POSTGRADUATE

2019

Faculty of Engineering and the Built Environment

UNIVERSITY OF JOHANNESBURG

Rules and Regulations book with the copy on the Inernet.
The electronic copy is updated regulary.
The University reserves the right to supplement, delete or change any part of a regulation without prior notice

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GENERAL INFORMATION AND CONTACT DETAILS

Executive Dean — **Prof Daniel Mashao**
PhD (Engineering, Brown University, RI, USA)

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011 559 2114

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Ms N Nkosi
011 559 6165

Vice Deans

Postgraduate Research and Innovation — **Prof Clinton Aigbavboa**
PhD (Univ of Johannesburg), MTech (Univ of Johannesburg), Hon (Auchi Polytechnic, Nigeria)

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011 559 2115

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Academic Departments

SCHOOL OF CIVIL ENGINEERING AND THE BUILT ENVIRONMENT

Civil Engineering Science – Auckland Park Campus
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Departmental Secretary: Ms Lerato Mahlangu
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Civil Engineering Technology – Doornfontein Campus
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Telephone: 011 559 6415

Construction Management and Quantity Surveying – Doornfontein Campus
Head of Department: Prof Wellington Thwala
Departmental Secretary: Ms Corlia Jordaan
Telephone: 011 559 6056

Town and Regional Planning – Doornfontein Campus
Head of Department: Prof Trynos Gumbo
Departmental Secretary: Ntakana Natasha
Telephone: 011 559 6428

SCHOOL OF ELECTRICAL ENGINEERING

Department of Electrical and Electronic Engineering Science – Auckland Park Campus
Head of Department: Prof Khmaies Ouahada
Departmental Secretary: Ms Mudzunga Roana
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Department of Electrical Engineering Technology – Doornfontein Campus
Head of Department: Dr P Bokoro
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SCHOOL OF MECHANICAL AND INDUSTRIAL ENGINEERING

Department of Mechanical Engineering Science – Auckland Park Campus
Head of Department: Prof Tien Chien Jen
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Telephone: 011 559 2386

Department of Mechanical and Industrial Engineering Technology – Doornfontein Campus
Head of Department: Dr Madindwa Mashinini
Departmental Secretary: Ms Lindelwa Bolilitye
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Department of Quality and Operations Management – Doornfontein Campus
Head of Department: Dr N Sukdeo
Departmental Secretary: Moloko Ramaboea
Telephone: 011 559 1206

SCHOOL OF MINES, METALLURGY AND CHEMICAL ENGINEERING

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Head of Department: Prof Kapil Moothi
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Department of Metallurgy - Doornfontein Campus
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Department of Mining and Mine Surveying - Doornfontein Campus
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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
- Duration of programmes
- Teaching, learning and assessment
- Regulations for examinations and tests
- Academic regulations applicable to Masters and Doctoral Degrees
- Regulations for a particular programme as provided in this publication
- Faculty postgraduate policy

EB2 POSTGRADUATE DEGREE PROGRAMMES OFFERED

All engineering science research based programmes (MEng, MPhil, PhD and DPhil) are offered on the Auckland Park Campus (APK), the coursework masters programmes (MEng (Engineering Management) and MPhil (Engineering Management)) are offered on the Auckland Park Bunting Road Campus (APB) and the technology programmes (MTech and DTech) on the Doornfontein Campus (DFC).

Postgraduate degree programme		Minimum study period		Campus
Master of Technology	MTech	1 year full-time	2 years part-time	DFC
Master of Engineering (Research based)	MEng	1 year full-time	2 years part-time	APK
Master of Philosophy (Research based)	MPhil	1 year full-time	2 years part-time	APK
Master of Engineering (Lectured)	MEng	18 months full-time	2 years part-time	APB
Master of Philosophy (Lectured)	MPhil	18 months full-time	2 years part-time	APB
Doctor of Technology	DTech	2 years full-time	3 years part-time	DFC
Doctor Philosophy	PhD	2 years full-time	3 years part-time	APK
Doctor of Philosophy	PhD	2 years full-time	3 years part-time	APK

EB3 ADMISSION AND STUDY REQUIREMENTS

Students applying for admission to a postgraduate Master's degree will normally be required to hold a qualification at the level of an Honours degree, a four-year Bachelor's degree, BTech degree or an equivalent qualification of an equivalent standard. Enrolment for a doctoral degree will normally require a Master's degree in the relevant discipline. In addition, candidates for admission to Master's and Doctoral degrees need to have obtained their previous degree with an average mark of at least 65%.

The applications of students who do not satisfy the formal entrance requirements for a specific higher degree programme may be considered in terms of UJ's Recognition of Prior Learning Policy, which is binding on this matter. In case of foreign students, consideration of their application for admission is subject to the rules stipulated in the University's Academic Regulations.

All postgraduate students are expected to familiarise themselves with and adhere to the University's Code of Academic Ethics. For this purpose, all masters and doctoral research proposals must receive ethics clearance before a project can commence.

EB4 HIGHER DEGREES

4.1 Master's Degrees

4.1.1 Applicants register for a master's programme as follows:

(a) Coursework modules: First-year coursework applicants register in the first semester of the academic year in accordance with the registration dates set by the relevant faculty.

(b) Research module or programme first-year registration: Applicants register up to and including the second Friday in March, in which case residency begins in the first semester. Registration may also take place during the second semester up to and including the third Friday in July, in which case residency begins in the second semester.

(c) Renewal of registration for a minor dissertation or dissertation takes place during the first semester of the academic year as contained in the University's Year Programme.

(d) Failure to submit the research or minor research proposal within the time frame specified in the Higher Degrees Policy may result in cancellation of registration.

(e) Interruption of study may be granted by the Executive Dean for legitimate reasons, as reflected in the Higher Degrees Policy.

Allowance is made for a possible preregistration period during which a student will have limited access to university resources such as the library. This is done in accordance with the relevant Faculty Rules and Regulations.

4.1.2 Students register for a master's programme full-time or part-time in accordance with the specific requirements of the programme as contained in the relevant Faculty Rules and Regulations as approved by Senate, and with due regard to the programme qualification mix as approved by the DHET.

4.1.3 The minimum duration of a master's programme is one academic year. Residency less than the prescribed minimum study period may not be granted.

4.1.4 The maximum period of registration for a master's programme is two years full-time or three years part-time. Further registration may be granted by the relevant Executive Dean in accordance with the University's Higher Degrees Policy and the Higher Degrees Administration: Structures and Processes.

4.1.5 The approval of applicants' research proposals, supervisors, study fields and provisional and/or final titles of minor dissertations or dissertations takes place in accordance with the University's Higher Degrees Policy and faculty-specific regulations as determined by the relevant Faculty Board, approved by Senate and contained in the relevant Faculty Rules and Regulations.

4.1.6 Any amendment to a project or research title is done in accordance with faculty-specific requirements. The amendment is approved by the relevant Faculty Board or faculty higher degrees' committee and noted by the SHDC. A change in project title at any stage does not constitute valid grounds for the extension of registration, residency or formal duration of study.

4.1.7 The renewal of students' registration for a master's programme is subject to satisfactory progress in accordance with the University's Higher Degrees Policy and the Higher Degrees: Administration: Structures and Processes, faculty-specific requirements and, where applicable, professional regulatory requirements, with due regard also to the University's Enrolment Management Plan and subsequent throughput interventions.

4.1.8 If students' progress is unsatisfactory, the Faculty Board may decide to terminate their registration for the master's programme.

4.2 Lectured Master's Degrees

4.2.1 The final marks for the coursework modules will be published within 30 days after the final assessment opportunity.

4.2.2 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 School after consultation with the Lecturer, or on recommendation of the Faculty's Examination and/or assessment Committee (Academic Regulation 6.6).

4.2.3 Appeals against academic exclusion for Master's programme by coursework
(i) Students may lodge an appeal against their academic exclusion (i.e. receiving a TF global result code for failing a module twice) at the faculty on the campus where the student is registered.
(ii) 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 Executive Dean's office according to faculty guidelines and procedures and in accordance with UJ policies within 7 days after the results of the module has been published.
(iii) The Executive Dean's office will consider the appeals and may refuse or allow readmission.
(iii) The students will be notified of the outcome of the appeal.
(iv) The decision of the Executive Dean's office is final.

4.3 Doctoral Degrees

Faculty-specific rules and regulations related to doctoral programmes in addition to Academic Regulation 15 are determined by the relevant Faculty Board, considered by the Senate Higher Degrees Committee, approved by Senate and contained in the relevant Faculty Rules and Regulations.

4.3.1 Admission

(a) For admission to a doctoral programme, applicants must have successfully completed a relevant master's programme in the same or relevant field of study or discipline as determined by the relevant Faculty Board, approved by the SHDC, ratified by Senate and contained in the relevant Faculty Rules and Regulations.

(b) The extent to which applicants meet admission requirements is assessed by the relevant Head of Department, in consultation with the prospective supervisors, in accordance with the admission requirements for the particular doctoral programme determined by the Faculty Board, approved by Senate and contained in the relevant Faculty Rules and Regulations. The Head of Department, in consultation with the relevant Executive Dean, may set additional admission requirements, as approved by the relevant faculty higher degrees' committee, for a particular student.

(c) In the case of interdisciplinary doctoral programmes, additional admission requirements may be set by the two or more relevant interdisciplinary fields, departments or faculties, approved by Senate and contained in the relevant Faculty Rules and Regulations.

(d) The relevant Head of Department (where applicable) may initiate the University's Policy on RPL to award academic status equivalent to that of a master's degree to enable applicants to gain access to a doctoral programme. Each individual case is considered by the relevant Faculty Board, submitted to the Senate Higher Degrees Committee for consideration and approved by Senate.

(e) The University reserves the right not to admit applicants to a particular doctoral programme in accordance with the programme-specific selection criteria and other relevant criteria or if the department lacks adequate supervision capacity. Compliance with minimum admission requirements does not constitute automatic right of admission to the programme.

(f) 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.

(g) Applicants who have applied for admission and have been refused may request written reasons for such refusal from the relevant Head of Department or Executive Dean.

EB5 OBTAINING A QUALIFICATION

A qualification is awarded or conferred with distinction if the requirements below are met:
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 an honours qualification, advanced diploma or postgraduate diploma within one year if registered full time and within two years if registered part time.
(iii) Students must complete a master's qualification within one-year full time and two years' 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 honours qualification, advanced diploma or postgraduate diploma of at least 75% calculated by weighting the final marks for all the modules comprising the qualification in accordance with the NQF credit values allocated to the modules.
(iii) Students for a master's qualification by dissertation must achieve a final mark of at least 75% for the dissertation.
(iv) Students for a master's qualification by coursework must achieve an average final mark for the qualification of at least 75% calculated by weighting the average final marks for all the coursework modules and the final mark for the minor dissertation in accordance with the credit values allocated to all the coursework modules and the minor dissertation respectively (for example, if the credit value of the minor dissertation represents 40% of the total credit value of the qualification, the average final mark for the qualification will be weighted in the proportion of 40 for the minor dissertation and 60 for all the coursework modules).
(v) Decimal marks may be rounded upwards or downwards in accordance with the decision taken by the Faculty Assessment Committee concerned.

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

(d) A student must have obtained a minimum mark of 65% in every prescribed module at NQF 7 in the qualification, in the case of a master's qualification by coursework, in the minor dissertation as well.

(e) Students for an honours qualification, advanced diploma or postgraduate diploma 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.

(f) If students are transferred from another Higher Education Institution in the same qualification to UJ, the same requirements as stated shall apply.

(g) 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.

EB6 REGISTRATION REQUIREMENTS

6.1 For specific Faculty Admission requirements, refer to Regulation EB3.

(a) All students who enrol at the University of Johannesburg for the first time, must submit certified copies of their academic records and certificates of good conduct, applicable to all previously obtained degrees.
(b) 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.
(c) Failure to submit admission documents timeously will result in the cancellation of registration. Registration of students is conditional until all admission requirements have been met.
(d) Renewal of registration for a dissertation or a minor dissertation takes place during the first semester of the academic year as contained in the University's Year Programme.
(e) Failure to submit the research or minor research proposal within the specified time frame may result in cancellation of registration.
(f) Interruption of study may be granted by the Executive Dean for legitimate reasons, as reflected in the Higher Degrees and Postgraduate Policy.

6.2 Applicants register for a master's programme as follows:

(a) Coursework modules: First-year coursework applicants register in the first semester of the academic year in accordance with the registration dates set by the relevant faculty.(b) Research module or programme first-year registration: Applicants register up to and including the second Friday in March, in which case residency begins in the first semester. Registration may also take place during the second semester up to and including the third Friday in July, in which case residency begins in the second semester.
(c) Renewal of registration for a minor dissertation or dissertation takes place during the first semester of the academic year as contained in the University's Year Programme.
(d) Failure to submit the research or minor research proposal within the time frame specified in the Higher Degrees Policy may result in cancellation of registration.
(e) Interruption of study may be granted by the Executive Dean for legitimate reasons, as reflected in the Higher Degrees Policy.

6.3 Applicants register for a doctoral programme as follows:

(a) First-year registration for the degree: up to and including the second Friday in March in which case the residency commences in the first semester.
(b) Registration may also take place during the second semester up to and including the third Friday in July in which case the residency commences in the second semester.
(c) Renewal of registration takes place during the first semester of the academic year.
(d) Failure to submit the research proposal within the specified time frame may result in cancellation of registration.
(e) The Executive Dean may grant a student permission to put his/her study in abeyance for legitimate reasons, as reflected in the Higher Degrees Policy and the Higher Degrees Administration: Structure and Processes.

6.3.1 Allowance is made for a possible preregistration period during which a student will have limited access to university resources such as the library. This is done in accordance with the relevant Faculty Rules and Regulations.

6.3.2 Students register for the doctoral programme full-time or part-time in accordance with the specific requirements of the programme as contained in the relevant Faculty Rules and Regulations, as approved by Senate, and with due regard to the approval of the DHET, as accredited by the CHE (HEQC) and registered by SAQA

6.3.3 The minimum duration of a doctoral programme is two academic years (part-time or full-time). Residency less than the prescribed minimum period is not granted.

6.3.4 The maximum period of registration for a doctoral programme is four years full-time or five years part-time. Further registration may be granted by the relevant Executive Dean in accordance with the University's Higher Degrees Policy and the Higher Degrees Administration: Structures and Processes.

6.3.5 The approval of students' research proposals, supervisors, study fields and provisional or final titles of theses is in accordance with the University's Higher Degrees and Postgraduate Studies Policy and faculty-specific regulations determined by the relevant Faculty Board, approved by Senate as recommended by the Senate Higher Degrees Committee.

6.3.6 Any amendment to the title of a thesis is in accordance with faculty-specific requirements, and such amendment is approved by the relevant Faculty Board or faculty committee with delegated authority, and noted by the Senate Higher Degrees Committee. A change in project title at any stage does not constitute valid grounds for the extension of registration or residency/formal duration of study.

6.3.7 Scholarship development at doctoral level may consist of at least the following formative and integrated assessment opportunities, as determined by the Faculty Board, approved by Senate and contained in the Faculty Rules and Regulations:

(a) regular discourse engagement with the supervisor(s), as contained in the faculty-specific guidelines for doctoral programmes;

(b) two doctoral seminars during the course of the programme: one to present and defend the research proposal and one to present the results of the research project and simultaneously to justify the originality of the thesis.

6.3.8 The renewal of students' registration for a doctoral programme is subject to their satisfactory progress in accordance with the Higher Degrees Policy, Higher Degrees Administration: Structures and Processes faculty-specific requirements and, where applicable, professional regulatory requirements.

6.3.9 In the event of students' progress being unsatisfactory, the relevant Faculty Board recommends to the Senate Higher Degrees Committee that their registration for the doctoral programme be terminated. The decision of the Senate Higher Degrees Committee is final.

EB7 FEES PAYABLE

In respect of fees payable, refer to the Brochure: **Student Fees.**
If you are not in possession of this brochure and you need information urgently, contact STUDENT FINANCES: 011 559 3777.

EB8 PLAGIARISM

16.1 **"Plagiarism"** means passing off ideas however expressed, including in the form of phrases, words, images, artefacts, sounds, or other intellectual or artistic outputs, as one's own when they are not one's own; *or* such passing off, as an original contribution, of ideas that are one's own but have been expressed on a previous occasion for assessment by any academic institution or in any published form, without acknowledgement of the previous expression. Plagiarism is understood as one of several related forms of academic dishonesty, all of which are addressed in the Student Disciplinary Code.
"Reportable plagiarism" means *Plagiarism* that:

(a) Vitiates the attempt fairly and meaningfully to assess and, where relevant, assign a mark, grade, or other outcome to the work in question; *and*

(b) Is such that an educational response (which may include capping or prescribing a mark) is inappropriate and that a formal academic response or a disciplinary response is appropriate, given the plagiarism history of the student, and all the other relevant circumstances of the case; *or*

(c) In the case of work that is not submitted for assessment (for example work submitted by a student to a supervisor or lecturer for comment), is deemed by the individual academic staff member in question to be reportable, having regard to the nature of the offence, the plagiarism history of the student, the possibility or probability of repeat offence, and all the other circumstances of the case.

EB8 MAGISTER TECHNOLOGIA ENGINEERING TECHNOLOGY PROGRAMMES

EB8.1 MTech: ENGINEERING: CIVIL 724-1
Research-based

EB8.1.1 Purpose of the qualification

A student having obtained this qualification will be competent to conduct research with minimal guidance, and contribute to knowledge production in the engineering environment with success.

EB8.1.2 Qualification outcomes

Demonstrate the capability to identify a problem or need in industry, and apply research methodologies to address the need or problem.

EB8.1.3 Admission requirements and selection criteria

A Baccalaureus Technologiae: Engineering: Civil, **or** an equivalent qualification of an equivalent standard.

EB8.1.4 Conferment of the degree

The MTech: Engineering: Civil will be conferred on students who have completed the dissertation successfully.

EB8.1.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
VEH1208	Dissertation: Civil	VEH1228	Dissertation: Civil

RESEARCH TIME: 100%

EB8.2 MTech: ENGINEERING: CHEMICAL 723-1
Research-based

EB8.2.1 Purpose of the qualification

This qualification is intended for chemical engineers or technologists working in process-related industries. Students who have obtained this qualification will be competent to conduct independent research in chemical engineering, and contribute significantly to knowledge production through the understanding, application and evaluation of existing knowledge. The research problem, its justification, process and outcome is reported in a dissertation, which complies with the generally accepted norms at that level.

EB8.2.2 Qualification outcomes

The qualifying student will have the ability to:

1. Collect and organise information in the selected field/area of research.
2. Apply research methods and techniques appropriately and correctly.
3. Make a significant contribution by recommending improvements to existing Chemical Engineering Science and Technology fields.

EB8.2.3 Admission requirements and selection criteria

A Baccalaureus Technologiae: Engineering: Chemical, **or** an equivalent qualification of an equivalent standard.

EB8.2.4 Conferment of the degree

The MTech: Engineering: Chemical will be conferred on students who have completed the dissertation successfully.

EB8.2.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
VEH1108	Dissertation: Chemical	VEH1128	Dissertation: Chemical

RESEARCH TIME: 100%

EB8.3 MTech: CONSTRUCTION MANAGEMENT 743-1 Research-based

EB8.3.1 Purpose of the qualification

This qualification is intended to enable graduates to apply integrated technical knowledge/skills and advanced analysis and problem-solving to particular specialisation in construction management, property and related fields, through involvement in an applied research project.

EB8.3.2 Qualification outcomes

Conduct research and development in a specialised area and engage in the transfer of technology in the field of construction management and property development.

EB8.3.3 Admission requirements and selection criteria

A BTech: Construction Management, **or** an equivalent qualification of an equivalent standard
OR
A National Higher Diploma: Building Surveying or Construction Supervision, **plus** approved work experience and other post-diploma studies.
Students are selected on academic merit and approved field of study.

EB8.3.4 Conferment of the degree

The M Tech: Engineering: Construction Management will be conferred on students who have completed the dissertation successfully.

EB8.3.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
VEH1508	Dissertation: Construction Management	VEH1528	Dissertation: Construction Management

RESEARCH TIME: 100%

EB8.4 MTech: ENGINEERING: ELECTRICAL 744-1
Research-based

EB8.4.1 Purpose of the qualification
A qualifying student will be able to conduct independent research, with minimum guidance, in a chosen field of Electrical Engineering, and contribute to knowledge production in that field.

EB8.4.2 Qualification outcomes
1. Demonstrate knowledge and understanding of the field/area of investigation.
2. Apply research methods and techniques appropriately and correctly.

EB8.4.3 Admission requirements and selection criteria
A Baccalaureus Technologiae: Engineering: Electrical, **or** an equivalent qualification of an equivalent standard.

EB8.4.4 Conferment of the degree
The MTech: Engineering: Electrical will be conferred on students who have completed the dissertation successfully.

EB8.4.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
VEH1608	Dissertation: Electrical	VEH1628	Dissertation: Electrical

RESEARCH TIME: 100%

EB8.5 MTech: EXTRACTION METALLURGY 616-1
Research-based

EB8.5.1 Purpose of the qualification
At this level, a qualifying student will be is competent in applying specialised knowledge and research methodology in a metallurgical environment, thus contributing to the research and development needs of the metallurgic industry and mining community. The qualified student will be able to register with ECSA as a Professional Technologist.

EB8.5.2 Qualification outcomes
The qualifying student should have the ability to:
1. Initiate and execute applied research in a range of metallurgical activities to full completion.
2. Function at middle to upper management level in a metallurgical environment.

EB8.5.3 Admission requirements and selection criteria
A Baccalaureus Technologiae: Extraction Metallurgy, **or** an equivalent qualification of an equivalent standard.

EB8.5.4 Conferment of the degree
The MTech: Extraction Metallurgy will be conferred on students who have completed the dissertation successfully.

EB8.5.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
VEH1808	Dissertation: Extraction Metallurgy	VEH1828	Dissertation: Extraction Metallurgy

RESEARCH TIME: 100%

EB8.6 MTech: ENGINEERING: INDUSTRIAL 725-1
Research-based

EB8.6.1 Purpose of the qualification
This qualification is intended to allow graduates to apply integrated operations techniques, together with advanced analysis and problem-solving, to a particular specialisation in the field of Industrial Engineering/Operations Management, through involvement in an applied research project.

EB8.6.2 Qualification outcomes and assessment criteria
Conduct research and development in a specialised area and engage in the transfer of technology in the field of Industrial Engineering or Operations Management.

EB8.6.3 Admission requirements and selection criteria
A Baccalaureus Technologiae: Industrial Engineering, **or** an equivalent qualification of an equivalent standard.

EB8.6.4 Conferment of the degree
The MTech: Engineering: Industrial will be conferred on students who have completed the dissertation successfully.

EB8.6.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
VEH1308	Dissertation: Industrial	VEH1328	Dissertation: Industrial

RESEARCH TIME: 100%

EB8.7 MTech: ENGINEERING: MECHANICAL 726-1
Research-based

EB8.7.1 Purpose of the qualification
This qualification is intended for students who will make a contribution, through research, to understanding the application and evaluation of existing knowledge in a specialised area of technology. They will also be able to demonstrate a high level of overall knowledge in that area, ranging from fundamental to advanced theoretical or applied knowledge.

EB8.7.2 Qualification outcomes and assessment criteria
Complete research successfully in engineering processes, products or systems.

EB8.7.3 Admission requirements and selection criteria
A Baccalaureus Technologiae: Engineering: Mechanical, **or** an equivalent qualification of an equivalent standard.

EB8.7.4 Conferment of the degree
The MTech: Engineering: Mechanical will be conferred on students who have completed the dissertation successfully.

EB8.7.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
VEH1408	Dissertation: Mechanical	VEH1428	Dissertation: Mechanical

RESEARCH TIME: 100%

EB8.8 MTech: ENGINEERING: METALLURGY 615-1
Research-based

EB8.8.1 Purpose of the qualification
At this level a qualifying student will be competent in applying specialised knowledge and research methodology in a metallurgical environment, thus contributing to the research and development needs of the metallurgical industry and mining community. The qualified student will be able to register with ECSA as a Professional Technologist.

EB8.8.2 Qualification outcomes and assessment criteria
The qualifying student should have the ability to:

1. Initiate and execute applied research in a range of metallurgical activities to full completion.
2. Function at middle to upper management level in a metallurgical environment.

EB8.8.3 Admission requirements and selection criteria
A Baccalaureus Technologiae: Engineering: Metallurgy, **or** an equivalent qualification of an equivalent standard.

EB8.8.4 Conferment of the degree
The MTech: Engineering: Metallurgy will be conferred on students who have completed the dissertation successfully.

EB8.8.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
VEH1708	Dissertation: Metallurgy	VEH1728	Dissertation: Metallurgy

RESEARCH TIME: 100%

EB8.9 MTech: QUANTITY SURVEYING 745-1
Research-based

EB8.9.1 Purpose of the qualification
This qualification is intended to enable graduates to apply integrated technical knowledge/skills and advanced analysis and problem-solving to a particular specialisation in quantity surveying, property development and other related fields, through involvement in an applied research project.

EB8.9.2 Qualification outcomes and assessment criteria
Conduct research and development in a specialised area and engage in the transfer of technology in the field of quantity surveying and property development.

EB8.9.3 Admission requirements and selection criteria
A BTech: Quantity Surveying, **or** an equivalent qualification of an equivalent standard
OR
A National Higher Diploma: Building Surveying **plus** approved work experience and other post-diploma qualifications.
Students are selected on academic merit and approved field of study.

EB8.9.4 Conferment of degree
The MTech: Quantity Surveying will be conferred on students who have completed the research project and dissertation successfully.

EB8.9.5 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
VEH1908	Dissertation: Quantity Surveying	VEH1928	Dissertation: Quantity Surveying

RESEARCH TIME: 100%

EB8.10 MTech: OPERATIONS MANAGEMENT 426-2
Research-based

EB8.10.1 Purpose of the qualification

The qualification aims to develop intellectual and professional skills, and provides the student with the opportunity to show evidence of independent and original scientific work. This qualification will further provide the student with the opportunity to display competence in the application of relevant research methodology, and the proper written and/or oral communication of the research process and findings and to reflect on the research process and findings.

EB8.10.2 Qualification outcomes and assessment criteria

Conduct research and development in a specialised area and engage in the transfer of technology in the field of quantity surveying and property development.

EB8.10.3 Admission requirements and selection criteria

An applicant must hold a BTech: Operations Management or an equivalent qualification at NQF Level 7 as determined by a Status Committee.

For admission to an MTech programme, all applications will be reviewed in terms of academic performance and prior qualifications, and if necessary, the applicants will be interviewed to ascertain, amongst others, interest in the postgraduate study and the department's ability to accommodate the research interest.

EB8.10.4 Conferment of degree

The MTech: Operations Management will be conferred on students who have completed the research project and dissertation successfully.

EB8.10.5 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
NV426-1	Research Project and Dissertation	NV4261B	Research Project and Dissertation

RESEARCH TIME: 100%

In a dissertation, students must prove that they understand a particular problem in the industry or field in which they have done research, are able to analyse and set it out logically, are able to arrive at logical conclusions or diagnoses, and are then able to make proposals for the improvement or the elimination of the problem.

EB9 MASTER OF ENGINEERING ENGINEERING SCIENCE PROGRAMMES

EB9.1 MEng: ELECTRICAL AND ELECTRONIC Research-based (SAQA 73987) (NQF 9) M6ER1Q

EB9.1.1 Purpose of the qualification

The purpose of the qualification is to develop an engineer with advanced abilities in applying fundamental engineering sciences and/design and synthesis, and related principles to specific problems of society at large. One of the main objectives of this process is to develop an advanced capability to conduct fundamental engineering research independently. It also promotes a lifelong learning approach.

EB9.1.2 Qualification outcomes

Exit level outcomes:
The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering research/development problems creatively and innovatively by applying relevant fundamental knowledge of i.e. Mathematics, Basic Science and Engineering Sciences in the chosen field of research.
2. Plan and manage engineering research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research.
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 judgement based on knowledge and expertise, pertaining to the field of research.
5. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with engineering and specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate research methods, skills, tools and information technology effectively and critically in engineering research/development practice, and show an understanding and a willingness to accept responsibility for the impact of inter-disciplinary research/development activities on society and the environment.
8. Perform 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, where applicable, in the chosen field of research.
9. Employ various learning strategies and skills to master 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 in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
12. Explore, where applicable, education and career opportunities in engineering research/development.
13. Organise and develop entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB9.1.3 Admission requirements and selection criteria

An approved four-year Bachelor's degree in Engineering or similar approved degree at honours level.

Final admission to the programme will only be granted upon successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the supervisors in the Faculty.

EB9.1.4 Conferment of the degree

The MEng: Electrical and Electronic degree will be conferred on students who have completed the research seminar and dissertation successfully.

EB9.1.5 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
M6E0109	Dissertation	M6E0209	Dissertation

RESEARCH TIME: 100%

EB9.2 MEng: MECHANICAL M6MR3Q
Research-based (SAQA 73989) (NQF 9)

EB9.2.1 Purpose of the qualification

The purpose of the qualification is to develop an engineer with advanced abilities in applying fundamental engineering sciences and/design and synthesis and related principles to specific problems of society at large. One of the main objectives of this process is to develop an advanced capability to do fundamental engineering research independently. It also promotes a lifelong learning approach.

EB9.2.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering research and development problems creatively and innovatively by applying relevant fundamental knowledge of i.e. Mathematics, Basic Science and Engineering Sciences in the chosen field of research.
2. Plan and manage engineering research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research.
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 pertaining to the field of research.
5. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies, and perform data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with engineering and specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate research methods, skills, tools and information technology effectively and critically in engineering research/development practice, and show an understanding and a willingness to accept responsibility for the impact of engineering research/development 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, where applicable, in the chosen field of research.
9. Employ various learning strategies and skills to master outcomes required for preparing him/herself to engage in continuous 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 in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research and development activities.
12. Explore, where applicable, education and career opportunities through engineering problem-solving, design, technical research and managerial skills.
13. Organise and develop entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB9.2.3 Admission requirements and selection criteria

An approved four-year Bachelor's degree in Engineering or similar approved degree at honours level.
Final admission to the programme will only be granted upon successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the supervisors in the Faculty.

EB9.2.4 Conferment of the degree

The MEng: Mechanical degree will be conferred on students who have completed the research seminar and dissertation successfully.

EB9.2.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
M6M0109	Dissertation	M6M0209	Dissertation

RESEARCH TIME: 100%

EB9.3 MEng: CIVIL M6CR4Q
Research-based (SAQA 73986) (NQF 9)

EB9.3.1 Purpose of the qualification

The purpose of the qualification is to develop an engineer with advanced abilities in applying fundamental engineering sciences and/design and synthesis and related principles to specific problems of society at large. One of the main objectives of this process is to develop an advanced capability to conduct fundamental engineering research independently. It also promotes a lifelong learning approach.

EB9.3.2 Qualification outcomes

Exit level outcomes:
The qualified student will be able to:
1. Identify, assess, formulate, interpret, analyse and solve engineering research and development problems creatively and innovatively by applying relevant fundamental knowledge of i.e. Mathematics, Basic Science and Engineering Sciences in the chosen field of research.
2. Plan and manage engineering research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research.
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 judgement based on knowledge and expertise, pertaining to the field of research.

5. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies, and perform data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with engineering and specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate engineering research methods, skills, tools and information technology effectively and critically in engineering research/development practice, and show an understanding and a willingness to accept responsibility for the impact of engineering research/development practices 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, where applicable, in the chosen field of research.
9. Employ various learning strategies and skills to master outcomes required for preparing him/herself to engage in continuous 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 in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research and development activities.
12. Explore, where applicable, education and career opportunities in engineering research/development.
13. Organise and develop entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB9.3.3 Admission requirements and selection criteria

An approved four-year Bachelor's degree in Engineering or similar approved degree at honours level.

EB9.3.4 Conferment of the degree

The MEng: Civil degree will be conferred on students who have completed the research projects and dissertation successfully.

EB9.3.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
M6C0109	Dissertation	M6C0209	Dissertation

RESEARCH TIME: 100%

EB9.4 MEng: ENGINEERING MANAGEMENT M6MC5Q
Lectured (SAQA 73988) (NQF 9)

EB9.4.1 Purpose of the qualification

The purpose of the qualification is to develop an engineer with advanced abilities in applying fundamental engineering management sciences and/design and synthesis and related principles to specific management systems problems of society at large. One of the main objectives in this process is to develop an advanced capability to conduct fundamental systems engineering and management research independently. It also promotes a lifelong learning approach.

EB9.4.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering research and development problems creatively and innovatively by applying relevant fundamental knowledge of i.e. Mathematics, Basic Science and/or Engineering and Management Sciences in the chosen field of research.
2. Plan and manage engineering management research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research.
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 judgement based on knowledge and expertise, pertaining to the field of research.
5. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies, and perform data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with engineering and specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate engineering management research methods, skills, tools and information technology effectively and critically in engineering research/development practice, and show an understanding and a willingness to accept responsibility for the impact of research/development activities on society and the environment.
8. Evaluate systems, works, products or processes as a set of related systems, and assess their social, legal, health, safety and environmental impact and benefits, where applicable, in the chosen field of research.
9. Employ various learning strategies and skills to master outcomes required for preparing him/herself to engage in continuous learning, to keep abreast of knowledge and skills required in the engineering management field.
10. Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering management research and development activities.
12. Explore, where applicable, education and career opportunities in engineering management research/development.
13. Organise and develop entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB9.4.3 Admission requirements and selection criteria
An approved four-year Bachelor's degree in Engineering.

EB9.4.4 Conferment of the degree
The MEng: Engineering Management degree will be conferred on students who have completed the six prescribed modules and minor dissertation successfully. Weight of the minor dissertation is 50%.

EB9.4.5 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
M6MEM19	Engineering Management	M6MRM29	Reliability Management
M6MAE19	Advanced Engineering Economics	M6MPM29	Project Management
M6MES19	Engineering Systems Management	M6MPD29	Product Development and Marketing

Second year (Prerequisites: Completion of coursework modules)

First semester		Second semester	
M6MMD19	Minor Dissertation	M6MMD19	Minor Dissertation

EB9.5 MEng: ENGINEERING MANAGEMENT M6MR6Q
Research-based (SAQA 73987) (NQF 9)

EB9.5.1 Purpose of the qualification
The purpose of the qualification is to develop an engineer with advanced abilities in applying fundamental engineering management sciences and/design and synthesis, and related principles to specific management systems problems of society at large. One of the main objectives in this process is to develop an advanced capability to conduct fundamental independent systems engineering and management research independently. It also promotes a lifelong learning approach.

EB9.5.2 Qualification outcomes
Exit level outcomes:
The qualified student will able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering research and development problems creatively and innovatively by applying relevant fundamental knowledge of i.e. Mathematics, Basic Science and/or Engineering and Management Sciences in the chosen field of research.
2. Plan and manage engineering management research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research.
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 judgement based on knowledge and expertise, pertaining to the field of research.
5. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies, and perform data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with engineering and specifically research audiences and the community at large, as far as they are affected by the research, using appropriate structure, style and graphical support.

7. Use and assess appropriate engineering management research methods, skills, tools and information technology effectively and critically in engineering research/development practice, and show an understanding and a willingness to accept responsibility for the impact of research/development activities on society and the environment.
8. Evaluate systems, works, products or processes as a set of related systems, and assess their social, legal, health, safety and environmental impact and benefits, where applicable, in the chosen field of research.
9. Employ various learning strategies and skills to master outcomes required for preparing him/herself to engage in continuous learning, to keep abreast of knowledge and skills required in the engineering management field.
10. Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering management research and development activities.
12. Explore, where applicable, education and career opportunities in engineering management research/development.
13. Organise and develop entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB9.5.3 Admission requirements and selection criteria

An approved four-year Bachelor's degree in Engineering.
Final admission to the programme will only be granted upon successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the supervisors in the Faculty.

EB9.5.4 Conferment of the degree

The MEng: Engineering Management degree will be conferred on students who have completed the research seminar and dissertation successfully.

EB9.5.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
M6M0109	Dissertation	M6M0209	Dissertation

RESEARCH TIME: 100%

EB9.6 MEng: STRUCTURAL ENGINEERING M6CSEQ
Lectured (SAQA -) (NQF 9)

EB9.6.1 Purpose of the qualification

The purpose of the programme is to develop an engineer with advanced abilities in applying fundamental structural engineering sciences, design and synthesis to specific structural engineering problems in society at large. One of the main objectives is to develop an advanced capability to do fundamental structural engineering research independently and, in so doing, promote lifelong learning.

EB9.6.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve structural engineering research and development problems creatively and innovatively by applying relevant fundamental knowledge of i.e. mathematics, basic science and engineering sciences in the chosen field of research.
2. Plan and manage structural engineering research projects demonstrating underlying fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering research/development in the chosen field of research practice.
3. Work effectively individually or with others as a member of a team, group, organization, and community or in multidisciplinary environments in the chosen field of research
4. Organise and manage him/herself and his/her activities responsibly, effectively, professionally and ethically and take responsibility within his/her own limits of competence and to exercise judgment commensurate with knowledge and expertise, pertaining to the field of research
5. Plan and conduct applicable level of investigations, research and /or experiments by applying appropriate theories and methodologies and perform data analysis and interpretation
6. Communicate effectively, both orally and in writing, with engineering and specifically research audiences and the community at large in so far as they are affected by the research using appropriate structure, style and graphical support
7. Use and assess appropriate structural engineering research methods, skills, tools, technology and information technology effectively and critically in engineering research/development practice and show an understanding and a willingness to accept responsibility for the impact that engineering research/development practice have 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 impacts and benefits where applicable in the chosen field of research
9. Employ various learning strategies and skills to master outcomes required in preparing him/herself to engage in continuous learning to keep abreast of knowledge and skills required in the structural engineering field
10. Participate as a responsible citizen in the life of local, national, and global communities by acting professionally and ethically in the chosen field of research
11. Demonstrate where applicable cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research and development activities
12. Explore, where applicable, education and career opportunities through engineering problem solving, design, technical research and structural engineering skills
13. Organise and develop entrepreneurial opportunities through engineering research, development and/or structural engineering skills

EB9.6.3 Admission requirements and selection criteria
A four year professional Bachelor's degree in Civil Engineering
OR
A Bachelor Honours degree or Postgraduate Diploma in Civil Engineering or an affiliated Engineering field

EB9.6.4 Conferment of the degree
The MEng: Structural Engineering degree will be conferred on students who have completed the six coursework modules (4 core modules and to electives) and minor dissertation successfully. Weight of dissertation is 50%.

EB9.6.5 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
M6CCT29	Advanced concrete technology	M6PAD19	Plastic analysis and design of structures
		M6ARC19	Advanced reinforced concrete analysis and design

Second year

First semester		Second semester	
M6FEA19	Finite element analysis	M6SOS19	Stability of steel structures
M6CSE19	Minor Dissertation	M6CSE29	Minor Dissertation

Choose two electives	
M6DAR26	Durability, assessment and repair of concrete structures (Second Semester)
M6DYS29	Dynamic analysis of structures (Second Semester)
M6DCS29	Design of cold-formed steel structures (First semester)
M6SPE19	Special topics in civil engineering materials and structures (

EB9.7 MASTER OF SUSTAINABLE URBAN PLANNING AND DEVELOPMENT M6MUPQ
Lectured-based (SAQA99782 -) (NQF 9)

EB9.7.1 Purpose of the qualification
The purpose of the programme is to develop built environment professionals specialising in the sustainable planning, design, development and management of urban centers. These graduates will acquire advanced abilities in applying sustainable development principles to urban development to benefit societies at large. One of the main objectives is to develop an advanced capability to independently conduct fundamental urban issues related research and as such promote a lifelong learning approach.

EB9.7.2 Qualification outcomes
Exit level outcomes:
On completion of this programme the student will be able to: -

1. understanding of relevant theory useful in solving planning, development and management problems in cities of the developing world;
2. reflect on the usefulness of principles of sustainable development to understand the socio-economic and environmental imperatives in urban areas
3. demonstrate a high level of understanding of smart cities and the need for provision

of adequate and intelligent infrastructure in urban areas

4. demonstrate the imperatives in managing the rapidly growing cities of the developing world
5. exhibit an understanding of the research process and requirements in urban planning and development
6. engage theoretical frameworks relevant to the development of urban space and be able to complete a dissertation within the built environment and related fields

Organise and develop entrepreneurial opportunities through urban research, development and management skills.

EB9.7.3 Admission Requirements and selection criteria

Any holder of a Bachelor honors degree in any relevant field, such as technological, commercial, science and arts will be eligible for admission to study towards the Master of Sustainable Urban Planning and Development
Or
Holders of Bachelor of Technology Degrees with additional research experience at Honors Level or participation in a bridging programme and a minimum of 2 years work experience will also be eligible for admission to study towards the Master of Sustainable Urban Planning and Development.

The selection criteria for this programme.
Students are selected on the basis of academic merit and an approved field(s) of study. An average mark of 65% in the previous degree qualification is generally required.

EB9.7.4 Conferment of the degree
The Master of Sustainable Urban Planning and Development will be conferred on students who have completed the research seminar and dissertation successfully.

EB9.7.5 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
AUPT019	Advanced Urban Planning Theory	IHSD029	Integrated Human Settlements Development
PSUD019	Principles of Sustainable Urban Development	USD9X01	Urban Sociology and Social Development
SUSC019	Sustainable Urban Infrastructure and Smart Cities Development	UFE9X02	Urban Financial and Economic Management

Second year

First semester		Second semester	
MSUP019	Minor Dissertation	MSUP029	Minor Dissertation

Choose two electives		
UFE9X02	Urban Financial and Economic Management	Second Semester
UEPG029	Urban Environmental Planning and GIS Applications	Second Semester
UED9X02	Urban Entrepreneurial Dynamics	Second Semester
SOC9X07	Urban Sociology and Social Development	Second Semester

MUP9X02	Urban Policy and Design	Second Semester
IHSD029	Integrated Human Settlements Development	Second Semester

EB9.8 MASTER OF MICRO AND NANOELECTRONIC ENGINEERING DEGREE PROGRAMME

EB9.8.1.1 Purpose of the qualification

The purpose of the Master of Micro- and Nanoelectronic Engineering programme is to develop engineers with advanced abilities in applying fundamental microelectronics within multi- and cross-disciplinary environments of today's workplace. In addition to being able to respond to complex problems and provide solutions to challenges experienced in the field of integrated circuit (IC) and systems on package (SoP) design, the programme will promote and develop the capability to perform independent research, investigate IC nanophenomena from scientific principles and implement outcomes to improve microelectronic designs.

The proposed curriculum is designed to provide advanced knowledge in areas such as analogue, digital and mixed-signal electronic design, RF, Mm-Wave and communications engineering, physics of semiconductor materials, design for testability, and microelectronic processes. Curriculum is designed to assist students in acquiring advanced computer skills, including the excessive use of online resources and electronic design automation (EDA) tools. The degree includes a minor dissertation, thus promoting research and independent learning from the candidates.

EB9.8.1.2 Qualification outcomes

Exit level outcomes:
The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve research and development problems creatively and innovatively by applying relevant inter-disciplinary knowledge in the chosen field of research.
2. Plan and manage research projects demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of interdisciplinary research.
4. Organise and manage him/herself and his/her activities responsibly, effectively and ethically, accept responsibility within his/her limits of competence, and exercise judgement based on knowledge and expertise, pertaining to the field of research.
5. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate research methods, skills, tools and information technology effectively and critically in research/development practice, and show an understanding and a willingness to accept responsibility for the impact of inter-disciplinary research/development activities on society and the environment.
8. Perform synthesis of systems, works, products or processes as a set of related systems and assess their social, legal, health, safety and environmental impact and benefits, where applicable, in the chosen field of inter-disciplinary research.
9. Employ various learning strategies and skills to master outcomes required for preparing him/herself to engage in continuous learning, to keep abreast of knowledge and skills required in the interdisciplinary field.

10. Participate as a responsible citizen in the life of local, national and global communities by acting ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
12. Explore, where applicable, education and career opportunities in research/development.
13. Organise and develop entrepreneurial opportunities through technical research, development and/or managerial skills.

EB9.8.1.3 Admission requirements and selection criteria

Bachelor Honours degree or equivalent from accredited programmes within the electronic engineering or related field such as physical physics, mathematics, computer science or material science, or Bachelor of Technology in Electrical/Electronic Engineering that is supported by any postgraduate learning or experience, may be admitted to study towards the degree qualification.

Students are selected on the basis of academic merit and an approved field(s) of study. A minimum average mark of 65% in the previous degree qualification, is generally required – this is as per the UJ higher degrees' policy. Candidates from related fields may be requested to take additional modules at undergraduate level to ease their transition to the field of micro-/nanoelectronics.

EB9.8.1.5 Curriculum

Module name	NQF level of the module	Credits per module	Compulsory / optional	Year (1, 2, 3, 4)	Total credits per year
Analogue and RF Microelectronics	9	30	Compulsory	1, Semester 1	180
Digital and Memory Design	8	30	Compulsory	1, Semester 1	180
Nanoelectronic Specialisation	8	7.5	Elective	1, Semester 2	180
Cross-Disciplinary Specialisation	8	7.5	Elective	1, Semester 2	180
Research Related Specialisation*	8	15	Elective	1, Semester 2	180
Engineering Research Proposal Writing	8	15	Compulsory	1, Semester 1	180
Minor Dissertation	9	90	Compulsory	1, Semester 2	180
* If the module Specialisation in a Related field is chosen (15 credits), it replaces both Nanoelectronic Specialisation and Cross-Disciplinary Specialisation (7.5 + 7.5 credits). Chosen elective credit weightings are therefore equivalent.					

The programme consists of four compulsory/core modules, electives and a compulsory Engineering Research Proposal Writing module followed by the research/mini-dissertation at NQF Level 9.

Students are required to complete the two major modules, Analogue and RF Microelectronic Design and Simulation and Digital and Memory Design and Synthesis, as well as the module Engineering Research Proposal Writing before they will be allowed to complete the Minor Dissertation in the second semester.

One or two additional modules (electives) are required from a choice of three: Nanoelectronic Specialisation and General Specialisation are tailored towards the need of the mini-dissertation (as each topic will be different, the programmatic development will allow for relevant specialisation). Nanoelectronic Specialisation needs to contain topic from the field on nanoelectronics, while the scope of the Cross-Disciplinary Specialisation is not limited to this field – allowing for multi- and cross-disciplinary specialisation. The curricula of both Specialisations are approved by the programme coordinator.

Alternatively, module Research Related Specialisation, with a higher credit double that of the two elective choices above, can replace both Nanoelectronic Specialisation and Cross-Disciplinary Specialisation, if such module is deemed appropriate for student's research work.

EB9.9 MASTER OF SUSTAINABLE MINING (RESEARCH-BASED)

EB9.9.1.1 Purpose of the qualification

This programme is aimed to develop an intellectual with advanced abilities in applying fundamental engineering technologies or related inter-disciplinary principles to develop methods, strategies and designs within all mining related sectors in Africa and to develop an advanced capability to conduct fundamental research of an inter-disciplinary nature independently. The purpose of this programme, to all persons involved within the mining value chain, from exploration to rehabilitation, to develop research and innovative practices to develop sustainable mining practices within the African continent. The qualifier "sustainable mining" will address issues around the increasing complexity of mining at great depths and the decline of mineral deposits that can be mined with minimal effort. This course will propose to support the UJ strategic objectives including excellence in research and innovation and improving the international profile in global excellence and stature.

EB9.9.1.2 Qualification outcomes

Exit level outcomes:
On completion of the dissertation a student should display the development of a research proposal to a point where a dissertation can be completed to address the specific sustainable mining practices within the African continent. On completion of the research dissertation addressing specific designs, strategies or practices that will improve sustainability in mining, the graduate will be able to:

1. Identify, assess, formulate, interpret, analyse and solve problems within the development of sustainable mining research problems creatively and innovatively by applying relevant inter-disciplinary knowledge in the chosen field of research.
2. Plan and manage sustainable mining policies and strategies in research projects, demonstrating inter-disciplinary knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) research/development in the chosen field of research practice.
3. Organise and manage him/herself and his/her activities responsibly, effectively and ethically, accept take responsibility within his/her limits of competence, and exercise judgement based on knowledge and expertise, pertaining to the field of research.

4. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
5. Communicate effectively, both orally and in writing, with specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate data analysis and interpretation.
6. Participate as a responsible citizen in the life of local, national and global communities by acting ethically in the chosen field of research.
7. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering management research/development activities.

EB9.9.1.3 Admission requirements and selection criteria

Bachelor Honours Degree or a relevant Postgraduate Diploma at NQF level 8. A relevant Bachelor's qualification with appropriate industry experience and subsequent recognised industry qualifications such as the Government Certificate of Competency may also be recognised as meeting the minimum entry requirement to the proposed Master's Degree programme. The University's RPL policy will be applied.

EB9.9.1.4 Conferment of the degree

Master of Sustainable Mining degree will be conferred on students who have completed the research seminar and dissertation successfully.

EB.1.5 Curriculum

Module name	NQF level of the module	Credits per module	Compulsory / optional	Year (1, 2, 3, 4)	Total credits per year
Research Module	9	180	Compulsory	2 years part-time	180 credits per year

CODE	MODULE	CODE	MODULE

RESEARCH TIME: 100%

EB10 MAGISTER PHILOSOPHIAE ENGINEERING SCIENCE PROGRAMMES

EB10.1 MPhil: ELECTRICAL AND ELECTRONIC ENGINEERING M6ER7Q Research-based (SAQA 74008) (NQF 9)

EB10.1.1 Purpose of the qualification

The purpose of the qualification is to develop an intellectual with advanced abilities in applying fundamental engineering sciences or related inter-disciplinary principles to specific problems of society at large. One of the main objectives in this process is to develop an advanced capability to conduct fundamental engineering research of an inter/intra-disciplinary nature independently. It also promotes a lifelong learning approach.

EB10.1.2 Qualification outcomes

Exit level outcomes:
The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve research and development problems creatively and innovatively by applying relevant inter-disciplinary knowledge in the chosen field of research.
2. Plan and manage research projects demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) research/development in the chosen field of research practice.

3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of interdisciplinary research.
4. Organise and manage him/herself and his/her activities responsibly, effectively and ethically, accept responsibility within his/her limits of competence, and exercise judgement based on knowledge and expertise, pertaining to the field of research.
5. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate research methods, skills, tools and information technology effectively and critically in research/development practice, and show an understanding and a willingness to accept responsibility for the impact of inter-disciplinary research/development activities on society and the environment.
8. Perform synthesis of systems, works, products or processes as a set of related systems and assess their social, legal, health, safety and environmental impact and benefits, where applicable, in the chosen field of inter-disciplinary research.
9. Employ various learning strategies and skills to master outcomes required for preparing him/herself to engage in continuous learning, to keep abreast of knowledge and skills required in the interdisciplinary field.
10. Participate as a responsible citizen in the life of local, national and global communities by acting ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
12. Explore, where applicable, education and career opportunities in research/development.
13. Organise and develop entrepreneurial opportunities through technical research, development and/or managerial skills.

EB10.1.3 Admission requirements and selection criteria

An approved four-year Bachelor's degree in Engineering or similar approved degree at honours level.

Final admission to the programme will only be granted upon successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the supervisors in the Faculty.

EB10.1.4 Conferment of the degree

The MPhil: Electrical and Electronic degree will be conferred on students who have completed the research seminar and dissertation successfully.

EB10.1.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
M6E0109	Dissertation	M6E0209	Dissertation

RESEARCH TIME: 100%

EB10.2 MPhil: MECHANICAL ENGINEERING M6MR8Q
Research-based (SAQA 74015) (NQF 9)

EB10.2.1 Purpose of the qualification

The purpose of the qualification is to develop an intellectual with advanced abilities in applying fundamental engineering sciences or related inter-disciplinary principles to specific problems of society at large. One of the main objectives in this process is to develop an advanced capability to do fundamental engineering research of inter/intra-disciplinary nature independently. It also promotes a lifelong learning approach.

EB10.2.2 Qualification outcomes

Exit level outcomes:
The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve research/development problems creatively and innovatively by applying relevant inter-disciplinary knowledge in the chosen field of research.
2. Plan and manage research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of interdisciplinary research.
4. Organise and manage him/herself and his/her activities responsibly, effectively and ethically, accept responsibility within his/her limits of competence, and exercise judgement based on knowledge and expertise, pertaining to the field of research.
5. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate research methods, skills, tools and information technology effectively and critically in research/development practice, and show an understanding and a willingness to accept responsibility for the impact of inter-disciplinary research/development activities on society and the environment.
8. Perform synthesis of systems, works, products or processes as a set of related systems and assess their social, legal, health, safety and environmental impact and benefits, where applicable, in the chosen field of inter-disciplinary research.
9. Employ various learning strategies and skills to master 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 ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
12. Explore, where applicable, education and career opportunities in research/development.
13. Organise and develop entrepreneurial opportunities through technical research, development and/or managerial skills.

EB10.2.3 Admission requirements and selection criteria

An approved four-year Bachelor's degree in Engineering or similar approved degree at honours level.
Final admission to the programme will only be granted upon successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the supervisors in the Faculty.

EB10.2.4 Conferment of the degree

The MPhil: Mechanical degree will be conferred on students who have completed the research seminar and dissertation successfully.

EB10.2.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
M6M0109	Dissertation	M6M0209	Dissertation

RESEARCH TIME: 100%

EB10.3 MPhil: CIVIL ENGINEERING M6CR9Q
Research-based (SAQA 74006) (NQF 9)

EB10.3.1 Purpose of the qualification

The purpose of the qualification is to develop an intellectual with advanced abilities in applying fundamental engineering sciences or related inter-disciplinary principles to specific problems of society at large. One of the main objectives in this process is to develop an advanced capability to do fundamental engineering research of inter/intra-disciplinary nature independently. It also promotes a lifelong learning approach.

EB10.3.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

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

11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
12. Explore, where applicable, education and career opportunities in research/development.
13. Organise and develop entrepreneurial opportunities through technical research, development and/or managerial skills.

EB10.3.3 Admission requirements and selection criteria

An approved four-year Bachelor's degree in Engineering or similar approved degree at honours level.
Final admission to the programme will only be granted upon successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the supervisors in the Faculty.

EB10.3.4 Conferment of the degree

The MPhil: Civil degree will be conferred on students who have completed the research seminar and dissertation successfully.

EB10.3.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
M6C0109	Dissertation	M6C0209	Dissertation

RESEARCH TIME: 100%

EB10.4 MPhil: ENGINEERING MANAGEMENT M6MC0Q
Lectured (SAQA 74010) (NQF 9)

EB10.4.1 Purpose of the qualification

The purpose of the qualification is to develop an intellectual with advanced abilities in applying fundamental engineering management sciences and/design and synthesis and related inter-disciplinary principles to specific management systems problems of society at large. One of the main objectives in this process is to develop an advanced capability to conduct fundamental systems engineering and management research of an inter/intra-disciplinary nature independently. It also promotes a lifelong learning approach.

EB10.4.2 Qualification outcomes

Exit level outcomes:
The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering management research/development problems creatively and innovatively by applying relevant inter-disciplinary knowledge in the chosen field of research.
2. Plan and manage engineering management research projects, demonstrating inter-disciplinary knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of inter-disciplinary research.
4. Organise and manage him/herself and his/her activities responsibly, effectively and ethically, accept take responsibility within his/her limits of competence, and exercise judgement based on knowledge and expertise, pertaining to the field of research.
5. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies, and perform appropriate data analysis and interpretation.

6. Communicate effectively, both orally and in writing, with specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate data analysis and interpretation.
7. Use and assess appropriate engineering management research methods, skills, tools and information technology effectively and critically in research/development practice, and show an understanding and a willingness to accept responsibility for the impact of inter-disciplinary research/development activities on society and the environment.
8. Perform systems, works, products or processes as a set of related systems and assess their social, legal, health, safety and environmental impact and benefits, where applicable, in the chosen field of interdisciplinary research.
9. Employ various learning strategies and skills to master 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 ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering management research/development activities.
12. Explore, where applicable, education and career opportunities in engineering management research/development.
13. Organise and develop entrepreneurial opportunities through inter-disciplinary research, development and/or managerial skills.

EB10.4.3 Admission requirements and selection criteria

A Baccalaureus Technologiae, Engineering **or** an equivalent qualification of an equivalent standard. With 1.5 years appropriate experience.

EB10.4.4 Conferment of the degree

The MPhil: Engineering Management degree will be conferred on students who have completed the six prescribed modules and minor dissertation successfully. Weight of the minor dissertation is 50%.

EB10.4.5 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
M6MEM19	Engineering Management	M6MRM29	Reliability Management
M6MAE19	Advanced Engineering Economics	M6MPM29	Project Management
M6MES19	Engineering Systems Management	M6MPD29	Product Development and Marketing

Second year (Prerequisites: Completion of coursework modules)

First semester		Second semester	
M6MMD19	Minor Dissertation	M6MMD29	Minor Dissertation

EB10.5 MPhil: ENGINEERING MANAGEMENT M6MR2Q
Research-based (SAQA 74010) (NQF 9)

EB10.5.1 Purpose of the qualification

The purpose of the qualification is to develop an intellectual with advanced abilities in applying fundamental engineering management sciences and/design and synthesis, and related interdisciplinary principles to specific management systems and problems of society at large. One of the main objectives in this process is to develop an advanced capability to do

independent systems engineering and management research of an inter/intra-disciplinary nature. It also promotes a lifelong learning approach.

EB10.5.2 Qualification outcomes

Exit level outcomes:
The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering management research/development problems creatively and innovatively by applying relevant inter-disciplinary knowledge in the chosen field of research.
2. Plan and manage engineering management research projects, demonstrating inter-disciplinary knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of inter-disciplinary research.
4. Organise and manage him/herself and his/her activities responsibly, effectively and ethically, accept responsibility within his/her limits of competence, and exercise judgement based on knowledge and expertise, pertaining to the field of research.
5. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate data analysis and interpretation.
7. Use and assess appropriate engineering management research methods, skills, tools and information technology effectively and critically in research/development practice, and show an understanding and a willingness to accept responsibility for the impact of inter-disciplinary research/development activities on society and the environment.
8. Perform systems, works, products or processes as a set of related systems and assess their social, legal, health, safety and environmental impact and benefits, where applicable, in the chosen field of inter-disciplinary research.
9. Employ various learning strategies and skills to master 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 ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering management research/development activities.
12. Explore, where applicable, education and career opportunities in engineering management research/development.
13. Organise and develop entrepreneurial opportunities through inter-disciplinary research, development and/or managerial skills.

EB10.5.3 Admission requirements and selection criteria

A Baccalaureus Technologiae, Engineering **or** an equivalent qualification of an equivalent standard. With 1.5 years appropriate experience. Final admission to the programme will only be granted upon successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the supervisors in the Faculty.

EB10.5.4 Conferment of the degree

The MPhil: Engineering Management degree will be conferred on students who have completed the research seminar and dissertation successfully.

EB10.5.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
M6M0109	Dissertation	M6M0209	Dissertation

RESEARCH TIME: 100%

EB11 DOCTORAL DEGREE ENGINEERING TECHNOLOGY PROGRAMMES

EB11.1 DTech: ENGINEERING: MECHANICAL (SAQA 73924) DTM002

EB11.1.1 Purpose of the qualification

This qualification is intended for students who will make a significant and original contribution to knowledge in a specialised area of technology. They will be able to demonstrate a high level of overall knowledge in that specialised area, ranging from fundamental to advanced theoretical or applied knowledge.

EB11.1.2 Qualification Outcomes

Exit level outcomes:
The qualified student will be able to:

1. Identify and solve problems by means of responses that demonstrate responsible decisions, using critical and creative thinking.
2. Collect, organise, analyse and critically evaluate information.
3. Work effectively with others.
4. Reflect on and explore a variety of strategies to learn more effectively.
5. Communicate effectively, using visual, mathematical and/or language skills in oral and/or written presentation.

EB11.1.3 Admission requirements and selection criteria

An appropriate Magister Technologiae or an equivalent qualification of an equivalent standard, as determined by a Status Committee.
Students are selected on academic merit and approved field of study.

EB11.1.4 Conferment of the degree

The DTech: Engineering: Mechanical will be conferred on students who have completed the research programme and thesis successfully.

EB11.1.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
PFS6009	Thesis: Mechanical Engineering	PFS6209	Thesis: Mechanical Engineering

EB11.2 DTech: EXTRACTION METALLURGY (SAQA -) 618-1

EB11.2.1 Purpose of the qualification

At this level, a qualifying student will be competent in conducting original research and development at a specialised level in Metallurgical Engineering, thus contributing to the research and development needs and knowledge base of the metallurgical industry and mining

community. The qualified student will be able to register with ECSA as a Professional Technologist.

EB11.2.3 Admission requirements and selection criteria
An appropriate Magister Technologiae **or** an equivalent qualification of an equivalent standard. Students are selected on academic merit and approved field of study.

EB11.2.4 Conferment of the degree
The DTech: Extraction Metallurgy is conferred on students who have completed the research programme and thesis successfully.

EB11.2.5 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
PFS8009	Thesis: Extraction Metallurgy	PFS8209	Thesis: Extraction Metallurgy

EB11.3 DTech: ENGINEERING: METALLURGY 617-1 (SAQA -)

EB11.3.1 Purpose of the qualification
At this level, a qualifying student will be competent in conducting original research and development at a specialised level in Metallurgical Engineering, thus contributing to the research and development needs and knowledge base of the metallurgical industry and mining community. The qualified student will be able to register with ECSA as a Professional Technologist.

EB11.3.3 Admission requirements and selection criteria
An appropriate Magister Technologiae **or** an equivalent qualification of an equivalent standard. Students are selected on academic merit and approved field of study.

EB11.3.4 Conferment of the degree
The DTech: Engineering Metallurgy will be conferred on students who have completed the research programme and thesis successfully.

EB11.3.5 Curriculum

CODE	MODULE	CODE	MODULE

First year

First semester		Second semester	
PFS5009	Thesis: Metallurgy	PFS5209	Thesis: Metallurgy

EB12 DOCTOR PHILOSOPHIAE ENGINEERING SCIENCE PROGRAMMES

EB12.1 PhD: ELECTRICAL AND ELECTRONIC P6E01Q (NQF 10)

EB12.1.1 Purpose of the qualification
The purpose of the qualification is to develop an engineer with advanced abilities in applying fundamental engineering sciences and/design and synthesis, and related principles independently to specific problems of society at large. One of the main objectives in this process

is to develop an advanced capability to conduct fundamental engineering research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields.

EB12.1.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve original engineering research/development problems creatively and innovatively by applying relevant advanced fundamental knowledge of i.e. Mathematics, Basic Science and Engineering Sciences in the chosen field of research.
2. Plan and manage advanced engineering research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research.
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 original judgment based on knowledge and expertise, pertaining to the field of research.
5. Plan and conduct advanced investigations, research and/or experiments of an original nature by applying or developing appropriate theories and methodologies, and perform data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate advanced engineering research methods, skills, tools and information technology effectively and critically in research/development practice, and show an understanding and a willingness to accept responsibility for the impact of engineering research/development 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, where applicable, in the chosen field of research.
9. Employ various learning strategies and skills to master outcomes required for preparing him/herself to engage in continuous learning, to keep abreast of knowledge and skills required in the engineering research/development field.
10. Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research/development activities.
12. Explore, where applicable, education and career opportunities in advanced engineering research/development.
13. Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB12.1.3 Admission requirements and selection criteria

An approved Master's degree in Engineering or a similar approved degree at Master's level.

Final admission to the programme will only be granted upon successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the supervisors in the Faculty and finally by the Senate or Executive Committee of the Senate of the University.

EB12.1.4 Conferment of the degree

The PhD: Electrical and Electronic will be conferred on students who have completed the research seminar and thesis successfully.

EB12.1.5 Curriculum

CODE	MODULE
P6E0110	Thesis: Electrical and Electronic semester 1
P6E0210	Thesis: Electrical and Electronic semester 2

EB12.2 PhD: MECHANICAL (NQF 10) P6M02Q

EB12.2.1 Purpose of the qualification

The purpose of the qualification is to develop an engineer with advanced abilities in applying fundamental engineering sciences and/design and synthesis, and related principles independently to specific problems of society at large. One of the main objectives in this process is to develop an advanced capability to conduct fundamental engineering research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields.

EB12.2.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering research/development problems of an original nature creatively and innovatively by applying relevant advanced fundamental knowledge of i.e. Mathematics, Basic Science and Engineering Sciences in the chosen field of research.
2. Plan and manage advanced research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research.
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 original judgment based on knowledge and expertise, pertaining to the field of research.
5. Plan and conduct advanced investigations, research and/or experiments of an original nature by applying or developing appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with engineering and specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate advanced inter-disciplinary research methods, skills and information technology effectively and critically in engineering research/development practice, and show a responsibility for the impact of engineering research/development 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, where applicable, in the chosen field of interdisciplinary research.
9. Employ various learning and research strategies and skills to master outcomes required for preparing him/herself to engage in continuous learning and research, to keep abreast of knowledge and skills required in the engineering management research/development field.

10. Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research/development activities.
12. Explore, where applicable, education and career opportunities in advanced engineering research/development.
13. Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB12.2.3 Admission requirements and selection criteria

An approved Master's degree in Engineering or a similar approved degree at Master's level.
Final admission to the programme will only be granted upon successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the supervisors in the Faculty and finally by the Senate or Executive Committee of the Senate of the University.

EB12.2.4 Conferment of the degree

The PhD: Mechanical will be conferred on students who have completed the research seminar and thesis successfully.

EB12.2.5 Curriculum

CODE	MODULE
P6M0110	Thesis: Mechanical semester 1
P6M0210	Thesis: Mechanical semester 2

EB12.3 PhD: CIVIL (NQF 10) P6C03Q

EB12.3.1 Purpose of the qualification

The purpose of the qualification is to develop an engineer with advanced abilities in applying fundamental engineering sciences and/design and synthesis, and related principles independently to specific problems of society at large. One of the main objectives in this process is to develop an advanced capability to conduct fundamental engineering research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields.

EB12.3.2 Qualification outcomes

Exit level outcomes:
The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering research/development problems creatively and innovatively by applying relevant fundamental knowledge of i.e. Mathematics, Basic Science and Engineering Sciences in the chosen field of research.
2. Plan and manage advanced engineering research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research.
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, pertaining to the field of research.
5. Plan and conduct advanced investigations, research and /or experiments of an original nature by applying or developing appropriate theories and methodologies, and perform data analysis and interpretation.

6. Communicate effectively, both orally and in writing, with engineering and specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate advanced engineering research methods, skills, tools, technology and information technology effectively and critically in engineering research/development practice, and show an understanding and a willingness to accept responsibility for the impact of engineering research/development 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, where applicable, in the chosen field of research.
9. Employ various learning strategies and skills to master outcomes required for preparing him/herself to engage in continuous learning, to keep abreast of knowledge and skills required in the engineering research/development field.
10. Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research/development activities.
12. Explore, where applicable, education and career opportunities in advanced engineering research/development.
13. Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB12.3.3 Admission requirements and selection criteria
An approved Master's degree in Engineering or a similar approved degree at Master's level.
Final admission to the programme will only be granted after successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the supervisors in the Faculty and finally by the Senate or Executive Committee of the Senate of the University.

EB12.3.4 Conferment of the degree
The PhD: Civil will be conferred on students who have completed the research seminar and thesis successfully.

EB12.3.5 Curriculum

CODE	MODULE
P6C0110	Thesis: Civil semester 1
P6C0210	Thesis: Civil semester 2

EB12.4 PhD: ENGINEERING MANAGEMENT P6EM4Q (NQF 10)

EB12.4.1 Purpose of the qualification
The purpose of the qualification is to develop an engineer with advanced abilities in applying fundamental engineering management sciences and/design and synthesis, and related principles independently to specific management systems problems of society at large. One of the main objectives in this process is to develop an advanced capability to conduct fundamental independent systems engineering and management research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields.

EB12.4.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering research/development problems independently, creatively and innovatively by

applying relevant advanced fundamental knowledge of i.e. Engineering and/or Engineering Management Sciences in the chosen field of research.
2. Plan and manage advanced engineering research project(s), demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering research/development/management in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research.
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 original judgment based on knowledge and expertise, pertaining to the field of research.
5. Plan and conduct advanced investigations, research and/or experiments of an original nature by applying or developing appropriate theories and methodologies, and perform data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate advanced research methods, skills, tools, technology and information technology effectively and critically in engineering research/development practice, and show an understanding and a willingness to accept responsibility for the impact of research/development 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, where applicable, in the chosen field of research.
9. Employ various learning and research strategies and skills to master outcomes required for preparing him/herself to engage in continuous learning and research, to keep abreast of knowledge and skills required in the engineering management research/development field.
10. Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering management research/development activities.
12. Explore, where applicable, education and career opportunities in advanced engineering management research/development.
13. Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB12.4.3 Admission requirements and selection criteria

An approved Master's degree in Engineering or a similar approved degree at Master's level.
Final admission to the programme will only be granted upon successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the supervisors in the Faculty and finally by the Senate or Executive Committee of the Senate of the University.

EB12.4.4 Conferment of the degree

The PhD: Engineering Management will be conferred on students who have completed the research seminar and thesis successfully.

EB12.4.5 Curriculum

CODE	MODULE
P6EM110	Thesis: Engineering Management semester 1
P6EM120	Thesis: Engineering Management semester 2

EB12.5 PhD: CHEMICAL ENGINEERING (NQF 10) P6CHEQ

EB12.5.1 Purpose of the qualification

The purpose of the qualification is to develop an engineer with advanced abilities in applying fundamental engineering sciences and/design and synthesis, and related principles independently to specific problems of society at large. One of the main objectives in this process is to develop an advanced capability to conduct fundamental engineering research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields.

EB12.5.2 Qualification outcomes

Exit level outcomes:
The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering research/development problems of an original nature creatively and innovatively by applying relevant advanced fundamental knowledge of i.e. Mathematics, Basic Science and Engineering Sciences in the chosen field of research.
2. Plan and manage advanced research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research.
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 original judgment based on knowledge and expertise, pertaining to the field of research.
5. Plan and conduct advanced investigations, research and/or experiments of an original nature by applying or developing appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with engineering and specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate advanced inter-disciplinary research methods, skills and information technology effectively and critically in engineering research/development practice, and show a responsibility for the impact of engineering research/development 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, where applicable, in the chosen field of interdisciplinary research.
9. Employ various learning and research strategies and skills to master outcomes required for preparing him/herself to engage in continuous learning and research, to keep abreast of knowledge and skills required in the engineering management research/development field.
10. Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research/development activities.
12. Explore, where applicable, education and career opportunities in advanced engineering research/development.
13. Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB12.5.3 Admission requirements and selection criteria

An approved Master's degree in Engineering or a similar approved degree at Master's level.
Final admission to the programme will only be granted upon successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the

supervisors in the Faculty and finally by the Senate or Executive Committee of the Senate of the University.

EB12.5.4 Conferment of the degree

The PhD: Chemical Engineering will be conferred on students who have completed the research seminar and thesis successfully.

EB12.5.5 Curriculum

CODE	MODULE
P6CH110	Thesis: Chemical semester 1
P6CH210	Thesis: Chemical semester 2

EB12.6 PhD: METALLURGY (NQF 10) P6METQ

EB12.6.1 Purpose of the qualification

The purpose of the qualification is to develop an engineer with advanced abilities in applying fundamental engineering sciences and/design and synthesis, and related principles independently to specific problems of society at large. One of the main objectives in this process is to develop an advanced capability to conduct fundamental engineering research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields.

EB12.6.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyse and solve engineering research/development problems of an original nature creatively and innovatively by applying relevant advanced fundamental knowledge of i.e. Mathematics, Basic Science and Engineering Sciences in the chosen field of research.
2. Plan and manage advanced research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research.
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 original judgment based on knowledge and expertise, pertaining to the field of research.
5. Plan and conduct advanced investigations, research and/or experiments of an original nature by applying or developing appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with engineering and specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate advanced inter-disciplinary research methods, skills and information technology effectively and critically in engineering research/development practice, and show a responsibility for the impact of engineering research/development 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, where applicable, in the chosen field of interdisciplinary research.
9. Employ various learning and research strategies and skills to master outcomes required for preparing him/herself to engage in continuous learning and research, to keep

abreast of knowledge and skills required in the engineering management research/development field.
10. Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research/development activities.
12. Explore, where applicable, education and career opportunities in advanced engineering research/development.
13. Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB12.6.3 Admission requirements and selection criteria

An approved Master's degree in Engineering or a similar approved degree at Master's level.
Final admission to the programme will only be granted upon successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the supervisors in the Faculty and finally by the Senate or Executive Committee of the Senate of the University.

EB12.6.4 Conferment of the degree

The PhD: Metallurgy will be conferred on students who have completed the research seminar and thesis successfully.

EB12.6.5 Curriculum

CODE	MODULE
P6MT110	Thesis: Metallurgy semester 1
P6MT210	Thesis: Metallurgy semester 2

EB12.7 PhD: OPERATIONS MANAGEMENT P6EM4Q (NQF 10)

EB12.7.1 Purpose of the qualification

The purpose of the qualification is to develop an engineer with advanced abilities in applying fundamental engineering sciences and/design and synthesis, and related principles independently to specific problems of society at large. One of the main objectives in this process is to develop an advanced capability to conduct fundamental engineering research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields.

EB12.7.2 Qualification outcomes

Exit level outcomes:
The qualified student will be able to:
1. Identify, assess, formulate, interpret, analyse and solve engineering research/development problems of an original nature creatively and innovatively by applying relevant advanced fundamental knowledge of i.e. Mathematics, Basic Science and Engineering Sciences in the chosen field of research.
2. Plan and manage advanced research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering research/development in the chosen field of research practice.
3. Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research.
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 original judgment based on knowledge and expertise, pertaining to the field of research.

5. Plan and conduct advanced investigations, research and/or experiments of an original nature by applying or developing appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
6. Communicate effectively, both orally and in writing, with engineering and specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
7. Use and assess appropriate advanced inter-disciplinary research methods, skills and information technology effectively and critically in engineering research/development practice, and show a responsibility for the impact of engineering research/development 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, where applicable, in the chosen field of interdisciplinary research.
9. Employ various learning and research strategies and skills to master outcomes required for preparing him/herself to engage in continuous learning and research, to keep abreast of knowledge and skills required in the engineering management research/development field.
10. Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically in the chosen field of research.
11. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research/development activities.
12. Explore, where applicable, education and career opportunities in advanced engineering research/development.
13. Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB12.7.3 Admission requirements and selection criteria

An approved Master's degree in Engineering or a similar approved degree at Master's level.
Final admission to the programme will only be granted upon successful presentation of a research seminar six months after enrolment. Research topics must also be accepted and approved by the supervisors in the Faculty and finally by the Senate or Executive Committee of the Senate of the University.

EB12.7.4 Conferment of the degree

The PhD: Operations Management will be conferred on students who have completed the research seminar and thesis successfully.

EB12.7.5 Curriculum

CODE	MODULE
P60M110	Thesis: Operations Management semester 1
P60M210	Thesis: Operations Management semester 2

EB12.8 PhD: QUANTITY SURVEYING (NQF 10) P6QSUQ

EB12.8.1 Purpose of the qualification

Quantity Surveyors are major players in the construction industry as they play a significant part in the management of construction business. The increasing complexity of the construction process requires high levels of engineering and management skills. Today, the planning, designing, costing, managing, building, and maintenance of facilities, require a higher level of sophistication and expertise than ever before. Many capable professionals and academics are unable to fill high level managerial appointments in the construction industry because of a lack of management education and experience.

The purpose of the programme is to develop an intellectual with the advanced ability to produce quantity surveying research that seeks to add knowledge and growth to this particular sector. One of the main objectives in this process is to develop an advanced capability to conduct inter-disciplinary quantity surveying research of an original nature. It will also promote a lifelong learning approach, as well as an aptitude for training other students in similar fields.

EB12.8.2 Qualification Outcomes

Exit Level Outcomes:

Upon completion of this programme, a student should be able to:

1. Analyze and solve Quantity Surveying (Construction Economics) research/development problems of an original nature creatively and innovatively by applying relevant advanced fundamental knowledge of Construction Management Sciences in the chosen field of research.
2. Plan and manage research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) construction research/development/management in the chosen field of research practice.
3. Plan and conduct advanced inter-disciplinary investigations, research and/or experiments of an original nature by applying or developing appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
4. Communicate effectively, both orally and in writing, with specific research institutions, audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
5. Apply and assess appropriate advanced inter-disciplinary research methods, skills, tools and information technology effectively and critically in Quantity Surveying (Construction Economics) research/development practice, and show an understanding and a willingness to accept responsibility for the impact of research/development activities on society and the environment.
6. Apply a 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, where applicable, in the chosen field of inter-disciplinary research.
7. Demonstrate and provide guidance where applicable and demonstrate cultural and aesthetic sensitivity across a range of social contexts in the execution of Quantity Surveying (Construction Economics) research/development activities.

EB12.8.3 Admission requirements

An approved Master's degree in Quantity Surveying (Construction Economics) or any Built Environment discipline or a similar approved degree at Master's level.

EB12.8.4 Selection Criteria

Students are selected on the basis of academic merit and an approved field(s) of study. An average mark of 65% in the previous degree qualification is required.

EB12.8.5 Conferment of the degree

The PhD: Quantity Surveying will be conferred on students who have completed the research seminar and thesis successfully.

EB12.8.6 Curriculum

CODE	FIRST YEAR
P6CO110	Thesis: Quantity Surveying 1
P6CO210	Thesis: Quantity Surveying 2

EB12.9 PhD: CONSTRUCTION MANAGEMENT P6CONQ (NQF 10)

EB12.9.1 Purpose of the qualification

Construction management is a holistically-developed built environment discipline in that the related tertiary education addresses three main streams, namely management, economics and science and technology. This empowers construction management graduates to manage the business of construction and projects (the physical process), as construction managers. Furthermore, construction management is the 'gateway' qualification for construction project management, which is the management of projects from conception to completion on behalf of a client, including design delivery, integration of design and construction, and the overseeing of construction. Expertise in this area is therefore imperative for the infrastructural development of South Africa and the African continent.

The purpose of the programme is to develop an intellectual with advanced abilities in applying construction engineering management with other related inter-disciplinary principles, in order to address construction management related problems within the sector. One of the main objectives in this process is to develop an advanced capability to conduct inter-disciplinary construction engineering management research of an original nature. It also aims to promote a lifelong learning approach, as well as an aptitude for training other students in similar fields.

EB12.9.2 Qualification Outcomes

Exit Level Outcomes:

Upon completion of this programme, a student should be able to:

1. Analyse and solve construction engineering management research/development problems of an original nature creatively and innovatively by applying relevant advanced fundamental knowledge of Construction Management Sciences in the chosen field of research.
2. Plan and manage research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) construction research/development/management in the chosen field of research practice.
3. Plan and conduct advanced inter-disciplinary investigations, research and/or experiments of an original nature by applying or developing appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
4. Communicate effectively, both orally and in writing, with specific research institutions, audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
5. Apply and assess appropriate advanced inter-disciplinary research methods, skills, tools and information technology effectively and critically in construction engineering management research/development practice, and show an understanding and a willingness to accept responsibility for the impact of research/development activities on society and the environment.
6. Perform 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, where applicable, in the chosen field of inter-disciplinary research.
7. Demonstrate cultural and aesthetic sensitivity across a range of social contexts in the execution of construction engineering management research/development activities.

EB12.9.3 Admission requirements

An approved Master's degree in Construction Management or any Built Environment discipline or a similar approved degree at Master's level.

EB12.9.4 Selection Criteria

Students are selected on the basis of academic merit and an approved field(s) of study. An average mark of 65% in the previous degree qualification is required.

EB12.9.5 Conferment of the degree

The PhD: Master's degree in Construction Management will be conferred on students who have completed the research seminar and thesis successfully.

EB12.9.6 Curriculum

CODE	FIRST YEAR
P6CO110	Thesis: Construction Management 1
P6CO210	Thesis: Construction Management 2

EB14 MODULE DESCRIPTIONS

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

M6MAE19	ADVANCED ENGINEERING ECONOMICS
Calculation Criteria	Final mark weighting = Semester mark (100%)
Credits	15
Purpose	To study specific technology management principles related to engineering economy in the engineering product development process.
Content	Engineering and engineering economy; physical and economic efficiency; engineering economy studies, economic and cost concepts, value, life cycle cost, time value of money; interest and equivalence; interest relationships, cash flows; economic equivalence calculations; bonds, loans, working capital, inflation; economic analysis and alternatives, decision making, comparison, replacement evaluation, break-even and optimization; accounting, depreciation and taxes, estimates of economic elements, risk, probability, economic analysis of operations.

M6MEM19	ENGINEERING MANAGEMENT
Calculation Criteria	Final mark weighting = Semester mark (100%)
Credits	15
Purpose	To study this specialized form of management concerned with the application of engineering principles to the planning and operational management of industrial and manufacturing operations.
Content	Consideration is given to Engineers as Managers, Organizational Structure, Financial Management, Product Development, Operations Management, Quality Management, Strategic Management, Personnel Management, Team Working & Creativity, Personal Management, Ethical Management, Communication, Project Management and Change Management.

M6MES19	Engineering Systems Management
Purpose	To study the application of systems engineering principles in the development of engineering systems.
Credits	15
Calculation Criteria	Final mark weighting = Semester mark (100%)
Content	Systems engineering principles, requirements engineering, scenario analysis, functional analysis, the role of SE in other discipline or functional groups, decision making, system analysis, system dynamics, system modelling, work breakdown structure, statistical engineering, graphical representation (FFBD, IDEF, DFD), risk management (FMEA, RCA).

M6MPD29	PRODUCT DEVELOPMENT AND MARKETING
Calculation Criteria	Final mark weighting = Semester mark (100%)
Credits	15
Purpose	To study specific technology management principles related to the engineering product development process.
Content	Aspects of structured product design, systems and competitive product design. Functions of marketing against the backdrop of engineering design and development. Introduction to production, manufacturing, objective in relation to marketing management and engineering design. Introduction to technical project evaluation.

M6MPM29	PROJECT MANAGEMENT
Calculation Criteria	Final mark weighting = Semester mark (100%)
Credits	15
Purpose	To study specific technology management principles related to project management in the engineering product development process.
Content	This course provides the student with a wide range of theoretical knowledge in the field of Project Management. This includes both the proven and traditional approaches to Project Management as well as the more innovative and novel practices that are becoming available. The content is designed to allow the student to understand and to utilize project management concepts when managing any project with regards to time, cost and quality according to accepted standards. The course content includes the following: • the components of modern project management with reference and consideration to the uniqueness and characteristics of the project life cycle; • the principles for excellence in modern project management and the appropriate organisational structures for project management; • all components of the project initiation phase • all components of the project implementation phase • all aspects related to project termination

M6MRM29	RELIABILITY MANAGEMENT
Calculation Criteria	Final mark weighting = Semester mark (100%)
Credits	15
Purpose	To study specific technology management principles related to the reliability management in the engineering product life-cycle from development through operation to phase-out and disposal.
Content	Reliability, definitions, evaluation, statistical methods, catastrophical failure models, reliability functions, distribution functions and applications, reliability and maintenance, preventative maintenance, reliability and systems (serie, parallel, standby), introduction to Markov models, economics and reliability, economics of maintenance, availability and cost, reliability and management.

M6CCT19	ADVANCED IN CONCRETE TECHNOLOGY
Credits	15
Purpose	To study and relate the advanced understanding of the chemistry and structure of cementitious systems to engineering performance and applications.
Content	Cement hydration, its role in concrete performance. Microstructural development, pore structure. Chemical admixtures and extenders. Cracking in concrete. Concrete deterioration processes covering basics, diagnosis and rehabilitation strategies. Special concretes.

M6ARC19	ADVANCED REINFORCED CONCRETE ANALYSIS AND DESIGN
Credits	15
Purpose	To study and apply the theory of design to the analysis of reinforced and pre-stressed concrete

Content	Introduction to yield analysis of slabs, the yield line, collapse mechanisms, orthotropic slabs, lower bound theorem and other phenomena. Truss and strut-tie models for torsion and shear analyses. Biaxial bending of short columns, slender columns. Analysis of RC frames subject to lateral loading. Deep beams and structural walls. Flat slab design. Pre-tensioned and post-tensioned slabs.

M6SOS19	**STABILITY OF STEEL STRUCTURES**
Credits	15
Purpose	To study stability theory and non-linear structural behaviour
Content	Stability theory. Column strength and stability. Buckling of plates. Elastic lateral–torsional buckling of beams. Composite beams and columns. Plate and box girders. Uniaxial and biaxial bending of beam-columns. Frame stability and National design methods. Thin-walled design.

M6FEA29	**FINITE ELEMENT ANALYSIS**
Credits	15
Purpose	To develop a theoretical basis of finite element methods and apply non-linear FEA to engineering problems
Content	This course provides the fundamentals of the finite element method, including elasticity, matrix algebra, calculus of vibrations, and energy principles. The formulation for axial, beam, isoparametric, membrane, plate, axisymmetric, three-dimensional, torsion, and fluid finite elements is presented. Solution methodologies and computer programming are discussed including the Ritz method, Galerkin's method and finite elements for stability and dynamics. Specific applications to field problems will be demonstrated such as 3D structural elements, heat transfer and flow in porous media. Practical exercises will be conducted using commercial packages such as ABAQUS or PROKON.

M6PAD19	**PLASTIC ANALYSIS AND DESIGN OF STRUCTURES**
Credits	15
Purpose	To conduct 3D fundamental elastic and plastic analysis of material behaviour, collapse analysis, design of elements and frames
Content	Introduction to material behaviour and theories of plastic analysis. Kinetic and statical methods. Plastic collapse of continuous beams. Analysis of single, multi-bay and multi-storey portal frames. Plastic design of portal framed industrial buildings.

M6DYS29	**DYNAMIC ANALYSIS OF STRUCTURES**
Credits	15
Purpose	To develop understanding of the problems of forced vibrations and compute the dynamic response of a structure
Content	Definitions and fundamental aspects of a periodic motion. Free vibration and harmonically excited vibration. Impulse excitation and Duhamel integral. Application of mathematical formulations to dynamics including Fourier analysis and Laplace transform, Eigen values and vectors. Flexibility and stiffness matrix approaches. Coordinate coupling and vibration of continuous systems.

M6DCS29	**DESIGN OF COLD FORMED STEEL STRUCTURES**
Credits	15
Purpose	To study the nature of local buckling in cold formed structures, the strength design approach and numerical analysis techniques

Content	Introduction to cold formed steel structures. Local buckling. Effective width and properties. Effective width equations. Stiffened and unstiffened sections. Effective width and direct strength design approaches. Application of the design methods to members in tension, bending, compression, combined axial load and bending, wall studs, connections and bracing. Numerical analysis for thin walled structures.

M6DAR29	**DURABILITY ASSESSMENT AND REPAIR OF CONCRETE STRUCTURES**
Credits	15
Purpose	To study durability and its relation to design principles, conduct assessment of degradation, service life and repair strategies
Content	Design for durability. Concrete degradation processes. Condition assessment. Structural assessment. Repair options and techniques. Repair materials. Structural repairs including strengthening and upgrade. Life cycle costing for reinforced concrete.

M6SPE_9	**SPECIAL TOPIC IN CIVIL ENGINEERING MATERIALS AND STRUCTURES**
Credits	15
Purpose	To conduct a focused in-depth study on a topic of specific research interest
Content	The topic of study should fall within the fields of civil engineering materials and/or structural engineering, while the nature of study may be determined by the supervisor. Registration for this module may only be allowed upon consultation for availability of an academic supervisor for the student's work. An announcement for availability of the module for the academic year will be made as and when appropriate.