCs. Acquisition of the above knowledge and understanding is through a combination of lectures and tutorials classes, and laboratory work. This course will be assisted by tests, assignments, and an examination.		

PRCMTB3	**Process Control (Metallurgy) 3B**		
NQF Level	7	**Credits**	14

Semester module, year 3, semester 2	
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)
Purpose	The emphasis in this module is on the understanding of the nature of the process control problems and their attributes, as well as the systematizing the approach to their solution. Optimization, the correlation between variables that are involved in different units process as well as the link between the output(s) and input(s) via a function are dealt with.
Content	Revisit Mathematics, Modelling the Dynamic and static behaviour of processes, Analysis of the Dynamic behaviour of a process, Qualitative analysis, Analysis and Design of feedback control systems, Sensitivity, Use of sofwares

PRDCHA3	**Process Design 3A**		
NQF Level	7	**Credits**	28
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The objective of this course is to expose the student to all the factors that need to be considered in the execution of a chemical plant project, and to enable him/her to apply his/her knowledge of chemical engineering principles to a problem where he/she can demonstrate his/her initiative, ingenuity, originality, creativity and critical thinking skills. On completion of the course, the student will be competent to: a) Identify and analyse specific project objectives, and plan and formulate the criteria for an acceptable design solution; b) Access, acquire and evaluate the relevant knowledge, information resources; c) Generate and analyse alternative solutions by applying appropriate engineering knowledge; d) Select an optimal solution based on technical, operational and economic criteria, and evaluate the impacts and benefits of the proposed design; e) Communicate the design logic and information in the appropriate format; f) Manage a project by identifying clear aims, milestones, and adhering to the project schedule and deliverables; g) Relate engineering activity to environmental, cultural and safety issues; h) Exhibit awareness of the need for professionalism.		
Content	Design of Chemical Plant Equipment: Design and sizing of most common equipment used in chemical plants: shell & tube exchangers, cooling towers, multicomponent flash drums, distillation columns, absorption columns, catalytic reactors, etc. Plant Design Aspects: Code of Professional Practice, Process design principles and design objectives, Design Guidelines: Conceptual design, detailed design process, detailed design layout, Operation and Maintenance, Documentation, Safety. Process Flow diagrams (PFD). Process Piping and Instrumentation Diagrams (P&ID's), Hazard and Operability Analysis (HAZOP). Environmental and Sustainability Aspects of Plant Design and Operations: Chemical Plant Emissions (Air Emission. Solid waste, liquid effluent); Environmental Impact Assessment (EIA). Process economics: Plant capital costs estimates (detailed factorial method), Operating costs estimates, Economic evaluation: NPV, IRR, etc. Design Project: Literature survey- evaluation of process and engineering		

	alternatives, Material and Energy balances, Process Flow sheeting - PFD and P&I diagrams, Simulation of a continuous flow process using rigorous simulation packages e.g. CHEMCAD / ASPEN / HYSIM. Etc., Equipment design and specifications, A Hazards and Operability Study, Environmental considerations, legislation and pollution control, Process economics. Acquisition of the above knowledge and understanding is through a combination of lectures, field teamwork projects, individual professional development project, workshop training. This course will be assessed by completion of a portfolio consisting of: assignments, technical reports, drawings and presentations, etc.

PRDCHB2	**Process Design 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This course provides an introduction to key concepts and principles in engineering practice. Upon completion of this course the learner will be able to : a) Describe and demonstrate the construction and fabrication of simple parts/components of chemical process equipment; b) Interpret and develop drawings associated with chemical process engineering; c) Appreciate the need for high ethical and professional standards and understand how they are applied to issues facing engineers; d) Be aware of the priorities and role of sustainable development; e) Development of abilities within problem solving, communication, effective working with others, effective use of IT, persuasive report writing, information retrieval, presentational skills, project planning, self-learning and performance improvement.		
Content	Sustained Development: Key environment and sustainable development challenges facing the chemical industry: atmospheric and water pollution, global warming, energy crisis, water crisis, etc.		

PRDMTB3	**Process Design (Metallurgy) 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	This module is essentially about designing different equipments that are used in metallurgical plants namely metallurgical plants.		
Content	Revisit of different processes in metallurgy, Sintering equipments, Additional equipments to sintering, Pelletizing equipments, Leaching equipments, Thickening, Filtering, Electrowinning cells, Furnaces.		

PREMTB2	**Process Engineering 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		

Purpose	This module introduces learners to an understanding and appreciation of the principles behind the design, operation and maintenance of process equipment in metallurgical plants.
Content	Vectors and scalars, Fluid mechanics, Pumps, Plant maintenance, Corrosion and wear.

PFFCHA2	**Process Fluid Flow 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The main objective of this course is the development of the fundamentals of fluid mechanics, and its application to chemical engineering operations. Upon completion of this course the learners will be able to: a) Solve simple fluid statics problems; b) Use the mechanical energy balance equation to solve compressible, incompressible, and multiple phase fluid flow problems both with and without friction; c) Design flow systems involving pipes, valves, fitting and pumps for Newtonian fluids; d) Select, based on performance characteristics and operational constraints, the appropriate pump (positive displacement, radial, axial, etc.) and valves for a given application; e) Design mixing systems for a variety of process applications.		
Content	Fluid statics and dynamics principles: Pressure head, impact pressure, pressure drop, Newtonian and Non-Newtonian fluids, momentum changes, shear stress in fluids, fluid friction, Newton's law of viscosity, laminar and turbulent flow, boundary layers, volumetric flow rate and average velocity in pipe. Incompressible flow in pipes and channels: Reynolds number, Pressure drop as function of shear stress at wall, Friction factor, Use of friction charts and other corrections, pressure drop in pipes and fittings, equivalent diameter for non-circular pipes, velocity profile for laminar and turbulent Newtonian flow in pipes, Flow in open channels, Two phase flow (gas liquid mixtures). Pumps and valves: Description of different pumps and valves and their application, Calculation of system heads, Pump curves for centrifugal pumps, Determination of operating point, Pumps in series and parallel, centrifugal pump relations, Simple calculation of pumping networks. Mixing of Newtonian liquids in tanks: Different types of impellers, Dimensionless groups for mixing, Power curves, Scale-up of liquid mixing systems. Flow of compressible flow in pipes: Energy relationship, Equations of state, Speed of sound and its impact on maximum flow rate, Isothermal and non-isothermal flow in horizontal pipes. This course will be assessed by tests, practical tutorial assignments, spreadsheet and/or appropriate fluid mechanics software assignments and a 3 hour examination.		

PDEMIA2	**Production Engineering 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		

Purpose	To introduce the principles, tools and techniques used in planning and control of production, inventory, the supply chain, quality and manufacturing operations.
Content	Production Planning and Control; Inventory planning and control; Supply chain Planning and Control; Material Requirements Planning (MRP); Just in time planning and control; Project planning and control; capacity planning and control and ; Operations improvement; Failure Prevention and recovery.

PISMTA3	**Production Of Iron And Steel 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	In this module learners are introduced the manufacturing of iron and steel using the blast furnace (BF) and basic oxygen furnace (BOF)		
Content	Topics covered are burden preparation, coke making, agglomeration processes, blast furnace process and chemistry, thermodynamic considerations, control of unwanted elements, calcination of limestone, BOF steel making and chemistry, slag properties and formation, alloy additions and calculations, refractory linings Module name		

PDTMIA3	**Production Technology 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Provide deeper understanding of a concept of a complete manufacturing system. Introduce the student to the design and operation of modern flexible manufacturing and assembly systems. Introduce the student to the Flexible Manufacturing Systems and Computer Integrated Manufacturing models and tools.		
Content	Material processing technology; Automated production lines; Automated Assembly lines; Sensing techniques in automated manufacturing processes; Automated materials handling and storage systems; Inspection principles and practices; Inspection technologies; Product design and CAD/CAM in the production system; Rapid manufacturing.		

PENMIA3	**Project Engineering 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of the module is to provide skills and knowledge in project management.		
Content	Modern Project Management; Organization Strategy and Project Selection; Structure and Culture; Defining the Project; Estimating Times and Costs; Developing the Project Plan; Managing Risk; Scheduling Resources and Costs; Reducing		

	Project Duration; Leadership; Teams; Outsourcing; Monitoring Progress; Project Closure.

PJMCIA3	**Project Management (Civil) 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of Project Management 3A is to provide the student with a wide range of theoretical and practical knowledge in the field of project management, thus enabling the learner to manage projects with regards to time, cost and quality according to generally accepted standards.		
Content	Project Management Concepts. Identifying and selecting projects. Project Proposals & Project Scoping. Project Scheduling. Resource Utilization. Budgeting. Cost Performance and Risk. Project Manager and Project Team. Project Communication and documentation.		

PJMELA3	**Project Management (Electrical) 3A**		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this module is to develop the ability to perform the task of project management. Without effective project planning any project is doomed from the outset. The module investigates the philosophy of project planning and management.		
Content	Theoretical and conceptual understanding of project management and planning principles; The project leader and manager; Strategic and operational liaison and debate with the client; Development of the project proposal; Project coordination and the control of resources such as human, components, money and time; Defining the project scope; Project development tools and techniques; Monitoring cash flow; Managing procurement; Managing risk; Supervision of contractors and liaison with accountants and managers;		

PMGMTB3	**Project Management (Metallurgy) 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Understand the nature and scope of project management functions. „h Techniques, tools and methods used for effective Project management. „h Effective managerial decisions , Understanding of management decisions influence „h Effective operations strategies when managing projects.		
Content	Introduction to Project Management, Definition of terms (What it a project and project management according to PMBK(Project Management Body of Knowledge),Brief history of Project Management, Project Life Cycle and Life Cycle Assessment, Project selection and project selection models, Project estimating models and techniques, Project reporting and		

	appraisal techniques, Project integration, Scope management, Time management, Cost management, Quality management, Procurement management and Human resources management

PRMMTA3	**Project Methodology A3**		
NQF Level	6	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The primary purpose of this module is to introduce 3rd year learners to the basics of conducting and experimental research and writing the project dissertation		
Content	The module topics include: Meaning and objectives of research, Types of research, Definition of research problem, research design and strategy, Referencing techniques research proposal		

PPMTRB3	**Project Planning And Management 3B**		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of this is to introduce student to the basic principles of Project Management and Public Economics. The project life cycle is analyses and tools for effective project delivery for infrastructure development is explored.		
Content	Introduction – overview of Advanced Public Finance Management and Public Economics, Module Outcomes Have an understanding of the organization, purpose, function and/or application of : ? Public Finance Management Act ? Project Management ? The triple P ? Management of infrastructural projects and closing deals. ? Marketing ? Advanced Business administration and management..		

PRSMIA3	**Project Research 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To introduce learners to research methods, experimental techniques and technical report writing. The learners will be expected to acquire professional writing skills.		
Content	The proposal; The literature review; Conducting field work; Research design (different methodologies that can be used); Data analysis; Research ethics; Writing an article/report.		

PYRMTA3	**Pyrometallurgy 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This subject deals with metal production at high temperatures including other high temperature processes		
Content	Revisit thermodynamics, Reactions in the solid state, Reactions in the molten state, Heat and Mass Balance, Some specific		

	pyrometallurgical processes, Slag cleaning, Laboratory experiments.

QUAMIA2	**Quality Assurance 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To present the basic principles and procedures that provide a foundation in the analysis of quality control problems and the application of quality control techniques.		
Content	Introduction to Quality Planning and Improvement; ISO 9000 Quality Assurance System; Fundamentals of Statistics; Statistical Process Control; Control Charts for Variables; Control Charts for Attributes; Fundamentals of Probability; Acceptance Sampling; Reliability.		

QMSMIA3	**Quality Management Systems 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide advanced knowledge for analysing and solving quality related problems, and for improving quality, in the service and manufacturing industries.		
Content	Management and Planning Tools; Total Quality Management; Quality Function Deployment; Design of Experiments; Failure Mode and Effect Analysis; Taguchi's Quality Engineering Methods; Six Sigma; Benchmarking; Lean Engineering.		

QUAMTB2	**Quality Techniques 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To understand the concepts of Quality Techniques and apply it in real life situations in a plant with the requisite knowledge and practical experience gained from solving theoretical problems to find adequate and optimum solutions.		
Content	The module covers fundamentals of quality control, statistics, statistic-control charts, probability, control charts- attributes, acceptance sampling, reliability, quality costs, quality costs calculations Module name		

QTPTRA2	**Quantitative Techniques In Planning 2A**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Students must be proficient in using calculations and mathematics needed for science purposes. They must be proficient in collecting, organising, analysing and interpreting data to establish statistical and probability models to solve		

	related problems. In order to carry out decisions within the paradigm of inferential statistics. This module is not only relevant to the learners' present academic program; it is also relevant to her/his future personal and professional life in Urban and Regional Planning.
Content	Introduction to Statistics, Frequency Distributions and describing a sample graphically, Describing a sample numerically, Probability, Sampling Distributions, sampling and estimation, Hypothesis Testing, Regression and correlation, Time series analysis Module Outcomes ? Collect, summarise and perform calculations based on data ? Describe and perform calculations involving probabilities and probability distributions ? Compute and interpret estimates and carry out hypothesis testing ? Explain, calculate and interpret regression and correlation analysis

REFMTB3	**Refractory Technology 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	In this module learners are introduced to refractory materials, manufacturing processes, uses in pyrometallurgy and protection from damage		
Content	Types of refractory, Acidic refractories, Basic refractories, Neutral refractories, Choice of refractory, , anufacturing methods, Damage of refractories, Care of refractories		

RACMIB3	**Refrigeration And Air Conditioning 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To give students of engineering a thorough understanding of psychrometry, refrigeration, cold storage and heat transfer and the analysis of refrigeration cycle and air conditioning systems. To give students the opportunity to demonstrate knowledge and understanding of the impact of engineering activity and engineering management principles		
Content	Psychrometry; Air conditioning; Refrigeration; Cold storage; Heat transfer.		

RADTRA3	**Regional Analysis And Development Planning 3A**		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To give students the opportunity to demonstrate knowledge and understanding of the impact of engineering activity and engineering management principles.		
Content	Approaches to planning, Plan/ design evaluation, Location theory, Methods of measuring development: impact of development quality of life Analytical techniques: economic viability of regions Module Outcomes The student must: ? Understand the relationship between theory and practice in		

	general ? Understand the historical context that gave rise to the development of the profession ? Understand some of the common planning theoretical strands ? Have knowledge of the common planning layout concepts and the context in which they evolved ? Understand different approaches to development planning. ? Be able to perform basic calculations for measuring development proposals to the economy and impact on human quality of life ? Be able to interpret basic calculations and make policy recommendations. ? Be able to develop link between theory and research ? Be able to promote the objective of environmentally sustainable cities and regions ? Be able to demonstrate an understanding of the role that land

RCSCIA3	**Reinforced Concrete Design Gp1 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of Reinforced Concrete & Steel Design 3A is to enable the student to apply the theoretical knowledge in order to design elementary reinforced concrete and structural steel structural elements.		
Content	Reinforced Concrete Design: Properties of Reinforcing Bars and Concrete, Limit States Design, Design of Beams, Design of Suspended Floors. Structural Steel Design: Connection Design, Tension Members, Compression Members, Flexural Members (Bending and Shear)		

RESTRA3	**Research Techniques In Planning 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of this course is to assist Planning students to understand the fundamental principles of both basic and applied research. Basic research advances fundamental knowledge about the social world, whereas applied research primarily want to apply and tailor knowledge to address a specific practical issue with the aim of answering a policy question or solving a social problem. It focuses on refuting or supporting theories that explain how social world operates, what makes things happen, why social relations are a certain way, and why society changes.		
Content	This course looks at the ethics and politics of social research, Developing a research proposal, Qualitative and Quantitative research design, measurements and sampling techniques, Data collection and Analysis, Literature Review, Research Protocols, Communication with others and understanding of the world of scientific community. Module Outcome Introduction to Research Techniques and Processes; The students should be able to understand the use of research ? The basic steps of a Research Processes ? Types of Research ? Quantitative Versus Qualitative Social Research ? The meaning of methodology ? Approaches to Research ? Ethical Issues involving Research subjects ? The act of choosing a research topic ? Problem		

	statement in social research ? Developing a conceptual framework or building on theories ? Qualitative and Quantitative Measurements ? Reliability and Validity ? A guide to measurement ? Sampling Techniques (Non probability & Probability sampling) ? Data Collection and Analysis

RMEMNA3	**Geotechnical Engineering (Mining) 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide a strong knowledge and skill-set in the application of geotechnical engineering in mining and to suitably prepare students for studies at honours level.		
Content	Rock Mass Characterisation. Mine seismology. Support Design. Stability Assessment, Instrumentation and monitoring. Risk assessment and Legal Aspects		

RMEMNB2	**Geotechnical engineering (Mining) 2B**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide basic essential knowledge and skills required for application of geotechnical engineering in mining.		
Content	Introduction and basic theorty. Rock mass behavior. Mine layout and excavation design. Support. Numerical modelling		

RLUTRB2	**Rural Land Use And Development Planning 2B**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To introduce the student to the Rural Development and Planning.		
Content	Introduction to regional planning and theories of regional development: Von Thunen, Growth Pole, Module Outcomes ? Understand the reasons for planning in Rural Areas ? Understand the problems LED ? Explain the Various Types of Regional Economic Theories ? Analysis of Rural Agric business and challenges ? Management and conservation of Rural Land Resources		

SENELA2	**Sensors And Devices 2A**		
NQF Level	6	**Credits**	7

Semester module, year 2, semester 1	
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)
Purpose	The purpose of the module is to gain an understanding of the measurement of variables, the types of variables as well as devices used to measure those variables.
Content	Peripheral Devices and Input Parameters; Measurement Parameters and Statistical Analysis; Deferred and Inductive Measurement; Deductive and Empirical Measurement; Data Acquisition and Storage; Measured variables quantum and quality descriptions; Types of sensors, magnetic, inductive, thermal, level, flow, radio, microwave and radar sensing, ultra high frequency sensors, pressure sensors; Devices: Switches, proximity switches, non-arcing and mechanical switches, Switch arrangements, Semiconductor switches and current source and sink arrangements; Devices: Hall effect and inductive switches; Crystal oscillator arrangement and frequency related measurements; Optical devices and light spectrum devices; Sensors: The main types and parameters of variables and the applicable sensors for each category; Simple integration with first level project and presentation of design specification of simple circuit to measure a number of variables.

SSVMSA2	**Site Surveying 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Introducing the student to the field of surveying and the practical application of trigonometry and geometry in surveying		
Content	Analytical geometry, trigonometric identities, laws of Sines and Cosines, proportion, co-ordinate systems, areas and volumes. Levelling, traversing methods. The fundamental principle of Checking calculations. Simple curves, triangulation. Two- and three- dimensional coordinate systems, grid reference systems,		

SOCTRA3	**Sociology And Planning 3A**		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Acquaint the learner with sociology. Provide the learner with an understanding of sociological phenomena such as Family, Groups, Culture, Social stratification, Belief systems, Education, Organizations and bureaucracy, Government and politics. Provide the learner with an understanding of the importance and relevance of sociological phenomena to town and regional planning. Enable the learner to consider and evaluate town and regional environments with reference to, and as a function of sociological phenomena.		
Content	The book Sociology, First South African Edition is prescribed for the subject, and all chapters are studied. Refer to the table of contents of the book as below. Module Outcomes ? Understand Sociology in relation to the Town and Regional Planning		

	environment ? Understand Sociological phenomena that inform the community participation process to generate appropriate design responses ? Plan for more socially sustainable environments and neighbourhoods

SWEELA2	**Software Engineering 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this module is to develop an introductory understanding of the object oriented software development process and its underlying engineering principles. This implies the development of OO software systems that behave reliably, effectively and satisfy all requirements of the client.		
Content	Object-oriented (OO) analysis and OO design methods; OO technology concepts; The OO software development process, project management, user interface design, testing and software quality assurance; Develop software applications in Java; OO analysis models in UML.		

SMEC1A2	**Soil Mechanics 2A**		
NQF Level	6	**Credits**	10
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semeter mark 40%, Examination mark 60%		
Purpose	To provide the student with broad knowledge on the fundamentals of soil mechanics		
Content	Soil and its formation, Phase relationships, Soil classification, Standard procedures and symbols for recording soil profiles, Soil compaction, The Californian Bearing Ratio (CBR), Dynamic cone penetration		

SSPMNB3	**Special Study Project 3B**		
NQF Level	7	**Credits**	70
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To give the student the opportunity to demonstrate his/her knowledge gained from coursework by solving practical problem from a given geological model and associated data.		
Content	The student will be required to complete a mine design project at the level of a pre-feasibility study from data and information supplied. This must include estimations of the quantity and quality of the mineral deposit, the choice of a surface or underground mining method, and the presentation of a viable and practical layout and schedule that includes a detailed budget.		

SPLMIB2	**Steam Plant 2B**

NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To give students of engineering a thorough understanding of steam formation and the analysis of a steam plant as well as to develop the ability to systematically investigate, diagnose, solve and report on broadly defined engineering problems.		
Content	Formation and properties of steam; Fuels and calorific value of fuels; Steam plant description and equipment; Steam plant layout; Rankine cycle with superheat; Boiler performance; Heat balance; Condenser performance; Steam power cycles.		

STRMIA3	**Strength Of Materials 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide advanced knowledge for analysing and solving strength of materials problems in the mechanical engineering manufacturing field.		
Content	Transformation Stresses, Transformation Strain, Theories of Failure, Deflection of beams, Buckling of beams, Energy Methods.		

STRMIB1	**Strength Of Materials 1B**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide basic knowledge for analysing and solving strength of materials problems in the mechanics and technology fields		
Content	Stress & Strain; Trusses; Pressure Vessels (thin); Torsion; Shear force & Bending Moment; Testing of Materials; Fatigue & Creep Strength.		

SANMIB3	**Stress Analysis 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To provide advanced knowledge and computational tools for analysing and solving complex stress problems in mechanical engineering systems		
Content	Finite Element Modelling; Strain Gauges; Asymmetrical Bending; Fracture Mechanics.		

STRCIB2	**Structural Analysis 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		

Purpose	The purpose of Structural analysis 2B is to provide students with knowlage of advanced application of laws or computation methods in the analysis of structures.
Content	Analysis of Statically Determinate Frameworks, Moment Area Theorems, Slope Deflection Technique in the Analysis of Structures (Displacement method) The Analysis of Axially Loaded Compression Members (Struts). Combined Bending and Axial Stresses.

STRCIA3	**Structural Analysis Gp2 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of Structural Analysis 3A is to provide students with knowlage of advanced methods in the analyse of structures.		
Content	Plastic Theory. Moment Distribution. Strain Energy method as applied to beams, Frames and Trusses.		

SGEMNB2	**Structural Geology 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Provide students with the skill to be able to visualize and depict, in maps and sections, the three-dimensional aspects of geological formations and mineral deposits.		
Content	Construction of geological maps and sections. Construct structures contours and to determine the strike and dip of geological structures. Construct structure contours for various faults or dykes and calculate the throw on these geological structures Lines of intersection between intersecting, dipping geological stuructures.		

SSDCIA3	**Structural Steel Design Gp2 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of Structural Steel Design 3A is to enable the student to apply the theoretical knowledge in order to design a steel structure.		
Content	Loading, Limit States Design and Analysis, Connection Design, Tension Members, Compression Members, Flexural Members, Bending, Shear, Combined Bending and Shear, Axial Tension and Bending, Cold-Formed Sections, Composite Beams.		

ALLMTA2	**Structure And Properties Of Alloy 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		

Purpose	The primary purpose of this module as an integral part of the National Diploma is to provide the students with a sound understanding of the structure of alloys and what the effect on the alloy properties are.
Content	The module covers the structures and properties of metals and alloys, the atomic bonds and the related effect on metal/alloy properties. The effect of alloying on properties, solid solutions, crystalline structures imperfections and their significance. Furthermore it covers materials characterization techniques, phase diagrams, solidification, casting and welding technology, plastic deformation and mechanical deformation, property manipulation and solid state transformations. Heat-treatment and related transformations with and without nucleation and growth are introduced. Metallography of alloys (ferrous and non-ferrous) are also explored. A practical component aimed at strengthening the learner's insight in the above mentioned aspects is integral to the course utilizing optical microscopy characterization of the alloys microstructures in relation to their processing and related properties. The practical also includes alloy assessment by macro and micro hardness, tensile strength and impact testing Module name

SCTCOY2	**Building Structures 2**		
NQF Level	6	**Credits**	18
Year module, year 2			
Calculation Criteria	**Final Mark = Semester Mark (40%) + Exam Mark (60%)**		
Purpose	The purpose of the module is to be able to: Describe and discuss theoretical concepts covered by the course. Explain the strong technical problems that may arise in a statically loaded simple construction.		
Content	Introduction to Strength of Materials, Stress and Strain, Poisson's Ratio and Thermal Expansion Properties of Areas, Compressive and Tensile strength, yield strength, safety factor, Tensile and compressive loads: Stress, deformation, resistances, Simple trusses		

SCTCOY3	**Building Structures 3**		
NQF Level	7	**Credits**	20
Year module, year 3, semester 1 & 2			
Calculation Criteria	**F**inal Mark = Semeter year mark 40%, Examination mark 60%		
Purpose	The objective of this course is to expose a learner to theories, principles and application of structural engineering. The course will provide the learner with the required knowledge of structural engineering to understand how a structure, material and technology inform the construction of structures.		
Content	The course gives an introduction to building structures emphasizing design principles, structural systems, stability and connections between building components. The design aspect deals with structural elements in both concrete and steel.		

	The basic knowledge of structural engineering encompassing strength of materials, statics and theory of structures is offered as a foundation for the design component.

SDRMSA1	**Survey Draughting 1A**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	0		
Content	preparation of maps/plans , intersection of lines/planes, distance from points to lines/planes, Geometry		

SURCIA1	**Surveying 1A**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Survey 1A will equip the student with a broad knowledge of the various topics of applied surveying.		
Content	Surveying fundamentals including error classifications and use of scale. Linear measurements. Levelling, setting out Long section and cross section profiles in the field as well as drawing. Mensuration. Calculations of areas and volumes of materials used during construction. Traverse surveys. Join and Polar calculations Intricacies of making accurate linear and angular measurements and dealing with potential errors. Calculation of open and closed traverse. Bowditch (compass) rule of adjustment. Tacheometry surveying. Collection of the field data. Prepare and produce a plan of the surveyed area.		

SUCCO1B	**Surveying 1B**		
NQF Level	5	**Credits**	10
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this course is to allow the student to develop skills in surveying and setting out of buildings, with the use of instruments such as measuring tapes, leveling instruments and theodolites. The student is required to spend a large portion of the allocated time on fieldwork, solving practical problems.		
Content	The practical use of all survey instruments –Tapes, automatic levels and theodolites. Have knowledge and conduct all aspects of leveling –Collimation method and Rise and fall method, Calculate and plot contours, Plot longitudinal and cross sections Calculate Co-ordinate, Carrying out a traverse survey, setting out of building works		

SUCCOY1	**Surveying (Construction) 1**		
NQF Level	6	**Credits**	20
Year module, year 1			

Calculation Criteria	Final Mark = Semester Mark (100%)
Purpose	The purpose of this course is to allow the student to develop skills in surveying and setting out of buildings, with the use of instruments such as measuring tapes, leveling instruments and theodolites. The student is required to spend a large portion of the allocated time on fieldwork, solving practical problems.
Content	The practical use of all survey instruments –Tapes, automatic levels and theodolites. Have knowledge and conduct all aspects of leveling –Collimation method and Rise and fall method, Calculate and plot contours, Plot longitudinal and cross sections Calculate Co-ordinate, Carrying out a traverse survey, setting out of building works

SYSMIB3	**System Dynamics 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To present advanced methods for analysing, modelling and simulating engineering problems and solutions in both the service and manufacturing sectors.		
Content	Introduction to systems dynamics; The Modelling Process; Structure And Behaviour Of Dynamic Systems; Causal Loop Diagrams; Dynamics Of Stocks And Flows; The Dynamic Modelling Process; Analysing Systems And Creating Robust Policies; Case Studies in Systems Dynamics, Simulation Modelling.		

TGRMIA1	**Technical Graphics 1A**		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To develop skill in sketching, instrument assisted drawing and interpretation of detailed engineering concepts, components and assemblies that meet the SABS 0111 standards.		
Content	1st and 3rd angle Orthographic Projection; Isometric Drawing; Sectional Drawings; Assembly drawings; Sectional Drawings of assemblies; Drawing Portfolio for final evaluation.		

TMGELB3	**Technology Management 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this module is to develop the skill to manage technological innovation in a modern high technology environment. It therefore complements the candidate that already has an essential technological base, in this case electrical technology.		
Content	The increasing complexity of technological systems; The creation and exploitation of modern technologies and technological products; The technological nature of the technology focused development environment; Technological		

	strategic planning; The scope of resources such as components and software; System client consultation; System modelling; Marketing and human resources; Finance;

TMAMIB2	**Theory Of Machines 2B**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide advanced knowledge of power and motion transfer via various machine applications.		
Content	Friction (Rotation); Belt Drives (Block brakes, capstan, band brakes); Vehicle Dynamics (Tractive effort, inertia of combined translational & rotational systems); Mechanisms (Velocity, Force & Acceleration diagrams); Hoisting.		

TSTED01	**Theory Of Structures 1B**		
NQF Level	5	**Credits**	14
Year module, year 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of Theory of Structures 1B is to introduce students to the general terminology and basic concepts in analyzing a structure by using laws, formulae or calculation methods.		
Content	Analysis of Statically Determinate Simple Plane Trusses. Simple Stress and Strain. Shear Force and Bending Moments (Statically Determinate Beams). Strain Energy Due to Direct Stresses. Determination of Sectional Properties of Structural Members. Bending Stresses in Beams. Shear Stress in Beams. Deflection of Beams (Integration Method).		

TRDMIA2	**Thermodynamics 2A**		
NQF Level	7	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To provide and develop basic knowledge and understanding of thermodynamic laws, systems, energies, processes and cycles.		
Content	Thermodynamic systems; Energy equations; Point and process equations; Energy equation for each process; Entropy; Theory of cycles; Gas cycles; Single stage compressor.		

TRDMIA3	**Thermodynamics 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To give students of engineering a thorough understanding of combustion and energy conversion and the analysis of engines and reciprocating compressors as well as to develop the ability to use appropriate resources, techniques and simulation packages.		
Content	Combustion of fuel; Internal combustion engines; Reciprocating compressors; Renewable energy; Cogeneration.		

THFMIB1	Thermofluids 1B		
NQF Level	5	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To present a thorough treatment of thermos-fluid engineering from the classical view point and to prepare students to use thermodynamics and fluid mechanisms in engineering practices.		
Content	Gases; Properties of water and steam; Basic steam plant layout; Condensers; Combustion; Fluid mechanics and fluid properties; Forces in static fluids; Static pressure; Statics forces on submerged surfaces; Buoyancy and stability of floating bodies; Fluid dynamics; Continuity and energy equations; Application of continuity and energy equations.		

TOUTRB3	Tourism And Recreation Planning 3B		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The student will be introduced to the Theoretical and Practical concepts of sustainable tourism in South Africa and comparism on international scale.		
Content	Ecology, Park Management and Administration; Leisure behaviour and diversity, Heritage, Conservation and Preservation of Natural Environment. Financial Management and forecasting. Module Outcomes The student will have an understanding of a number of Tourism guidelines within the context of: ? Movement System / Destinations ? Recreation and Leisure ? LED ? Public Facilities Management and role of Private sector ? Tourism Marketing and role in the economy ? Public utility services		

TPRCHA2	Transfer Processes 2A		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This course introduces learners to the fundamental concepts in heat and mass transfer. On completion of this course, the student should be competent to: a) Perform heat transfer calculations for planar, radial and spherical systems; b) Perform design and thermal performance calculations for double-pipe and shell-and-tube heat exchangers using LMTD approach; c) Perform mass transfer calculations for steady state molecular diffusion, convective mass transfer and mass transfer across an interface.		
Content	Conduction and Convection: Heat flow through a plane wall, radial systems (cylinders), spheres, composite bodies; heat transfer by combined modes; overall heat transfer coefficient. Thermal Radiation: Thermal radiation in electromagnetic spectrum; radiation properties; emissive power of a black body, Stefan-Boltzman Law; Kirchoff's Law; Grey bodies. Double-Pipe		

	and Shell-and-Tube Heat Exchangers: Features of exchangers, heat exchanger configurations, design and thermal performance calculations sing LMTD approach. Steady State Molecular Diffusion: Classification of mass transfer processes. Fick's Law, diffusion with bulk flow, equimolar counter diffusion, diffusion with one stagnant component, diffusion with varying cross-sectional area, diffusion through solids, diffusion with a chemical reaction, determination of diffusivities, diffusion in multi-component mixtures. Convective Mass Transfer: Rate equations; heat, momentum and mass transfer analogies; determination of film coefficients. Mass Transfer Across An Interface: Equilibrium, two resistance theory, individual mass transfer coefficients, overall mass transfer coefficients, mass transfer across a membrane. Acquisition of the above knowledge and understanding is through a combination of lectures and tutorial classes, and laboratory work. This course will be assessed by tests, practicals, Mini-Projects: Design of shell-and-tube heat exchanger using an excel spreadsheet as well as CCTherm, and an examination.

TRACIA2	**Transportation Engineering 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose ofation Engineering 2A is to introduce students to different transportation organizations and agencies that plan, design, build, operate, and maintain the nation's transportation system. Develop an understanding of the fundamental principles of Transportation Planning. The economical siting of the roadway alignment, and Geometric design principles to establish the highway horizontal and vertical alignment.		
Content	The Profession of Transportation. Transportation Systems and Organisations. The Transportation Planning Process. Forecasting Travel Demand. Evaluation Transport Alternatives. Highway Surveys and Location. Geometric Design of Highway Facilities. Highway Drainage		

TRACIB2	**Transportation Engineering 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of Transportation Engineering 2B is to introduce the student to the properties and structural characteristics of the different materials used in the construction or rehabilitation of roads. The methods and theories for the design of asphaltic and concrete pavements, as well as various treatment strategies for low-volume roads.		
Content	Soil Engineering for Highways. Bituminous Materials. Design of Flexible Pavements. Design of Rigid Pavements. Pavement Management and Rehabilitation.		

TRACIA3	**Transportation Gp1 3A**		
NQF Level	7	**Credits**	14

Semester module, year 3, semester 1	
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)
Purpose	The purpose of Transportation Engineering 3A is to let the student understand the basic characteristics of the driver, the vehicle and the roadway and how these interact with each other. Traffic flow is important in developing and designing strategies for intersection control, rural highway and freeway segments.
Content	Characteristics of the Driver, the Pedestrian, the Vehicle and the road. Traffic Engineering Studies. Highway Safety. Fundamental Principles of Traffic Flow. Intersection Design. Intersection Control. Capacity and Level of Service for Highway Segments. Capacity and Level of Service for Signalized Intersections.

TRATRA2	**Transportation Planning 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose is to introduce student to the relevance of Transport in Urban Infrastructure Planning and Management.		
Content	The course covers the history, policies, politics or Urban Transportation systems. The dynamics of the urban environment; Problems, Challenges; Opportunities; Origins; Locational Factors; Urban growth; Planning improved urban environments by different mode of transport system. The relevance of Urban Transport system in the Economic development in South Africa and the Gauteng Province. Module Outcomes For successful completion of the course – 1, the student should demonstrate that he / she can explain the different mode of transport system and their advantages / disadvantages understand the role of both public and private transport systems and consequences. The ability to analyse trends in transport distribution using analytical tools.		

TRMMIB3	**Turbo Machines 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	To deepen the basic principles of a common and important application of Fluid Mechanics and Thermodynamics. To give the learners a good understanding in the advanced level study to Rotodynamics / Turbo Machines, and improve the learners' ability to identify, analyze and solve broadly defined technical problems, whilst giving the learners the opportunities to improve their research techniques.		
Content	Review of basic Thermodynamics and Fluid Mechanics; Axial flow compressors and Fans; Axial flow steam and gas turbines; Centrifugal Compressors and Fans; Radial flow gas turbines		

UMMMNA2	**Underground Mining Methods 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			

Calculation Criteria	Final Mark = Semester Mark (100%)
Purpose	0
Content	Coal and hardrock underground techniques including block-caving, board and pillar, longwall methods. Development techniques including shaft sinking, tunneling methods. Tramming.

UNOCHB2	**Unit Operations 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	This course provides an introduction to the key unit operations used in the chemical industry, the principles upon which they are based, and their limitations and advantages. The unit operations considered are distillation, absorption, evaporation, drying, cooling towers and leaching. Upon completion of this course the learner will be exposed to: a) Basic understanding of mass transfer and thermodynamics; b) Application and design of distillation processes; c) Application and design of absorption processes; d) Analysing problems involving evaporators; e) Application and design of drying processes; f) Application and design of cooling towers.		
Content	Distillation: Single stage distillation, Distillation without reflux Equilibrium/flash distillation, Differential/simple batch distillation, Steam distillation, Distillation with reflux and McCabe-Thiele Method (number of theoretical stages, total and minimum reflux). Absorption: Henry's Law, Single stage equilibrium contact for gas-liquid system, Counter-current multiple stage contact, Mass balance for absorption columns, Graphical Design Method, Types of absorption equipment. Evaporation: Single-effect Evaporators, Multiple-effect Evaporators, Calculation methods for single-effect evaporators (heat and material balance), Boiling point rise and Enthalpy-concentration charts, Calculation methods for multiple-effect evaporators (heat and material balance), Comparison of single-effect and multiple-effect evaporators, Evaporation equipment - a brief discussion. Humidification and Dehumidification Processes (Drying): Classification of drying methods, Terminology (Humidity, Saturation humidity, % humidity, % relative humidity, Dew point of air-water mixture, humid heat of air-water mixture, total enthalpy of air-water mixture), Humidity charts for air-water vapour mixtures, Adiabatic air-water saturation (heat balance, wet bulb temperature), Equilibrium moisture content of materials, Rate of drying curves, The mechanism of moisture movement during drying, Calculation methods for constant rate drying, Calculation methods for falling rate drying period, Material and Heat balances, Drying Equipment, Specialized Drying Methods. Humidification and Dehumidification Processes (Cooling Towers): Principles and Definitions, Rate equations for Heat and Mass Transfer, Heat balances on adiabatic water cooling, Design of cooling towers using film transfer coefficients, Design of cooling towers using overall mass transfer coefficients, Design of cooling towers using height		

	of a transfer unit, Dehumidification tower. Acquisition of the above knowledge and understanding is through a combination of lectures and tutorial classes and laboratory work. This course will be assessed by tests, assignments, tutorial assignments and an examination.

ULUTRB2	**Urban Land Use And Development Planning 2B**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To introduce the student to the Urban & Rural Land Use Planning processes as applied in South Africa.		
Content	Introduction to Town planning Schemes, Definitions, Models of urban growth, Guidelines for planning and design of settlements, SLUMA and Implementation strategies and ramework. Module Outcomes ? Understand the reasons for Town planning schemes ? Understand the problems with DFA ? Explain the Various Types of Town Planning Schemes. ? Explain Spatial Planning ? Illustrate the planning processes ? Understand the content of SPLUMA and implementation framework.		

VENMNA3	**Occupational Hygiene (Mining) 3A**		
NQF Level	7	**Credits**	7
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Provide an advanced level of knowledge and applied practice in Occupational Hygiene as applicable to mining		
Content	Occupational hygiene. Heat in Mines. Pshycrometry. Refrigeration. Spontaneous combustion		

VENMNB2	**Occupational Hygiene (Mining) 2B**		
NQF Level	6	**Credits**	7
Semester module, year 2, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	Provide a strong level of knowledge and applied practice in Occupational Hygiene as applicable to mining		
Content	Introduction to mine ventilation. Airflow. Mechanical ventilation. Airborne pollutants. Fires and explosions. Ventilation practice and reporting.		

WWWCIB3	**Water & Waste Water Engineering Gp1 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		

Purpose	The purpose of Water & Wastewater Engineering 3B is to develop an understanding of the fundamental concepts and principles in the treatment of water and wastewater and the Reuse of wastewater
Content	Water Chemistry. Water Quality And Pollution. Water Treatment Processes. Characteristics Of Wastewater. Preliminary Wastewater Treatment. Primary Wastewater Treatment. Secondary Wastewater Treatment. Wastewater Plant Residual Management. Wastewater Reuse.

WRDCIA3	**Water Reticulation Design Gp1 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of Water Reticulation Design 3A is to introduce students to the fundamental concepts and principles in the design of water supply, stormwater and sewer reticulation systems.		
Content	Introduction To Water Supply. Water Demand. Hydraulics of Water Distribution Systems. Water Reticulation Design. Water Storage Reservoirs. Stormwater Management. Best Management Practices. Urban Stormwater Design. Sanitation Services in South Africa. Classification of Sewers. Sewage Flow Estimation. Principles of Sewer Design. Design of Sewage Systems.		

SIGSTA2	**Signals and Systems 2A**		
NQF Level	6	**Credits**	14
Semester module, year 2, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this module is to introduce the candidate to Analogue Communication techniques		
Content	Introduction to the analysis of Energy Spectral Density (ESD) and Power Spectral Density (PSD); Amplitude modulation and Frequency modulation and its generation, detection etc.; Pulse modulation and sampling including Pulse amplitude modulation (PAM), Pulse width modulation (PWM), Pulse position modulation (PPM).		

SIGSTA3	**Signals and Systems 3A**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 1			
Calculation Criteria	Final Mark = Semester Mark (40%) + Exam Mark (60%)		
Purpose	The purpose of this module is to introduce the candidates to Digital Communication techniques		
Content	The Nyquist Sampling Theorem; Pulse code Modulation (PCM); Different keying techniques like Amplitude shift keying (ASK), Frequency shift keying (FSK), Phase shift keying (PSK); Direct Sequence Spread Spectrum (DSSS) and Frequency Hop Spread Spectrum (FHSS) techniques.		

WLDMTB3	**Welding Technology 3B**		
NQF Level	7	**Credits**	14
Semester module, year 3, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The primary purpose of this module as an integral part of the National Diploma is to provide a general and comprehensive and basic foundation for Physical Metallurgy engineering discipline		
Content	The course covers joining processes, requirements of shielding, classification, welding terminology, fundamentals of arc processes, fusion welded processes, metallurgy of welding, heat-treatment of steels, welding cracking in stainless steels, design guidelines and selection of welding process. Module name		

WKSMNB1	**Mining Engineering Practice 1B**		
NQF Level	6	**Credits**	7
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	To provide first year students with a foundational knowledge base of the mining value chain, and to prepare them for more detailed study of the facets of mining that will follow in their second study year.		
Content	Introduction to mining. Hard rock mining. Soft rock mining. Geotechnical engineering. Occupational hygiene. Mechanical, electrical and Civil engineering Mineral resource management		

WKSELA1	**Workshop Technology 1A**		
NQF Level	5	**Credits**	7
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of the module is to introduce the candidate with practical industry related applications based on knowledge gained from other modules in this qualification. The emphasis is in basic hand skills.		
Content	Company Orientation; Safety and First Aid; Basic Hand Skills; Measuring Instruments; Electrical and Electronic and computer Components; Circuit Diagrams; Power Sources; Programmable Devices; Network Administration; Application Programming; General Administration and Report Writing.		

WKSELB1	**Workshop Technology 1B**		
NQF Level	6	**Credits**	7
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		

Purpose	The purpose of the module is to introduce the candidate with practical industry related applications based on knowledge gained from other modules in this qualification. The emphasis is in installation and commissioning.
Content	Communication Systems; Industrial Electronics and Instrumentation; Analogue and/or Digital Systems; Computer Aided Engineering and/or Computer Applications; Quality Control; Cables and Overhead lines; Power Transformers; A.C. and D.C. Machines; Rectification and Inversion; Protection Systems; Switches and Circuit Breakers; Equipment installation and Commissioning; Testing and Fault Finding; Drawing and Design; Installation and commissioning of Communication Systems; Design of Network systems; Fault finding and maintenance; Application software; Quality control; General Administration and Report Writing.

EB26 MODULES: BENG PROGRAMMES

EB26.1 ALPHABETICAL LIST WITH PRE-REQUISITES

NAME	TYPE	CODE	PRE-REQUISITE
Advanced Manufacturing Systems 4A11	SM	MVSMCA4	Manufacturing Methods 3B (VVEMCB3)
			Engineering Mathematics 1B (MATENB1)
Civil Design 4B21	SM	OWSCIB4	All modules up to the 2nd year and at least 80% of the prescribed number of modules of the 3rd year.
Civil Project Investigation 4B21	SM	PJSCIB4	All modules up to the 2nd year and at least 80% of the prescribed number of modules of the 3rd year.
Computer Systems 4A11	SSM	RKEEEA4	Modelling 2A (MODEEA2) (final mark ≥ 40%)
Concrete Technology 1B21	SM	BTKCIB1	Chemistry 1A (CEM01A1)
Control Systems (Mechanical) 4B	SM	TKNMCB4	Modelling 2A (MODEEA2)
			Engineering Mathematics 2A (MATEAA2 & MATECA2)
Control Systems 3B01	SSM	BHSEEB3	Applied Mathematics 2A (APM02A2)
			Applied Mathematics 2B (APM02B2)
			Signals and Systems 3A (SSTEEA3) (final mark ≥ 40%)
Control Systems 4A11	SM	BHSEEA4	Control Systems 3B (BHSEEB3) (final mark ≥ 40%)
Control Systems Mechanical 4B	SM	TKNMCB4	Modelling 2A (MODEEA2) Engineering Mathematics 2A (MATEAA2 & MATECA2) Engineering Mathematics 2B (MATECB2 & MATEAB2)
Design (Mechanical) 2A	SM	OWMMCA2	Graphical Communication 1B21 (GKMEEB1), Introduction to Engineering Design 1B21 (IINEEB1)
Design (Mechanical) 2B21	SM	OWMMCB2	Introduction to Engineering Design 1B (IINEEB1)
			Graphical Communication 1B (GKMEEB1)
Design (Mechanical) 3A11	SM	OWMMCA3	Design (Mechanical) 2B21 (OWMMCB2)
Design (Mechanical) 3B	SM	OWMMCB3	Design (Mechanical) 3A11 (OWMMCA3)
Design and Engineering Practice 4000	YM	OIPMCY4	Design (Mechanical) 3B (OWMMCB3)
			80% of all third year modules passed
Electronics 3B21	SM	EKAEEB3	Electrotechnics 2A (ETNEEA2)) (final mark ≥ 40%)
Electrotechnics 2A11	SM	ETNEEA2	Electrotechnics 1B (ETNEEB1)) (final mark ≥ 40%)
Electrotechnics 2B21	SM	ETNEEB2	Electrotechnics 2A (ETNEEA2) (final mark ≥ 40%)

Geotechnical Engineering 3A11	SM	GTGCIA3	Applied Mathematics 2B10 (APME0B2)
Geotechnical Engineering 3B21	SM	GTGCIB3	Geotechnical Engineering 3A (GTGCIA3)
Geotechnical Engineering 4A11	SM	GTGCIA4	Geotechnical Engineering 3B (GTGCIB3)
Heat Transfer 4A11	SM	WAOMCA4	Fluid Dynamics 3A (STRMCA3)
			Thermofluids 3A (TMSMCA3)
Hydraulic Engineering 3A11	SM	HMGCIA3	Fluid Mechanics 2A (STRCIA2)
Hydraulic Engineering 3B21	SM	HMGCIB3	Fluid Mechanics 2A (STRCIA2)
Introduction to Engineering Design 1B21	SM	IINEEB1	Introduction to Engineering design 1A (IINEEA1)
Power Electronics 4A01	SSM	PWEEEA4	Electronics 3B (EKAEEB3)) (final mark ≥ 40%)
Power Systems 4B21	SM	KRLEEB4	Power Systems 3A (KRL3A01)) (final mark ≥ 40%)
Project Investigation (Electrical & Electronic) 4B	SM	PJEEEEB4	Project Investigation (PJEEEA4)
Project Management 4A11	SM	PJBCIA4	Project Management 3B (PJBCIB3)
Signals and Systems 3A11	SM	SSTEEA3	Mathematics 2A (MATEAA2)
			Mathematics 2A (MATECA20)
Strength of Materials for Civil Engineers 2B21	SM	SMCCIB2	Applied Mechanics 2A (MGACIA2)
Strength of Materials 3B21	SM	SLRBCB3	Strength of Materials 2B (SLRBCB2)
Strength of Materials 4A11	SM	SLR4BCA4	Strength of Materials 3B (SLRBCB3)
Structural Engineering 3A11	SM	SUS3A11	Strength of Materials 2B SLRBCB2)
Structural Engineering 3B21	SM	SUSCIB3	Structural Engineering 3A (SUSCIA3)
Structural Engineering 4A1	SM	SUSCIA4	Structural Engineering 3B (SUSCIB3)
Structural Engineering 4A2	SM	SUCCIA4	Structural Engineering 3B (SUSCIB3)
Telecommunications 4A01	SSM	TELEEA4	Telecommunications 3B (TELEEB3)) (final mark ≥ 40%)
Theory of Machines3B21	SM	MKE3B21	Design 2A11(Mechinical) OWM2A11
Thermal Systems 4B21	SM	TMLMCB4	Thermofluids 3A11 (TMSMCA3)
			Statistics for Engineers (STAE0A3)
Urban Hydraulics 4A11	SM	SDICIA4	Hydraulic Engineering 3B (HMGCIB3)

EB26.2 BENG MODULE DESCRIPTIONS

The outcomes of each module are stated in the relevant learning guides.

APM01A1	**APPLIED MATHEMATICS 1A10**		
NQF Level	6	**Credits**	30

Refer to the Rules and Regulations of the Faculty of Science for more information on the module.

APM01B1	**APPLIED MATHEMATICS 1B10**		
NQF Level	6	**Credits**	30
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

APM02A2	**APPLIED MATHEMATICS 2A10**		
NQF Level	6	**Credits**	30
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

APM02B2	**APPLIED MATHEMATICS 2B10**		
NQF Level	6	**Credits**	30
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

MVSMCA4	**ADVANCED MANUFACTURING SYSTEMS 4A11**		
NQF Level	8	Credits	12
Semester module, fourth year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To develop competence and proficiency in modern trends in areas and concepts of design for manufacture, systems design and integration, automation, assembly and equipment optimisation.		
Content	Introduction to automation, Industrial Control Systems, Sensors, Actuators and other control system components, Industrial Robots, Discrete control using programmable logic controllers and personal computers and Material Handling Systems.		

AMDEEA3	**ADVANCED MODELLING 3A**		
NQF Level	7	**Credits**	12
Semester module, third year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach students more advanced computing concepts, applications of programming, algorithms and computer architectures.		
Content	Introduction to the C++ programming language with advanced computing concepts like object orientation and advanced data structures. More advanced algorithm archetypes will be introduced and applied. A fundamental view of computer hardware architecture and operating system concepts shall also be introduced.		

MGACIA2	**APPLIED MECHANICS 2A**		
NQF Level	6	**Credits**	14
Semester module, second year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	Applied Mechanics comprises two modules namely statics and dynamics. A basic understanding and implementing of the		

	principles in statics and dynamics are of the utmost importance throughout an engineer's career. Statics focuses on the behaviour of structural elements to statically applied external physical forces and moments, thus covering simple structural mechanics. It will improve the knowledge of the learner of the basic principles involved in static forces applied to elements such as beams, columns and machine parts. Dynamics focuses on the dynamic behaviour of mechanical systems when forces and moment are applied to them. It will improve the knowledge of the learner to apply basic principles of mechanics in the analysis of elementary structures and machines.
Content	Bending moment; shear force diagrams; relationships between load, shear force and bending moment; moment of inertia and other geometrical properties of sections; shear stress distributions and shear flow; theory of curvature; differential equations for deflections of beams; moment area-method for deflections and superposition for deflections; compression elements and struts. Combined stress due to axial loading and bending moment; balancing of masses. Dynamics: Brake systems; flexible drives; clutches. Velocity and acceleration diagrams for machine elements. Combined stress due to axial loading and bending moment; balancing of masses; Kinetics of rigid bodies; vibration and time response of rigid bodies; governors.

CEM01A1	**CHEMISTRY 1A10**		
NQF Level	5	**Credits**	15
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

NWE3A11	**CIRCUITS 3A11**		
NQF Level		**Credits**	
This module has been replaced by KRL3A01			

OWSCIB4	**CIVIL DESIGN 4B21**		
NQF Level	8	**Credits**	28
Semester module, fourth year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	The Design module, together with Project Investigation, makes up all of the second semester modules in the final year. Design is a module where all the previous work of the program is incorporated. It therefore fulfils an integration function that also includes aspects such as teamwork, environmental impact analyses, project management, risk considerations, aesthetics, and professional ethics. Note that students may only register for this module provided that all modules up to and including fourth year, first semester are completed.		
Content	Seek solutions to an engineering problem in groups of two to four students; preliminary analysis of three different conceptual solutions in terms of costs, environmental impact and risk; submission of planning report; design documentation, measurement and compilation of a tender document; integration and submission of final design report; oral and		

	visual presentation of the design by the team to a panel of experienced engineers from practice; assessment by lecturers external panel and other team members. Typical projects include dams, sport pavilions, industrial buildings, reservoirs, water towers, bridges.

CPPCIB4	**CIVIL PROFESSIONAL PRACTICE 4B21**		
NQF Level	8	**Credits**	7
Semester module, fourth year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To introduce students to the practice of civil engineering across the discipline: consultancy, contracting and parastatal sectors.		
Content	Professional registration and associated issues such as professional liability, ethical constraints, management principles and entrepreneurial activity are presented and discussed with external professionals. Continuing professional development and career development. Relevant site visits. Health and safety, including First Aid practice. Human resource management. Client/Consultant relationships, General Conditions of Contract and other relevant client/contractor contracts. Basic Computer application in Civil Engineering Drawing (CAD): Standard package overview. Dimensioning, elevation and sectional drawings, Civil Engineering and Construction drawings + plans		

PJSCIB4	**CIVIL PROJECT INVESTIGATION 4B**		
NQF Level	8	**Credits**	28
Semester module, fourth year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	Civil Project Investigation 4B (PJO4B) involves limited research aligned with the research programs of the different research groups at UJ. This module allows the learner to specialise in a divergent, but limited, engineering project in a manner that will enable the learner to plan and complete his/her own project.		
Content	Individual research project based on a civil engineering problem, structured solution under guidance of a designated study leader with interim reports, reporting by means of two seminars, poster, written reports. Note that students may only register for this module provided that all modules up to and including fourth year, first semester are completed.		

COM2B21	**COMMUNICATION 2B**		
NQF Level	7	**Credits**	14
Semester module, third year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	The Project Communication module is presented in the broadest possible context to ensure that learners are equipped to communicate effectively, both orally and in writing with engineering audiences and the community at large, using appropriate structure, style and graphical support.		

Content	The communication process; formal and informal communication in organisations; verbal and non-verbal communication; conflict and negotiation; information technology; meetings, seminars, etc; presentations, writing reports.

CPS31A3	**COMPLEMENTARY STUDIES 3A1**		
NQF Level	7	**Credits**	16
Part semester module, third year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To expose students to a broader range of perspectives of reality, interpretations of the physical universe, and value systems and how these can influence the wider engineering environment. To broaden the student's perspective on the nature and role of ethics in the engineering profession		
Content	The nature of philosophy and ethics: the sort of questions asked by philosophers; the role of argument and debate. Philosophy of science and the philosophy of technology: definitions of the nature and functioning of science and technology. Ethics: The definition and nature of ethics and ethical dilemmas, decision making and case studies in ethics. Environmental aesthetics and ethics: Contemporary ethics and the use of the environment in the context of global warming and the exhaustion of natural resources; human responsibility for the rehabilitation of damaged areas.		

CPS32A3	**COMPLEMENTARY STUDIES 3A2**		
NQF Level	7	**Credits**	16
Part semester module, third year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To expose students to a broader range of perspectives of reality, interpretations of the physical universe, and value systems and how these can influence the wider engineering environment. To broaden the student's perspective in the humanities and social sciences to support uan understanding of the world.		
Content	Visual and contextual analysis of art and design. Industrial Revolution – birth of modern society: rise of the middle class; technological advancements; effects on art and design. Modernism: art movements up to WW1; developments in graphic design, product design and architecture. Visual arts in the 20th century: 1950's: effects of WW1; art and design. 1930's and 1940's; effects of WW2; art and design. 1950's: consumerism and its effects; art and design. 1960's: youth culture and its effects; art and design. 1970's: 'reality hits home', art and design. 1980's: the post-modern world – deconstruction; art and design. South African art: 'famous artists'; contemporary trends.		

CSC1A10	**COMPUTER SCIENCE 1A10**		
NQF Level	6	**Credits**	30

Refer to the Rules and Regulations of the Faculty of Science for more information on the module.

CSC1B10	**COMPUTER SCIENCE 1B10**		
NQF Level	6	**Credits**	30

CSC2A10	**COMPUTER SCIENCE 2A10**		
NQF Level		**Credits**	
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

CSC2B10	**COMPUTER SCIENCE 2B10**		
NQF Level		**Credits**	
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

CSC3A10	**COMPUTER SCIENCE 3A10**		
NQF Level	7	**Credits**	60
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

CSC3B10	**COMPUTER SCIENCE 3B10**		
NQF Level	7	**Credits**	60
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

RKEEEB3	**COMPUTER SYSTEMS 3B01**		
NQF Level	7	**Credits**	8
Sub-semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach the principles of combinatorial and sequential logic.		
Content	Boolean algebra, Karnaugh maps, combinatorial logic design and synthesis, sequential logic design and synthesis		

RKEEEA4	**COMPUTER SYSTEMS 4A11**		
NQF Level	8	**Credits**	8
Sub-semester module, fourth year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To develop basic understanding of the function of the various components of a computer system and its interaction with other components, including an introduction to key concepts in computer networks.		
Content	Concepts in computer architecture, networks and programming from the perspective of an electrical engineer whose specialty is not computer or software engineering. The student is expected to understand the design of computer systems including data communication and transmission, system interfaces, topology, network models and standards. The student must also design software algorithms and C programs to interact with various peripherals for a microcontroller platform.		

BTKCIB1	**CONCRETE TECHNOLOGY 1B**		
NQF Level	6	**Credits**	14
Semester module, second year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	Concrete Technology 2B provides the learner with a wide range of theoretical and practical knowledge in the field of concrete technology		
Content	Properties of concrete in fresh and hardened state; concrete constituents: cement, aggregates, admixtures and additives; concrete mix design; formwork for concreting and various architectural finishes; concrete degradation and diagnostic procedures; repair and rehabilitation of concrete structures; methods of transporting and placing concrete; precast concrete and production processes; concreting under hot and cold weather conditions.		

BHS3B01	**CONTROL SYSTEMS 3B01**		
NQF Level	8	**Credits**	16
Sub-Semester module, third year, second semester.			
Calculation Criteria	Final mark weighting >40%		
Purpose	To teach the principles of classical control systems and PID control design.		
Content	Introduction to control systems, mathematical modeling of dynamic systems for control, Laplace transforms and applications to control systems, principle of feedback control, PID control design, introduction to industrial applications and implementation.		

TKNMCB4	**CONTROL SYSTEMS (Mechanical) 4B21**		
NQF Level	7	**Credits**	8
Semester module, third year, second semester.			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To enable the student to study the basic components, methods, techniques and mathematical modeling in the analysis and design of control systems as well as the basics of digital systems and measurement techniques		
Content	Control Systems introduction, Leplace transforms and the solution of ODE's in the time domain, State space modelling techniques for discrete systems, Root locus plots, Analysis of the stability of systems, Frequency domain techniques such as Bode and Nyquist plots, Design of controllers for PID applications, Design of controllers using ZN techniques, State space controller design techniques (dead beat and pole placement), Modeling of mechanical systems – specifically machines, hydraulics and thermodynamic systems, An introduction to micro-controllers in controller designs and Measurement techniques.		

BHSEEA4	**CONTROL SYSTEMS 4A11**		
NQF Level	8	**Credits**	8
Semester module, fourth year, first semester			

Calculation Criteria	Final mark weighting = Semester mark (100%)
Purpose	Design techniques for the frequency domain: root locus diagram; revision of Bode diagrams; closed loop frequency response; design of lead-, lag-, and lead-lag compensation; determination of pole-zero models from frequency response data. State-space methods: system analysis in terms of state equations; control law design with full state feedback; pole placement; estimator design; compensator design with combined control law and estimator; digital control: digitization algorithms; application of the z-transform to controller design; direct digital design; digital controller design in the state space; practical implications of digital controllers used for analogue systems. Introduction to advanced control topics.
Content	Design techniques for the frequency domain: root locus diagram; revision of Bode diagrams; closed loop frequency response; design of lead-, lag-, and lead-lag compensation; determination of pole-zero models from frequency response data. State-space methods: system analysis in terms of state equations; control law design with full state feedback; pole placement; estimator design; compensator design with combined control law and estimator; digital control: digitization algorithms; application of the z-transform to controller design; direct digital design; digital controller design in the state space; practical implications of digital controllers used for analogue systems. Introduction to advanced control topics.

OWMMCA2	**DESIGN (Mechanical) 2A**		
NQF Level	6	**Credits**	24
Semester module, second year, First semester.			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To enable students to further develop spatial perception abilities, techniques and communication skills using computer based systems including CAD, CAM and CAE.		
Content	Design of engineering components with application of engineering science topics covered in parallel modules. Introduction to engineering statics and dynamics.		

OWMMCB2	**DESIGN (Mechanical) 2B21**		
NQF Level		**Credits**	
Semester module, followed in second year, second semester.			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	Further development of engineering design skills at component and simple systems level.		
Content	. Design of mechanical components using engineering and science topics covered. Design reports of components designed.		

OWMMCA3	**DESIGN (Mechanical) 3A11**		
NQF Level	7	**Credits**	24
Semester module, third year, first semester.			

Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)
Purpose	To enable the student to design machine elements and mechanical assemblies, duly considering function, performance, safety, environmental/social impact manufacture and cost. To further develop student's ability to design machine components and more advanced systems.
Content	Emphasis falls on machine level. Failure of machine elements: Static and fatigue failure theories. Fracture mechanics and contact stresses. Design of machine elements and joints B: Shafts with complex loading, gears, springs and threaded elements. Emphasis falls on function, production and fatigue life. Design of statically indeterminate frames: Introduction to the finite element method for two-dimensional trussed structures. Conceptual design techniques: Technical processes, functional descriptions, allocation of requirements, synthesis of candidate concepts and selection of the optimum. Design projects: Conduction of a number of designs on the machine level according to development specifications. Modelling of performance and strength. Documentation. Design of advanced components and sub-systems. Group work

OWMMCB3	**DESIGN (Mechanical) 3B**		
NQF Level	7	**Credits**	24
Semester module, third year, second semester.			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To further develop student design skills at component and systems level.		
Content	Advanced design of mechanical systems.		

OWMMCA 2	**DESIGN 2A**		
NQF Level	6	**Credits**	24
Semester module, second year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To enable students to further develop spatial perception abilities and techniques and communication skills using computer based systems including CAD, CAM and CAE.		
Content	Design of engineering components with application of engineering science topics covered in parallel modules, Introduction to engineering statics and dynamics.		

OIPMCY4	**DESIGN AND ENGINEERING PRACTICE 4**		
NQF Level	8	**Credits**	32
Year course, fourth year.			
Calculation Criteria	Final mark weighting = Semester mark (20%) + Exam mark (80%)		
Purpose	To further develop the ability of students to design mechanical systems to professional standards,		

Content	. To complete the design of a mechanical system for manufacturing and implementation. Use of standards and codes.

DRGCIB1	**DRAUGHTING 1B**		
NQF Level	5	**Credits**	14
Semester module, first year, second semester			
Calculation Criteria	Final mark weighting = semester mark (50%) + exam (50%)		
Purpose	To enable the student to develop spatial perception abilities and techniques in order to graphically communicate ideas and designs with colleagues and other professionals.		
Content	Technical Drawings, Dimensioning and Tolerances, Working Drawings, Orthographic and Isometric Drawings, Roof and foundation Detailing, Cross and long sections, Intersections, Contour Lines, Structural Steel Drawings, Reinforced Concrete Detailing and Calculations.		

EEMEEA1	**ELECTRICAL ENIGNEERING METHODS 1A**		
NQF Level	5	**Credits**	8
Semester module, first year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To introduce students to electrical engineering and problem solving methods.		
Content	Problem solving techniques, basic concepts of design and optimisation, breaking a problem into steps, debugging philosophy. Computer programs, University and online resources, applications of math and science, and basic electrical engineering techniques.		

EMAEEB4	**ELECTRICAL MACHINES 4B**		
NQF Level	8	**Credits**	8
Sub-semester module, fourth year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach the fundamental aspects of the control of different types of electrical machines		
Content	Electromechanical energy conversion: General considerations with respect to electromechanical energy conversion; electromechanical conversion in conducting structures; rotating converters; analysis of different kinds of converters; general theory of machines and machine primitive; modelling of dynamic behaviour.		

EEPEEB3	**ELECTRICAL ENGINEERING PRACTICAL 3B**		
NQF Level	7	**Credits**	12
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To give students hands-on experience with electrical engineering tools and techniques.		
Content	Practical/Laboratory based module. This module is complementary to the third year electrical engineering modules		

	and incorporates electrical engineering tools and applications of the techniques learned in those modules.

EEPEEA4	**ELECTRICAL ENGINEERING PRACTICAL 4A**		
NQF Level	8	**Credits**	12
Semester module, fourth year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To give students hands-on experience with electrical engineering tools and techniques.		
Content	Practical/Laboratory based module. This module is complementary to the fourth year electrical engineering modules and incorporates electrical engineering tools and applications of the techniques learned in those modules.		

PJEELA2	**ELECTRICAL PROJECT 2A**		
NQF Level	6	**Credits**	8
Semester module, second year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To have students build a device incorporating various electrical engineering devices and techniques.		
Content	Semester-long project incorporating basic electronics, machines, programming, and computing. An example project could be a basic robot, made up of a microcontroller, small motors, input buttons and sensors, LED indictors, etc.		

EMNEEA3	**ELECTROMAGNETICS 3A**		
NQF Level	7	**Credits**	8
Semester module, third year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach fundamental field theory and electromechanical energy conversion theory.		
Content	Field Theory: fundamental aspects of the interaction of electromagnetic waves, circuits and matter in different applications and media; analysis and simple design of electromagnetic problems and systems. Electromechanical Energy Conversion: fundamental aspects of magnetic circuits and energy conversion as applied in electric machines, transformers and magnetic structures; analysis and simple design of electric machines, transformers, magnetic structures and related problems and systems.		

EMNEEB4	**ELECTROMAGNETICS 4B01**		
NQF Level	8	**Credits**	8
Sub-semester module, fourth year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach the fundamental aspects of RF structures, waveguides and antennae used in the analysis, specification and design of electromagnetic devices and systems.		
Content	Transmission lines, waveguides, EM propagation and antennae		

EKA3B21	**ELECTRONICS 3B21**		
NQF Level	7	**Credits**	8
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting >40%		
Purpose	To teach the principles of semiconductor devices, analog and digital circuits, and complex circuit analysis.		
Content	Semiconductor materials and properties; diodes, bipolar junction transistors; field effect devices; amplifiers: design and analysis; operational amplifiers; analog and digital conversion; and logic circuits.		

EKA4A01	**ELECTRONICS 4A01**		
NQF Level		**Credits**	
This module has been replaced by HSE4A01			

EKA4A02	**ELECTRONICS 4A02**		
NQF Level		**Credits**	
This module has been replaced by PWE4A01			

ETNEEB1	**ELECTROTECHNICS 1B21**		
NQF Level	5	**Credits**	12
Semester module, first year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach the principles of DC Circuit Analysis, phasor solutions to AC circuits and to provide an introduction into electronics and electrical machines.		
Content	Fundamental circuit analysis: ideal voltage sources and ideal current sources, current and voltage conventions, circuit terminology (node, branch, mesh, loop), parallel and series circuits, Kirchhoff's current and voltage laws, resistors, Ohm's law, circuit analysis with resistors, basic definition of instantaneous power, superposition, maximum power transfer. AC analysis: capacitors, inductors, sinusoidal signals, phasor representation, impedance, phasor solutions to AC circuits, average and effective values. Electronics: ideal amplifiers, terminal characteristics of a diode, ideal and real diodes, terminal characteristics of the BJT, FET and the transistor as a switch. Introduction to digital logic and digital electronics. Electromechanics: ideal transformers, voltage and current transformations, basic construction of a DC machine, series and shunt DC machines.		

ETNEEA2	**ELECTROTECHNICS 2A11**		
NQF Level	6	**Credits**	12
Semester module, second year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach the principles of AC circuits, basic semiconductor devices, and electric machines.		
Content	AC Circuits: Revision of important concepts, three phase networks star and delta, generation and distribution of AC power, grounding and safety, instantaneous and average power		

	in AC circuits, complex power, power factor, impedance transformation, three phase power. Electronics: The diode equation, rectifier circuits and non-linear circuit analysis, zener diodes, BJT as a switch, BJT in the linear region, terminal characteristics of the Enhancement MOSFET, circuit analysis with MOSFETs. Electromechanics: Magnetic circuits, transformers, electromechanical transducers, series and parallel DC machines, Basic operation of induction machine, basic operation of synchronous machine.

ETNEEB2	**ELECTROTECHNICS 2B21**		
NQF Level	6	**Credits**	24
Semester module, second year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach the principles of electrical circuits applicable to first order circuits and second order circuits		
Content	Circuit theorems, energy storage elements (capacitors and inductors), complete response of first order circuits, complete response of second order circuits, sinusoidal steady-state analysis, frequency response, digital systems		

IEP3B21	**ENGINEERING ECONOMICS AND PRACTICE 3B21**		
NQF Level	6	**Credits**	8
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach the principles of engineering economics, the impact of engineering activity on the social, industrial and physical environment and engineering ethics and professionalism.		
Content	The module firstly exposes learners to concepts in engineering economics such as the time value of money, the product lifecycle, decision making processes and basic economic concepts and product design. Students should be aware of the financial implications of their engineering design decisions and be able to evaluate the financial/economic attractiveness of an engineering project. Students are secondly educated in terms of the impact of engineering activity on the social, industrial and physical environment. The third objective is to develop a sense of ethics and professionalism and create a critical awareness of the need to act professionally and ethically and take responsibility within own limits of competence. This module is intended to be complementary to the module Project Management 3B (PJBCIB3).		

INPMCB3	**ENGINEERING PRACTICE 3B21**		
NQF Level	7	**Credits**	8
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To expose students to what is to be expected from Practicing Engineers.		

Content	To expose students on what is to be expected from Practicing Engineers regarding professionalism, ethics, management and environmental issues.

ENV3B01	**ENVIRONMENTAL MANAGEMENT FOR ENGINEERS 3B01**		
NQF Level	6	**Credits**	7
Sub-semester module, third year, second semester			
Purpose	To enable the student to integrate various aspects and perspectives of environmental management by indicating the importance and necessity of incorporating evaluation and assessment skills and tools into the field of environmental management. The importance of this is viewed against the background of the development of small and large development projects as well as projects associated with engineering and the built environment. Integrated environmental management, environmental impact assessment (EIA, social impact assessment (SIA) and environmental monitoring and mitigation will be used to identify the development of environmental problems and impacts which need to be mitigated or rehabilitated. It will also be illustrated and explained how these above mentioned skills and techniques can be used to overcome the ultimate problem of environmental degradation. Furthermore the module is designed to develop academic skills such as reading, presentation and report writing		
Content	Environmental impact assessment: Principles and practice of integrated environmental management, legal framework, case studies.		

STRMCA3	**FLUID DYNAMICS 3A11**		
NQF Level	7	**Credits**	12
Semester module, third year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To provide students with the theory related to differential analysis of fluid flow, compressible flow, potential flow and boundary layer flow.		
Content	Differential Analysis of Fluid Flow, Inviscid flow (potential flow), Viscous flow (Navier-Stokes), Flow over immersed Bodies, Boundary Layer Theory, Drag, Compressible flow, Isentropic flow of an ideal gas, Non-isentropic flow of an Ideal gas, Normal Shock Waves, Raleigh/Fanno Flow		

STRCIA2	**FLUID MECHANICS 2A11**		
NQF Level	6	**Credits**	14
Semester module, second year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	It integrates concepts from physics, mathematics, kinematics and dynamics to enable a rigorous analysis of fluids at rest and in motion.		
Content	Properties of fluids (density, viscosity, surface tension, modulus of elasticity); submerged objects (pressures, forces, buoyancy, stability); mass, momentum and energy balances for fixed control volumes; practical flow measurement in open and closed systems; laminar and turbulent pipe flow fundamentals;		

	analysis and design of simple piping systems; dimensional analysis with the Buckingham theorem.

GGR1B01	**GEOGRAPHY 1B01**		
NQF Level		**Credits**	
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

GLG1A10	**GEOLOGY 1A10**		
NQF Level		**Credits**	15
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

GTGCIA3	**GEOTECHNICAL ENGINEERING 3A11**		
NQF Level	7	**Credits**	14
Semester module, third year, first semester.			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To introduces the student to the theory of fundamental soil mechanics as used in the analysis, synthesis and solution of engineering design problems.		
Content	Soil classification (soil phase composition, Atterberg testing, grading); excavation and placement of soils (compaction, grading); groundwater (soil permeability, one- and two-dimensional flow, flow nets); stress and effective stress (stress distribution in soil masses due to self-weight and applied loads); consolidation and settlement analysis.		

GTGCIB3	**GEOTECHNICAL ENGINEERING 3B21**		
NQF Level	7	**Credits**	14
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To provide the student with a thorough basis in the application of basic soil mechanics theory to engineering design requirements.		
Content	Consolidation and settlement analysis; theory of soil strength; slope stability; lateral earth pressure and retaining walls; bearing capacity and structural foundations; site exploration and characterisation; soil improvement.		

GTGCIA4	**GEOTECHNICAL ENGINEERING 4A11**		
NQF Level	8	**Credits**	14
Semester module, fourth year, first semester			
Calculation Criteria	Final mark weighting = Semester mark - test and two Geotechnical Reports (50%) + Exam mark (50%)		
Purpose	Geotechnical Engineering 4A deals with the practical application of soil mechanics theory to design problems. It will further develop the theoretical and practical aspects of soil mechanics previously dealt with in Geotechnical Engineering 3A and 3B.		
Content	Deep foundations; difficult soils; soil improvement; site exploration and characterisation; dams and embankments; dam design; buried pipelines; geotechnical earthquake engineering.		

GKMEEA1	**GRAPHICAL COMMUNICATION 1A11**		
NQF Level	5	Credits	24
Semester module, first year, first semester.			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To enable the student to develop spatial perception abilities and techniques in order to graphically communicate ideas and designs with colleagues.		
Content	This course is the culmination of six months of study and reflects his/her knowledge relating to spatial perception and technical drawing skills Spatial Perception, Orthographic Projection, Descriptive Geometry And an Introduction to Technical Drawing Design.		

GKMEEB1	**GRAPHICAL COMMUNICATION 1B21**		
NQF Level	5	**Credits**	24
Semester module, first year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To enable the student to further develop spatial perception abilities and techniques in order to graphically communicate ideas and designs with colleagues.		
Content	This course is the culmination of six months study and reflects his/her knowledge relating to spatial perception and technical drawing skills, Spatial Perception, Orthographic Projection, advanced Technical Drawing, Assembly drawings and an introduction to Computer Aided Design (CAD).		

WAOMCA4	**HEAT TRANSFER 4A11**		
NQF Level	8	**Credits**	12
Semester module, fourth year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To provide students with a thorough background in heat transfer relevant to mechanical engineering systems.		
Content	One and multi-dimensional static and transient heat transfer by conduction, convection and radiation. Heat exchangers.		

HTA3BB3	**HERITAGE ASSESSMENT 3B02**		
NQF Level	6	**Credits**	7
Sub-semester module, third year, second semester			
Purpose	This course is intended to: Explain what *cultural heritage* is, Sensitise students to the phenomenon and notion of cultural heritage Foster awareness of the variety and value of cultural heritage, Create an awareness of the public and personal value of cultural heritage Inform students on relevant provisions of the National Heritage Resources Act (no.25 of 1999) and Government Notices. Promote an awareness of the responsibilities this act lays on civil engineers, specifically in the field of cultural heritage conservation.		

	Provide an overview of the process of conducting Heritage Assessments as required for demolition and other permit applications and of Heritage Impact Assessments (HIA's) as may be required by the appropriate Provincial or National Heritage Resources Authority.
Content	Nature of heritage; Heritage impact assessment; theory of heritage and historical consciousness; cultural and natural heritage; legal framework; case studies.

HSEEEA4	**HIGH SPEED ELECTRONICS 4A**		
NQF Level	8	**Credits**	8
Sub-semester module, fourth year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach the fundamental aspects of high speed, high frequency digital design as applicable to computers and digital logic circuits. Emphasis is placed on hardware design at PCB level, Signal Integrity (SI) and the Electromagnetic Compatibility (EMC) of digital systems.		
Content	Fundamentals of high-speed digital design, high speed properties of logic gates, measurement techniques, transmission lines, ground planes and layer stacking, terminations, and digital power systems.		

HMGCIA3	**HYDRAULIC ENGINEERING 3A11**		
NQF Level	7	**Credits**	14
Semester module, third year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	It is useful to engineers specialising in water treatment and transport, road engineers who have to design drainage structures and structural engineers who have to consider drainage from and around their buildings amongst others		
Content	Pipe flow (laminar and turbulent flow, Reynolds number, secondary losses); pipe systems (pipes in series and parallel, multiple reservoirs); pipe networks (setting up and solving network equations, modelling, components); pumps (types and components, characteristic curves, cavitation); pump systems (pumps in series and parallel, working point, selection, optimization); water hammer (compressible pipe flow, pressures, control).		

HMGCIB3	**HYDRAULIC ENGINEERING 3B21**		
NQF Level	7	**Credits**	14
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	Hydraulic Engineering 3B, along with Hydraulic Engineering 3A, develops the principles of fluid mechanics into a practical set of tools that should enable the learner to approach hydraulic problems in practice. Hydraulic Engineering 3B will thus be a continuation of Fluid Mechanics 2A and Hydraulic Engineering 3A and will focus on hydrology and open channel flow.		

Content	Hydrology: Precipitation (mechanisms, intensity, duration, distribution); flood estimation (deterministic, probabilistic and empirical methods); flood routing through rivers and dams; storage dams (sizing, siltation, evaporation, safety); case studies of SA floods. Open-channel flow: fundamentals (specific energy, best hydraulic section, Froude number); uniform and non-uniform flow profiles; hydraulic control points (weirs, jumps, flumes, piers).

BSK2A01	**INDUSTRIAL PSYCHOLOGY 2A01**		
NQF Level		**Credits**	
Refer to the Rules and Regulations of the Faculty of Humanities for more information on the module.			

IFM2A10	**INFORMATICS 2A10**		
NQF Level	6	**Credits**	40
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

IFM2B10	**INFORMATICS 2B10**		
NQF Level	6	**Credits**	40
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

IFM3A10	**INFORMATICS 3A10**		
NQF Level	7	**Credits**	60
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

IFM3B10	**INFORMATICS 3B10**		
NQF Level	7	**Credits**	60
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

IINEEA1	**INTRODUCTION TO ENGINEERING DESIGN 1A11**		
NQF Level	5	**Credits**	8
Semester module, first year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To introduce students to engineering and enable students to solve fundamental engineering problems.		
Content	Introduction to Statistics: Engineering Materials; Force, Force, Moment, Stress, Strain, Compound Bars; Temperature stresses; Rigid-body equilibrium; Free-body diagrams; Method of joints in truss analysis; Method of sections and shear force/bending moment diagrams; Second moment of inertias and bending stresses. Designing, making, fabricating and evaluating engineering components. Perform group work, related to the solving of engineering mechanics problems. Communicate effectively, product portfolios and class presentations. Understand the impact that engineering mechanics can have on society, either directly or indirectly.		

IINEEB1	INTRODUCTION TO ENGINEERING DESIGN 1B21		
NQF Level	5	**Credits**	16
Semester module, first year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To enable students to design simple standard machine elements and mechanical assemblies, and to communicate their work.		
Content	Basic overviews of the covered topics, coupled with appropriate analysis and synthesis of solutions to: Statics: Engineering Materials; Force, Moment, Stress, Strain; Compound bars; Temperature stresses; Rigid-body equilibrium; Free-body diagrams; Method of joints in truss analysis; Method of sections and shear force/bending moment diagrams; Second moment of inertias and bending stresses. Dynamics: Torque and power in rotating mechanical systems Report writing.		

RTIENB4	LEGAL APPLICATIONS IN ENGINEERING PRACTICE 4B21		
NQF Level	8	**Credits**	7
Semester module, fourth year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	The nature of construction is such that variations to the conceptual design are inevitable as a consequence of which the construction contract provides for a unilateral right to the consulting engineer to change the performance required of the contractor. Legal Applications in Engineering Practice 4B therefore lays the foundations for this aspect of the engineering profession.		
Content	Introduction to South African law; law of obligations (introduction; emphasis on delictual/professional and especially contractual liability); mercantile law (introduction); law of patents; law relating to occupational health and safety; infringement of rights and relevant legal provisions (emphasis on remedies, especially mediation and arbitration).		

MPPBM4	MANAGEMENT PRINCIPLES AND PRACTICE 3B21		
NQF Level	8	**Credits**	8
Refer to the Rules and Regulations of the Faculty of Management for more information on the module.			

VVEMCB3	MANUFACTURING METHODS 3B		
NQF Level	7	**Credits**	12
Semester module, third year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To enable students to manage projects, understand the design process and develop computer aided spatial perception abilities and techniques to electronically communicate ideas and designs with colleagues.		
Content	Computer Aided Engineering through geometric modelling and the role of digital models in design and manufacturing, Digital Product and Process design methodologies as part of a concurrent engineering approach. Computer aided		

	manufacturing process planning. Computer Aided Design including Computer Aided Manufacturing system types, the basic architecture, input and output devices, graphics and data format using homogeneous transformation and manipulation. Different methods and techniques for 3D modelling including dimensioning, tolerances and data exchange of different design systems.

VVEMCB3	**MANUFACTURING METHODS 3B**		
NQF Level	7	**Credits**	12
Purpose	The course aims at introducing the student to fundamental knowledge, methods, concepts and industrial aspects of manufacturing technologies and processes. The analysis and study is based on a scientific and systematic approach with emphasis on the practical integration of manufacturing methods to aspects of design, materials, engineering environment and economical principals. The course stimulates the imagination and utilizes a general engineering background towards manufacturing technologies and optimization.		
Content	Relationships between design, materials and manufacturing technologies. Material removal processes: Milling, Turning, EDM and Drilling are foundation. This includes orthogonal cutting, deformations, forces, stresses, shear zones 3D machining principals, Taylor relationships, Tool geometry, Tool wear, Power requirements and kinematics of machine tools are discussed. Forming and Metalworking methods: Extrusion, Rolling and Bending are foundation. This includes mathematical analysis of plastic deformation, slip lines and Hencky's equations, analysis of hot and cold forming processes. Process control, forces and power requirements, effects of pressure. Additive manufacturing and Assembly Methods: Welding, 3D printing and Binding methods are foundation. Introduction to Systems in manufacturing: Concepts of design & process planning, Numerical Control Systems, Adaptive Control based systems, Production and Quality Systems.		

MATENA1	**ENGINEERING MATHEMATICS 1A**		
NQF Level	6	**Credits**	30
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

MATENB1	**ENGINEERING MATHEMATICS 1B**		
NQF Level	6	**Credits**	30
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

MATECA2	**ENGINEERING MATHEMATICS 2A1**		
NQF Level	6	**Credits**	30
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

MATEAA2	**ENGINEERING MATHEMATICS 2A20**		
NQF Level	6	**Credits**	30

Refer to the Rules and Regulations of the Faculty of Science for more information on the module.

MATECB2	**ENGINEERING MATHEMATICS 2B1**		
NQF Level	6	**Credits**	30
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

MATEAB2	**ENGINEERING MATHEMATICS 2B2**		
NQF Level	6	**Credits**	30
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

MLA3000	**MECHANICAL ENGINEERING LABORATORY3000**		
NQF Level	7	**Credits**	16
Year module, third year			
Calculation Criteria	60% of 2nd year modules passed.		
Purpose	To ensure that students have an appreciation, including both theoretical and practical application, of the methods and relevance of experimental techniques in mechanical engineering.		
Content	Objectives of engineering/scientific measurements, experimental design, research methodology; accuracy, reliability, data correlation, presentation of results, meaning. Report writing and structure of technical reports and publications. Measurement techniques: Fluids - Pitot tubes, orifice plates, venturi meters, pressure transducers, hot wire anemometry, Laser Doppler methods, laser sheets; Thermodynamics - temperature - thermometers, thermocouples, thermisters; Materials - strain gauges. External presentations: presentations by experts in laboratory instrumentation and measurement		

MODEEA2	**MODELLING 2A11**		
NQF Level	6	**Credits**	12
Semester module, second year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach students programming concepts using the C programming language and computing tools that will be used frequently by engineers.		
Content	The objective of the module is to introduce the engineering student to the basic concepts, structures and mechanisms of structured programming. The course will focus on how to model real-world problems and systems in a manner that can be solved by using a computer program, specifically C, MATLAB and Microsoft Excel. Using these concepts to model real-world problems the course will then explore how to write programs and make use of Excel to solve the problems, analyse and manipulate data and present the results.		

OTSEEB4	**OPTICAL SYSTEMS 4B**		
NQF Level	8	**Credits**	12

Semester module, fourth year, first semester.	
Calculation Criteria	Final mark weighting = Semester mark (100%)
Purpose	To teach the principle of fibre optics, optical fibre components, optical fibre sensors, lasers, photo-detectors and fibre optic communication links.
Content	*Fibre Optics*: Light propagation, attenuation and dispersion in fibre optics, fibre optic components and fibre sensors. *Optical Sources and Detectors*: LEDs, semiconductor lasers, fiber lasers, PIN photo-detectors, APD photo-detectors, and photo-detection noise. *Fibre Optic Communication Links*: Power budget and bandwidth calculation.

PHYE0A1	**ENGINEERING PHYSICS 1A**		
NQF Level	6	**Credits**	30
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

PHYE1OB1	**ENGINEERING PHYSICS 1B**		
NQF Level	6	**Credits**	30
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

PHYE2A2	**ENGINEERING PHYSICS 2A01**		
NQF Level	6	**Credits**	15
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

PHYE2B2	**ENGINEERING PHYSICS 2B01**		
NQF Level	6	**Credits**	15
Refer to the Rules and Regulations of the Faculty of Science for more information on the module.			

PWEEEA4	**POWER ELECTRONICS 4A**		
NQF Level	8	**Credits**	8
Sub-Semester module, fourth year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach the principles of power electronics from component level to converter level including all the associated magnetic components.		
Content	Thermal circuits: Junction temperature in steady state; single pulse operation; repetitive pulses. Components: Terminal properties; losses and drive of power semiconductor components; diodes; thyristors; TRIAC's; DIAC; bipolar- and MOS-transistors. Controlled and uncontrolled rectifiers: half-wave; full-wave; single-phase and three-phase; influence of free-wheeling diodes; power factor; harmonics. DC-to-DC converters: buck-, boost-, flyback-, forward-converters. Single-phase inverter: half-bridge; full-bridge; harmonics; pulse-width modulation.		

KRLEEA3	**POWER SYSTEMS 3A01**		
NQF Level	7	**Credits**	8

Sub-Semester module, third year, first semester	
Calculation Criteria	Final mark weighting = Semester mark (100%)
Purpose	To introduce electric power systems and the main concepts of electric network theory.
Content	Circuits: Review basic electric circuit concepts and develop understanding of different techniques available to analyse more complex electric circuits. Use simulation tools and software to solve complex electric circuit problems. Power systems: understand the fundamentals of electrical power systems, including power definitions; develop ability to analyse power electric circuits; and basic energy conversion principles.

KRLEEB4	**POWER SYSTEMS 4B21**		
NQF Level	8	**Credits**	8
Semester module, fourth year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach the principles of power systems from component level to system level		
Content	Introduction to power systems, the per-unit system, generator and transformer models, transmission line parameters, line model and performance, power flow analysis, balanced and unbalanced 3-phase faults, FACTS (Flexible AC-Transmission Systems), power quality, harmonics, protection, OHS ACT; ISO 14004		

AVI3A11	**PROJECT COMMUNICATION 3A11**		
NQF Level	6	**Credits**	14
Semester module, third year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	The Project Communication module is presented in the broadest possible context to ensure that learners are equipped to communicate effectively, both orally and in writing with engineering audiences and the community at large, using appropriate structure, style and graphical support.		
Content	The communication process; formal and informal communication in organisations; verbal and non-verbal communication; conflict and negotiation; information technology; meetings, seminars, etc.; presentations, writing reports.		

PJCEEB1	**PROJECT COMMUNICATION 1B**		
NQF Level	6	**Credits**	12
Semester module, first year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To introduce engineering students to professional and technical communication techniques and standards, both oral and written, through the practical implementation of an engineering project.		
Content	The communication process, formal vs. informal communication in organizations, communication formats and structures,		

	communication tools. Introduction of writing standards, plagiarism, reference techniques, using the internet.

PJEEEA4	**PROJECT INVESTIGATION (Electrical & Electronic) 4000**		
NQF Level	8	**Credits**	42
Year module; fourth year			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To assess learners' ability to successfully complete a project of limited engineering scope, progressing through the full normal project life-cycle. This prepares learners for entry into the industry and similar problems that they will encounter and need to solve with independent research.		
Content	Students must be able to finish their degrees within 6 months after completing this module. Students may only commence with their projects in the first semester. A Project Investigation Committee will handle any grievances or exceptional requests. A number of formal lectures will be presented which students must attend. In the first semester, students are required to meet with their supervisors regularly. In the second semester, students may request meetings with supervisors as needed. A number of deliverables must be submitted at predetermined deadlines throughout the year. Students must give an oral presentation at a seminar scheduled at the end of the first semester. If a student does not show sufficient progress during the first semester, the student will not be allowed to continue with the second semester. At the end of the second semester students must submit a complete report in the form of a thesis, which will be examined by an internal as well as an external examiner. Students must also demonstrate their work at the end of the second semester at a Project Day.		

PJMMCY4	**PROJECT INVESTIGATION (Mechanical) 4000**		
NQF Level	8	**Credits**	32
Year module; fourth year			
Calculation Criteria	Final mark weighting = Semester mark (20%) + Exam mark (80%)		
Purpose	To enable the student to demonstrate that an engineering research project of limited scope may be successfully completed within a prescribed time frame.		
Content	Explore project management including project planning, control, resource scheduling, cost control and time management in practice, Formulation of the research proposal, Lifelong learning skills are demonstrated in the form of a literature survey, A concept and detail experimental design needs to be completed and reported on before practical experimentation or manufacture commences, Plan and complete practical experiments – where applicable, Describe and conclude on results. Deliver seminar presentations and a poster presentation to report on project progress and outcome, Compile a final report in the form of a typeset mini research dissertation outlining the project as a whole.		

PJBCIB3	**PROJECT MANAGEMENT 3B21**		
NQF Level	7	**Credits**	14
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	It provides the learner with a wide range of theoretical and some practical knowledge in the field of project management.		
Content	Introduction to generic project management including project definition, life cycle, management functions, project constraints, terminology and general education and ethical issues; project initiation including project proposal and scoping, statement of work, selection, organisation and administration, communication and negotiation; project implementation including planning, financing, scheduling, resourcing, monitoring and control; project termination including auditing, termination and reporting; latest developments in project management including future considerations, impacts on private and public sector, demographics, information technology, and career paths of the project manager.		

PJBCIA4	**PROJECT MANAGEMENT 4A11**		
NQF Level	8	**Credits**	14
Semester module, fourth year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	Project Management 4A provides the learner with a wide range of specialised theoretical and practical knowledge in the field of construction management thereby enabling the learner to manage civil engineering projects with regards to time, cost and quality according to standards required by the civil engineering profession.		
Content	Management and organisational behaviour; construction contractual aspects; construction economics; risk analysis in construction management; construction productivity; construction planning; managing construction equipment.		

MTKMCB2	**SCIENCE OF MATERIALS 2B21**		
NQF Level	6	**Credits**	10
Semester module, second year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To enable the student to make an informative engineering material selection in solving an engineering problem.		
Content	Distinguish between materials engineering and materials science. Recognize the different processes involved in the total materials cycle and recognise the importance of recycling, Recognise the effect of atomic structure on the properties of engineering materials		

MTKMCA3	**SCIENCE OF MATERIALS 3A11**		
NQF Level	7	**Credits**	12
Semester module, third year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		

Purpose	To enable the student to make an informative metallic material selection in solving an engineering problem and predicting its behaviour under different conditions in different environments.
Content	Explain the fabrication process of steel as found in a typical integrated steel mill, Distinguish between hot and cold working, Predict the equilibrium conditions of binary alloys by using binary phase diagrams including the iron-carbon diagram. Differentiate between the different heat treatment processes including quench hardening, annealing, normalising, tempering, martempering, austempering, spheroidizing and ageing according to its aim and metallurgical process. Specify an appropriate heat treatment process, Differentiate between the different specifications, structures, properties and processing techniques of carbon steel, low alloy steel, tool steel, stainless steel, aluminium alloys, nickel alloys, copper alloys, titanium alloys and cast irons, Specify and differentiate between the different surface, hardening processes including selective hardening, carburizing, nitriding and cyaniding, Evaluate component failure under dynamic loading conditions, in aggressive environments and at high and low temperatures. Make a lifetime prediction of a component subject to fatigue, Evaluate different corrosive environments and different corrosion preventative techniques, Evaluate and distinguish between the different non-destructive testing techniques

SIG3B01	**SIGNAL PROCESSING 3B01**		
NQF Level	7	**Credits**	8
Sub-Semester module, third year, second semester			
Calculation Criteria	Final mark weighting >40%		
Purpose	To teach the concept of converting continuous signals and systems into discrete equivalents and designing discrete systems.		
Content	Analogue-to-digital conversion and sampling techniques; discrete time systems and related difference equations; discrete filters, including finite impulse response (FIR) and infinite impulse response (IIR) filters; discrete transforms, Z-transform and discrete Fourier transforms.		

SIGEEA4	**SIGNAL PROCESSING 4A**		
NQF Level	8	**Credits**	8
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach the theoretical principles of analysis and processing of random signals, estimation and binary decision, adaptive filters		
Content	Overview of probability theory, temporal characteristics and spectral characteristics of random processes, linear systems with random inputs, estimation theory, detection theory, adaptive filters, speech processing		

SST3A11	**SIGNALS AND SYSTEMS SST3A11**		
NQF Level	7	**Credits**	12
Semester module, third year, first semester			

Calculation Criteria	Final mark > 50%
Purpose	To teach the basic concepts involved in modeling and analysing signals and systems in an engineering context, and to describe signals and systems in the frequency domain rather than only in the time domain. These concepts are used in most other modules in the 3rd and 4th year of study.
Content	The focus of this module is on linear, time-invariant continuous time signals and systems, focusing on the following topics: properties and classification of signals; time domain representation of signals in terms of singularity and other functions; properties and classification of systems; convolution and its applications in the engineering field; Fourier series representation of periodic signals and its applications to engineering; Fourier transform of non-periodic signals and its applications to engineering; Laplace transform of signals and its application to engineering; introduction to analogue filters.

STAE0A3	**STATISTICS FOR ENGINEERS 3A10**		
NQF Level	7	**Credits**	8
Semester module, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To develop a basic understanding of elementary probability theory, random variables, random processes and statistical inference to be able to apply the methodology to a variety of engineering oriented problems.		
Content	Introduction to Probability Theory, Random Variables and Processes: Basic axioms of probability theory; probability of simple events; conditional probability rules; Baye's formula; statistical independence; probability distribution and density functions of various discrete and continuous random variables; expected value and variance of a random variable; random processes. Descriptive Statistics: Empirical distributions; histograms; sample mean; sample variance; median; quartiles; percentiles. Statistical Inference: Central Limit Theorem; Sampling distribution of mean, t-distribution, F-distribution, Chi-square-distribution; Confidence Intervals; Hypothesis testing for parameters of a population such as the mean, variance and proportion. Applications in Reliability Theory and Life Testing: Reliability of series and parallel systems; exponential and Weibull models.		

SMCCIB2	**STRENGTH OF MATERIALS FOR CIVIL ENGINEERS 2B21**		
NQF Level	6	**Credits**	14
Semester module, second year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To introduce the fundamental concepts of the Strength of Materials. Classical methods of analysis for the evaluation of stresses and strains caused by external forces on common structural elements like beams, rods, columns, etc. will be introduced.		

Content	Introduction to the relationship between microstructure (atomic, crystalline etc.) and strength and deformation of some civil engineering materials. Simple stresses and strain, Axially loaded bars, Shear force and bending moment, Properties of sections, Ben ding stresses in beams, Statically indeterminate systems, Torsion, Plane and principal stresses, Buckling of axially loaded columns.

SLRBCB2	**STRENGTH OF MATERIALS 2B21**		
NQF Level	6	**Credits**	12
Semester module, second year, second semester			
Calculation Criteria	Final mark weighting = Semester mark(50%) + Exam mark (50%)		
Purpose	To enable the student to comprehend the behaviour of structures when exposed to loads		
Content	Tension, compression and shear, Axially loaded members, Torsion, Shear forces and bending moments, Principal stresses and maximum shear stresses, Two-dimensional stress and strain analysis, the Mohr Circle, Deflection of beams, Statically indeterminate beams, Strain gauges. Stress, Strain, Mechanical Properties of materials, Axial loads, Torsion, Bending, Transverse Shear, Combined Loading, Stress Transformation, Strain Transformation, Deflection of Beams and Shafts.		

SLRBCB3	**STRENGTH OF MATERIALS 3B**		
NQF Level	7	**Credits**	12
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark(50%) + Exam mark (50%)		
Purpose	To demonstrate how basic principles in stress analysis are applied and what assumptions are made to develop practical failure theories. The students are then required to apply these to solve Engineering problems in stress analysis of components and structures under static and dynamic loading conditions. This module has a close relationship to the Design module. To enable students to analyse and solve advanced strength of materials problems.		
Content	Failure criteria and three-dimensional stress analysis (Mohr circles), Stresses under torsion and combined loads, Statically indeterminate problems, Stresses with thick walled cylinders, shrink fits and rotating components, Contact stresses and thermal effects on deformation and stresses, Stresses in curved beams and helical springs, Stress analysis for thin plates, Energy methods and impact loads, Stresses in rotating components are introduced. Buckling of Struts, Bending of curved beams, Shear Stresses Due to Bending, Torsional Behaviours of Symmetrical and Asymmetrical Sections, Combined Loads, Helical Springs, Thermal Distortion, Energy and Impact Concepts, Statically Inderterminate Beams, Thick Walled Cylinders and Press Fits, Stresses in Rotating Components and Contact Stresses.		

SLRBCA4	**STRENGTH OF MATERIALS 4A11**		
NQF Level	8	**Credits**	12

Semester module fourth year, first semester	
Calculation Criteria	Final mark weighting = Semester mark(50%) + Exam mark (50%)
Purpose	To enable the student to perform stress and deformation analysis on three dimensional structures using both analytical and numerical methods.
Content	Matrix methods in three dimensional elasticity, Stress and strain tensors, their transformation, eigenvalues and eigenvectors, Strain-displacement relationships in different coordinate systems, Three dimensional stress and strain relationships, Three dimensional theories of failure due to static or dynamic loading, Energy principles in elasticity: the theorem of Clapeyron. An introduction to the Finite Element Method. Discretization of a problem. Interpolation functions for simple elements. Formulation of finite element equations for elastic problems by using the variational formulation (minimization of potential energy).

SUSCIA3	**STRUCTURAL ENGINEERING 3A11**		
NQF Level	7	**Credits**	14
Semester module, third year, first semester.			
Calculation Criteria	Final mark weighting = Semester mark(50%) + Exam mark (50%)		
Purpose	Use is made of basic science courses in mathematics and physics to analyse the basic response of structures to primarily static loads but dynamic effects (such as wind) are also considered		
Content	Overview of structural analysis and design, structural elements, types of structures, modelling of structural systems and structural elements, analysis of different types of loads; modelling of supports and reactions, determinacy, indeterminacy and stability of structures (beams and rigid frames), application of the equations of equilibrium; type of trusses, determinacy and stability of trusses, computation of internal forces using the method of joints and method of sections; shear and moment functions, relationship between load, shear force and bending moment; axial, shear force and bending moment diagrams; cables subjected to concentrated and uniformly distributed loads, three-pinned and two-pinned arches; influence lines of beams, plate girders, frames and trusses, absolute maximum response, application of influence lines; calculation of deflections using the method of virtual work, double integration method, moment area method, application to trusses, beams and frames.		

SUSCIB3	**STRUCTURAL ENGINEERING 3B21**		
NQF Level	7	**Credits**	14
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	The main objective in this course is to provide the students with the necessary tools to analyse indeterminate structural systems. The course also introduces the students to qualitative analysis so that they can visualize the behaviour of structures without carrying out any calculation.		

Content	Qualitative analysis of beams and frames; approximate analysis of statically indeterminate structures, application of the portal and cantilever methods to lateral loaded building frames; Virtual work (flexibility method), slope deflection, moment distribution and the stiffness method, application of these methods to indeterminate trusses, beams and frames, concept of buckling, instability of ideal and practical struts, beams and beam-columns; plastic analysis of structures; stress-strain relationship of steel, bending theory of beams, shape factors, moment-curvature graphs, effect of axial load on plastic moment, static method, virtual or kinematic method; use of structural analysis software to solving problems of multi degree indeterminate structures.

SUSCIA4	**STRUCTURAL ENGINEERING 4A1**		
NQF Level	8	**Credits**	14
Semester module, fourth year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	The module covers the design of concrete structural elements.		
Content	Material properties of concrete and steel for both reinforced and tensioned concrete structures; limit state analysis; design of concrete structural elements, laboratory demonstrations/projects; computer applications.		

SUCCIA4	**STRUCTURAL ENGINEERING 4A2**		
NQF Level	8	**Credits**	14
Semester module, fourth year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	The module covers the design of structural steel elements.		
Content	Material properties of steel, limit state analysis, design of structural steel elements (tension members, compression members, trusses and bracing, beams and plate girders, beam-columns, connections, column bases, composite beams), laboratory demonstrations, computer applications.		

OPMCIB3	**SURVEYING 3B**		
NQF Level	7	**Credits**	7
Followed during the first two weeks of the winter recess			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	This module will familiarise the student with all the calculations and practical applications required during construction, thus providing him/her with the extensive knowledge required for making the right management decisions in this context. The module thus provides an in-depth study of the different types of surveys the engineer will have to control on a construction site.		
Content	Levelling (control points, road sections, cross-sections, cut and fill requirements); traversing (control points, directions and verticals, distances and co-ordinates, joins and polars); site-surveying (spot heights, contours and grids); triangulation (point fixing by intersection resection and double polars, heights of points by trigonometrical levelling); setting out (gradients		

	with a level, road centrelines with theodolite, curves – transition, circular, vertical).

SIOEEA3	**SYSTEMS ENGINEERING AND DESIGN 3A**		
NQF Level	7	**Credits**	16
Semester module, third year, First semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To expose the student to the principles of Systems Engineering		
Content	Documentation writing skills, introduction: reasons for systems engineering, scope of systems engineering, specification trees, applicable standards, work breakdown structures, design principles for man machine interfacing, requirements management, baseline definitions (requirements, functional, allocated), design reviews, configuration control, system safety, system acceptance, system qualification and certification, risk management, reliability engineering.		

SIOEEB3	**SYSTEMS ENGINEERING AND DESIGN 3B**		
NQF Level	7	**Credits**	16
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To expose the student to the principles of Systems Engineering		
Content	Documentation writing skills, introduction: reasons for systems engineering, scope of systems engineering, specification trees, applicable standards, work breakdown structures, design principles for man machine interfacing, requirements management, baseline definitions (requirements, functional, allocated), design reviews, configuration control, system safety, system acceptance, system qualification and certification, risk management, reliability engineering.		

TEL3B01	**TELECOMMUNICATIONS 3B**		
NQF Level	7	**Credits**	8
Sub-Semester module, third year, second semester			
Calculation Criteria	Final mark weighting >40%		
Purpose	To teach the relevant theoretical principles and applications of analogue modulation theory and analogue telecommunication systems.		
Content	Modulation of sinusoidal carrier with continuous information signal. Frequency division multiplexing. Amplitude modulation, double sideband suppressed carrier modulation, single sideband and vestigial side band modulation, frequency modulation, phase modulation.		

TELEEA4	**TELECOMMUNICATIONS 4A01**		
NQF Level	8	**Credits**	8
Sub-Semester module			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	To teach the theoretical concepts of information theory, digital telecommunication systems, and digital modulation.		

Content	Introduction to information theory and channel coding: entropy, capacity, Shannon's theorems, Markov models, source coding and pseudo-random binary sequences. Introduction to digital telecommunication systems: equalization, the matched filter, binary and M-ary digital telecommunications. Introduction to baseband digital communication systems: inter-symbol interference and eye patterns and correlated multi-level techniques. Introduction to digital modulation systems: modulation of sinusoidal carrier by discrete information signals, amplitude shift keying, frequency shift keying, phase shift keying and a combination of techniques.

MKEMCB3	**THEORY OF MACHINES 3B21**		
NQF Level	7	**Credits**	12
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To enable students to apply the Physics of motion, force, inertia and fluid flow to the design of machines. This course is closely related to the design course. To provide an understanding of the kinematics and kinetics of machine elements.		
Content	Mechanisms and machines. Kinematics: degrees of freedom, links, joints and chains, linkage transformation. Graphical linkage synthesis. Velocity and acceleration of mechanisms. Gyroscopes. Equivalent mass, moments of inertia. Dynamics. Balancing. Engine dynamics. Gear trains. Cam design and analysis. Servo-mechanisms.		

TMLMCB4	**THERMAL SYSTEMS 4B21**		
NQF Level	8	**Credits**	12
Semester module, fourth year, second semester			
Calculation Criteria	Final mark weighting = Semester mark(50%) + Exam mark (50%)		
Purpose	To enable the student to solve engineering problems of a fundamental nature in thermo systems.		
Content	Mass transfer, psychrometry, cooling and air conditioning applications, introduction to multiphase flow, turbulent flow, introduction to thermal systems design, power plant applications, study of relevant article(s) from literature. Psychromentery. Heating and cooling losses. Heating and air conditioning applications. Cooling and dehumidifying coils. Vapour compression cycle. Expansion valves. Refrigerants. Absorption cooling.		

TRDMCB2	**THERMODYNAMICS 2B21**		
NQF Level	6	**Credits**	12
Semester module, second year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To enable students to gain both a thorough understanding of the fundamentals of thermodynamics and an ability to apply these fundamentals too thermodynamic problems. To enable the development of applied competence in some of the		

	following fields of thermodynamics. Mass momentum and energy balances -the first law of Thermodynamics - in control volumes. Energy transfer in thermodynamic equipment. The second law of Thermodynamics; Carnot cycles and efficiency of thermal cycles. Gas cycles for thermodynamic equipment, thermodynamic properties of matter, etc. The objective of the module is to gain both a thorough understanding in the fundamentals of thermodynamics and an ability to apply these fundamentals to thermodynamic problems.
Content	Mass momentum and energy balances - the first law of Thermodynamics - in control volumes. Energy transfer in thermodynamic equipment. The second law of Thermodynamics; Carnot cycles and efficiency of thermal cycles. Gas cycles for thermodynamic equipment, thermodynamic properties of matter, etc. The objective of the module is to gain both a thorough understanding in the fundamentals of thermodynamics and an ability to apply these fundamentals to thermodynamic problems.

TMSMCA3	**THERMOFLUIDS 3A11**		
NQF Level	7	**Credits**	12
Purpose	Further development of applied competence in advanced thermodynamics		
Content	Second Law Analysis for a control volume, Irreversibility and Availability, Power and Refrigeration Systems, Gas Mixtures, Thermodynamic Relations, Chemical Reactions, Combustions		

TMS3B21	**THERMOFLUIDS 3B21**		
NQF Level	7	**Credits**	12
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To enable the development of applied competence in some of the following fields of advanced thermodynamics: review of laws of thermodynamics; entropy and description of systems using averages over a control volume; thermostatics as local equilibrium and the constitutive equation for reversible processes; canonical variables; cycles and available energy (energy); gas mixtures and chemical reaction; gas dynamics; compressible flows; thermodynamic relations and generalised equations of state		
Content	Second Law Analysis for a control volume, Irreversibility and Availability, Power and Refrigeration Systems, Gas Mixtures, Thermodynamic Relations, Chemical Reactions		

TRMMCA4	**THERMOMACHINES 4A11**		
NQF Level	8	**Credits**	12
Semester module, fourth year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	This module serves to develop applied competence in the working and design of internal and external combustion engines taking into account basic operation, simulation, performance prediction, fuels, construction and control. The students are		

	then required to apply these to solve engineering problems in turbo-machines and internal combustion engines. This course is closely related to theory of machines, thermodynamics, and heat transfer, fluid dynamics and design courses.
Content	Gas turbines: Cycle analysis (temperature entropy diagrams), Shaft Power Cycles, Aircraft propulsion, Environmental Impact of Gas Turbines, IC-engines: Types of engines with their various characteristics, Engine performance and design, Working fluids – thermochemistry and properties, Combustion and cycle analysis (p-v diagrams), Turbo-charging, super charging and intercooling

TRM4B21	**THERMOMACHINES 4B21**		
NQF Level	8	**Credits**	12
Semester module, fourth year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To enable the advanced development of applied competence in some of the following fields of thermomachines. The energy conversion process and the generation of electricity. Steam power plant, the Rankine cycle, problem solving, cycle design, optimisation, reheating, regenerative feed heating, feed pumping systems, steam turbines and generators. Boilers, heat exchangers, the procurement and combustion of pulverised coal, milling plant, air and gas systems, fans, ash and flue gas cleaning, particulate and gaseous pollution. Reference and application of nuclear plant systems, solar energy systems, axial and radial steam turbines. Various plant auxiliary and ancillary systems.		
Content	To enable the advanced development of applied competence in some of the following fields of thermomachines. The energy conversion process and the generation of electricity. Steam power plant, the Rankine cycle, problem solving, cycle design, optimisation, reheating, regenerative feed heating, feed pumping systems, steam turbines and generators. Boilers, heat exchangers, the procurement and combustion of pulverised coal, milling plant, air and gas systems, fans, ash and flue gas cleaning, particulate and gaseous pollution. Various plant auxiliary and ancillary systems. A basic fundamental approach is required wherein basic practical engineering thermodynamic situations are to be modelled to a limited extent, analysed and appropriately synthesized where applicable using relevant physical laws, mathematics, computational methods and societal skills		

VVICIA3	**TRANSPORTATION ENGINEERING 3A11**		
NQF Level	7	**Credits**	14
Semester module, third year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	Transportation Engineering is taken to introduce students to the way transportation engineers think and act, as well as providing a basic body of knowledge on core topics in the field. Transportation Engineering covers the broad field of transportation systems and infrastructure, from planning		

	through to detailed design of constituent elements. In covering this range, it addresses terminology, principles or concepts, techniques, applications and case studies. The purpose of this module is not so much to develop fully proficient transportation engineers, but to provide sufficient grounding and entry into the field for students to enable them to pick up further knowledge in practice or by further study.
Content	The transportation system; design fundamentals; geometric design of roads (horizontal and vertical alignment); pavement design;; fundamentals of traffic flow and cueing theory, traffic signal control; capacity and levels of service

VVICIB3	**TRANSPORTATION ENGINEERING 3B**		
NQF Level	7	**Credits**	14
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	The purpose of the module is to provide the principles and concepts needed to plan, design and manage multi scale transportation systems in relation to urban demands and associated environmental impacts. The module highlights the multi-layered integration of modes, space and population demand.		
Content	Transportation systems: Transportation modes and trends, Multimodal transport, Demand forecast modelling, transport system evaluation and safety criteria, Congestion, Energy conservation and environmental impact. Road and rail mass transit infrastructure planning, design and operation. Innovations in transit technology.		

UDS3B21	**URBAN DEVELOPMENT STUDIES 3B21**		
NQF Level	8	**Credits**	14
Semester module, third year, second semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	The purpose of Urban Development Studies 3A is to enable the learner to have insight into and exposure to the ways in which transportation activities contribute to social and economic development. The perspective taken is that of the humanities and social sciences where students are required to engage, in a theoretical manner, with the social issues at play around transportation decisions. These may pertain to transport infrastructure, transport systems, transport financing and other transport related matters such as land-use development, socio-economics, regulation, demographic trends, and the environment.		
Content	Transportation and economic development; transportation and urban development; transportation networks; transportation and the environment; the legal, regulatory, and fiscal framework governing transport; transportation modes; transportation and intermodality; managing transportation demand; transportation policy and planning.		

UDSCIA4	**URBAN DEVELOPMENT STUDIES 4A11**

NQF Level	8	**Credits**	14
Semester module, fourth year, first semester			
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	The first part of this module (Solid Waste Management) provides the learner with a broad knowledge of solid waste management. The second part of the module (Urban Development) introduces learners to the complexities surrounding urban development and service delivery.		
Content	Solid waste; waste disposal by landfill; landfill classifications; landfill engineering. Urban development: population trends and demography; urban growth and urbanization; transportation and urban development; road infrastructure financing; privatization; and the role of urban infrastructure asset management in promoting socio-economic development and service delivery.		

SDICIA4	**URBAN HYDRAULICS 4A11**		
NQF Level	8	**Credits**	14
Semester module, fourth year, first semester			
Calculation Criteria	Final mark weighting = Semester mark(50%) + Exam mark (50%)		
Purpose	Urban Hydraulics is a practical summation of most matters that the learner has become acquainted with in the civil engineering programme, thus far. It is a subject that will prepare the learner for the actual work that they might be confronted with in practice.		
Content	Service levels for municipal infrastructure; water distribution systems (plan, analyse, design); sewer reticulation systems (plan, analyse, design); storm water systems (plan, analyse, design); drinking water quality (quality issues, treatment processes); wastewater quality (quality issues, treatment processes).		