



P O S T G R A D U A T E
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Faculty of
Engineering and
the Built
Environment



UNIVERSITY
OF
JOHANNESBURG

Rules and Regulations book with the copy on the Internet.
The electronic copy is updated regularly.
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

GENERAL INFORMATION AND CONTACT DETAILS

Executive Dean

PhD (Engineering, Brown University, RI, USA)

Secretaries of the Executive Dean:

Prof Daniel Mashao

Auckland Park Campus
Ms D Layte
011 559 2114

Doornfontein Campus
Ms N Nkosi
011 559 6165

Vice Deans

Postgraduate Research and Innovation

Prof Y Sun

Secretary of the Vice Dean:

Ms N Nkosi
011 559 6165

Teaching & Learning and Operations

Prof Didier Nyembwe

Secretary of the Vice Deans:

Ms R Mogola
011 559 6934

Heads of School

Civil Engineering and the Built Environment

Pr. Eng., Pr.CPM, PhD (Wits), MSc Eng. (Surrey, UK), (UZ), FSAICE

Secretary:

Dr Jeffrey Mahachi

M.IT (UP), BSc Eng. (Hons)

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011 559 3511

Electrical and Electronic Engineering

Secretary:

Prof Thokozani Shongwe

Ms LM Jayiya

011 559 6521

Mechanical and Industrial Engineering

Secretary:

Dr Samuel L Gqibani

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011 559 3760

Mining, Metallurgy and Chemical

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Ms N Radebe

011 559 6817

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Ms Lungiswa Bobi

011 559 2119

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Faculty of Engineering and the Built
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Academic Departments

SCHOOL OF CIVIL ENGINEERING AND THE BUILT ENVIRONMENT

Civil Engineering Science – Auckland Park Campus

Head of Department: Prof M Ferentinou
Departmental Secretary: Ms Lerato Mahlangu
Tel: 011 559 2342

Civil Engineering Technology – Doornfontein Campus

Head of Department: Mr German Nkhonjera
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Construction Management and Quantity Surveying – Doornfontein Campus

Head of Department: Dr Molusiwa Ramabodu
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
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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
Telephone: 011 559 2147

Department of Electrical Engineering Technology – Doornfontein Campus

Head of Department: Dr P Bokoro
Departmental Secretary: Ms Melanie van der Voorden-Bester
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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
Departmental Secretary: Ms Elma Taylor
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Department of Mechanical and Industrial Engineering Technology – Doornfontein Campus

Head of Department: Dr Madindwa Mashinini
Departmental Secretary: Ms Lindelwa Bolilitye
Telephone: 011 559 6163

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

Department of Chemical Engineering Technology – Doornfontein Campus

Head of Department: Prof Kapil Moothi
Departmental Secretary: Ms Showneez Snyders
Telephone: 011 559 6276

Department of Metallurgy - Doornfontein Campus

Head of Department: Prof Elizabeth Makhatha
Departmental Secretary: Nurse Nyelisani
Telephone: 011 559 6169

Department of Mining and Mine Surveying - Doornfontein Campus

Head of Department: Prof Hennie Grobler
Departmental Secretary: Ms Alta De Wet
Telephone: 011 559 6186

POSTGRADUATE SCHOOL OF ENGINEERING MANAGEMENT

Head of School: Prof Jan-Harm Pretorius
Administrative Assistant: Ms Gina Rautenbach
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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 master's 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). The new programmes as well as the pipeline Tech qualification (Advanced Diploma, Postgraduate Diploma, Honours and D Tech) are offered on the Doornfontein Campus (DFC).

Postgraduate degree programme		Minimum study period		Campus
Postgraduate Diploma	PGDip	1 year full-time		DFC
Bachelor of Engineering Honours	Hons	1 year full-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%. All research applications should be accompanied by a research proposal.

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

4.3.1 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.

4.3.2 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.

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

4.3.4 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.

4.3.5 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.

4.3.6 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.

- 4.3.7 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.
- 4.3.8 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 honour's 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 honour's 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.

EB9.1

**Postgraduate Diploma: Quality
(SAQA: 111191) (NQF 8)**

E6Q21Q

EB9.1.1 Purpose of the qualification

The purpose of the Postgraduate Diploma in Quality is to endow the student from a production and/or service environment to become a quality professional specialising in quality tools, techniques and projects. The qualifying person will apply their pragmatic capabilities and proficiencies in decisions making and management of quality projects. The qualification is to intensify the student's skills and knowledge required for decision making, into sound quality practices. The proposed curriculum will enable the student to competently employ and integrate evidence-based techniques, practical experience and appropriate skills in an independent manner in conducting and managing research projects and application of an integrated system. Students will undertake a research

dissertation related to operations management. The proposed program offers an opportunity to showcase the skills students acquired in classes during the year and to apply research practice. This activity will be supervised by a member of academic staff, who will guide and assist in conducting a literature review and carry out an appropriate study.

EB9.1.2 Qualification outcomes

The Department of Quality and Operations Management (DQOM) is to introduce the new Postgraduate Diploma in Quality, which is articulated from the Advanced Diploma in Quality, as aligned with the new HEQSF structure as well as other institutions which offer the Postgraduate Diploma in Quality. This also provided an opportunity to develop a new relevant curriculum which catered to industry needs. Therefore, the Postgraduate Diploma in Quality is to enable students to specialise in the management of quality initiatives, thereby allowing the student to integrate a wealth of knowledge, skills and competencies of quality tools and techniques in order to manage research projects and implement these projects in their respective working environment. The Postgraduate Diploma also allowed the department to close the gap from the Advanced Diploma and Masters. The management of quality initiatives and decision making is for the student to employ appropriate methods of identifying, researching and diagnosing quality management problems as well as institute an integrated quality management system. This enables students to critically assess environmental influences on quality management activities. In view of these activities, the Postgraduate Diploma in Quality is targeted at persons at all level's senior management, as well as, those who aspiring to these positions and who wish to increase promotional prospects by acquiring this qualification. Consequently, this contributes to the development of the South African commerce and industry through the provision of quality and professional consultancy services and industry-based student project in order to assist small, medium and large-scale industries to establish sound quality techniques.

EB9.1.3 Admission requirements and selection criteria

The minimum admission requirement is a relevant BTech qualification at NQF level 7 or NQF level 7 equivalent with 120 credits. Students are selected on the basis of academic merit and an approved field(s) of study. An average mark of 60% in the previous degree qualification is required.

EB9.1.4 Conferment of the degree

One year full-time.

EB9.1.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
APR8X01	Advanced Project Management	SQM8X02	Strategic Quality Management
IMS8X01	Quality Management Systems	QEQ8X02	Ethics in quality
RQP8X00	Quality Project	RQP8X00	Quality Project

EB9.2.1 Purpose of the qualification

The purpose of the Postgraduate Diploma in Operations Management is to (1) give a gathered learning knowledge in particular operations administration issues in a national and universal environment for candidates with or without business or public administration foundation, operations management specifically; (2) build up a basic comprehension of the changing operations management technique and strategy setting inside the private, public and non-profit associations; (3) develop competencies in strategic issues associated with organizations operations management function; (4) develop an intermediary understanding of fundamental concepts and principles from the various business and public disciplines; (5) improve students' administrative abilities through a pledge to an on-going administrative advancement; (6) urge students to think broadly and bridge gaps between theories and the actual practice of effective operations management; and (7) distinguish factors and create methodologies contributing to poverty alleviation and community development.

This program will empower students to increase significant learning and aptitudes and build up a more profound comprehension of their specific specialisation. Notwithstanding the taught modules, a student must complete an assignment project of a limited scope on a topic selected to permit the student to use information, hypothesis and research aptitudes gained in classroom learning in a connected setting identified with the individual's business, interest or community. Students will undertake a research dissertation related to operations management. The proposed program offers an opportunity to showcase the skills students acquired in classes during the year and to apply research practice. This activity will be supervised by a member of academic staff, who will guide and assist in conducting a literature review and carry out an appropriate study.

EB9.2.2 Qualification outcomes

The Faculty of Engineering and the Built Environment at the University of Johannesburg introduced POSTGRADUATE DIPLOMAS in order to articulate with the Advance Diploma, as there would have been a gap between Advance Diplomas and master's degrees. Therefore, the need by the Department of Quality and Operations Management (DQOM) to introduce the Postgraduate Diploma in Operations Management, which is aligned with the Advance Diploma programme as a necessity is aligned with the Higher Education Qualification Sub-Framework (HEQSF) structure. The aim of the qualification is to develop the student's applied and cognitive competencies in the acquisition, interpretation, understanding and applications of operations management. Under the guidance of our advisory committee, this qualification is now regarded as in critical demand in the industry.

It is understood that Operations management is critical to the success of delivering customer satisfaction. This course gives you the theories, concepts and tools to be able to analyse and implement solutions to operations management issues in a business environment. You will gain an in-depth knowledge in operational issues related to manufacturing as well as service industries worldwide, and in South Africa in particular. The course is aimed at graduates wishing to broaden their expertise from a technological advanced diploma, or who want to advance their professional career. The course focuses on the wider strategic and global issues facing manufacturing and services organisations. It examines the use and application of techniques that enable operations effectiveness. The final focus is on operational areas. The course structure and content are based on the operational needs of 21st century organisations, with content applying to both manufacturing and services.

EB9.2.3 Admission requirements and selection criteria

The minimum admission requirement is a relevant BTech qualification at NQF level 7 or NQF level 7 equivalent with 120 credits. Students are selected on the basis of academic merit and an approved field(s) of study. An average mark of 60% in the previous degree qualification is required.

EB9.2.4 Conferment of the degree

One year full-time.

EB9.2.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
APR8X01	Advanced Project	MOC8X02	Management of Change
OPM8X01	Operations Management 5	OMT8X02	Operations Management
OMP8X00	Operations Management Project	OMP8X00	Operations Management Project

EB.9.3**Postgraduate Diploma: Management Services (SAQA: 115555) (NQF 8)****E6MS0Q****EB9.3.1 Purpose of the qualification**

The purpose of the Postgraduate Diploma in Management Services is to improve the student's capabilities and proficiencies in decision making and developing their expertise in the management of projects. The aim of the programme is to transform the student's competencies in evaluating and assessing organisation's issues and problems with the purpose of resolution in relation to the improvement of management services.

EB9.3.2 Qualification outcomes

- Evaluate the source of organisational management service problems at their earliest stage.
- Design advanced project management plans to enhance Management Services projects and deploy project leadership skills.
- Compare research strategies to produce and collate data, perform rigorous interpretations and disseminate quality information.
- Argue and address ethical issues based on critical reflections of ethical values within a complex, abstract and integrated quality context in order to justify, and motivate ethical behaviour in pursuing management service strategies and goals.
- Analyse and apply business enterprises law, the structure of companies and the legal framework that governs companies as it pertains to board governance and business ethics.

EB9.3.3 Admission requirements and selection criteria

The minimum admission requirement is a relevant BTech qualification at NQF level 7 or NQF level 7 equivalent with 120 credits. Students are selected based on academic merit and an approved field(s) of study. An average mark of 60% in the previous degree qualification is required.

EB9.3.4 Conferment of the degree

One year full-time.

EB9.3.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
ORE8X01	Organisational Effectiveness A	ORE8X02	Organisational Effectiveness B
APR8X01	Advanced Project Management	BUL41B1	Business Enterprise Law
MSP8X00	Project Management Services	MSP8X00	Project Management Services

EB10.1.1 Purpose of the qualification

The purpose of the Bachelor of Science Honours in Construction Management is to provide students with the necessary professional attributes, project management skills and Construction Management competencies, which would allow them to successfully fulfil the requirements of registration with the SACPCMP as a professional Construction Manager.

EB10.1.2 Qualification outcomes and assessment criteria

- Demonstrate knowledge of advanced construction methods and techniques.
- Undertake full project design, planning and management responsibilities including project planning, project control, analysis, identification, supply chain management, human resources management and solving managerial problems in construction.
- Confirm the supervisor's role and client's requirements.
- Confirm an understanding of contracts in construction.
- Define project requirements and objectives with the supervisor.
- Ascertain the capability of available resources with the supervisor and other team members.
- Communicate detailed instructions to supervisors and other team members.
- Undertake simple research projects in the construction industry.
- The qualifying learning is expected to apply construction principles in all construction work.
- The qualifying learner is expected to apply project management principles in all construction work.
- The qualifying learner must demonstrate professional decorum and conduct in project by understanding different roles, when working with supervisors.
- The qualifying learner must demonstrate the ability to solve problems using knowledge available in legal studies.
- The qualifying learner must demonstrate professional decorum and conduct in project by understanding different roles, when working with supervisors.
- The qualifying learner must demonstrate the capability to manage resources and must demonstrate professional decorum and conduct when working with supervisors and team members.
- The qualifying learner is expected to communicate ideas, theories, and concepts to all professionals involved in construction activities.
- The graduate must demonstrate the ability to conduct independent research aimed at solving industry-based problems and contributing to the proper understanding of concepts in construction management.

EB10.1.3 Admission requirements and selection criteria

The minimum entry requirement is a BSc (Construction) or NQF level 7 equivalent.

EB10.1.4 Conferment of the degree

One year full-time.

EB10.1.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
Year Modules		Year Modules	
CCM8X00	Construction Management	QMS8x00	Strategic Management
CEA8X00	Construction Equipment Automation	RRC8X00	Research Report: Construction Management
CFM8X00	Facilities Management	SCI8X00	Sustainable Construction and Innovation
CHR8X00	Human Resources Management for Construction	CPP8X00	Professional Practice
CLA8X00	Construction Law & Contract Administration		

EB10.2

**Bachelor of Science Honours in
Construction Project Management
(SAQA: 110061) (NQF 8)**

H6CP0Q**EB10.2.1 Purpose of the qualification**

The purpose of the Bachelor of Science Honours in Construction Project Management is to provide students with the necessary professional attributes, project management skills and Construction Project Management competencies, which would allow them to successfully fulfil the requirements of registration with the SACPCMP as a professional Construction Project Manager.

EB10.2.2 Qualification outcomes and assessment criteria

- Demonstrate knowledge of advanced construction methods and techniques;
- Undertake full project design, planning and management responsibilities including project planning, project control, analysis, identification, supply chain management, human resources management and solving managerial problems in construction;
- Confirm the supervisor's role and client's requirements;
- Confirm an understanding of contracts in construction;
- Define project requirements and objectives with the supervisor;
- Ascertain the capability of available resources with the supervisor and other team members;
- Communicate detailed instructions to supervisors and other team members;
- Undertake simple research projects in the construction industry.

EB10.2.3 Admission requirements and selection criteria

The minimum entry requirement is a BSc (Construction) or NQF level 7 equivalent.

EB10.2.4 Conferment of the degree

One year full-time.

EB10.2.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
Year Modules		Year Modules	
PRP8X00	Research Report	CHR8X00	Construction Human Resources Management
SCI8X00	Sustainable Construction & Innovation	QMS8X00	Strategic Management
CLA8X00	Construction Law & Contract Administration	ICC8X00	International Construction
CPM8X00	Construction Project Management	CPP8X00	Professional Practice

EB10.3.1 Purpose of the qualification

The purpose of the Bachelor of Science Honours in Health and Safety Management is to provide students with the necessary professional attributes, Health and Safety skills and competencies, which would allow them to successfully fulfil the requirements of registration with the SACPCMP.

EB10.3.2 Qualification outcomes and assessment criteria

- Demonstrate knowledge of advanced construction methods and techniques;
- Undertake full project design, planning and management responsibilities including project planning, project control, analysis, identification, supply chain management, human resources management and solving managerial problems in construction;
- Confirm the supervisor's role and client's requirements;
- Confirm an understanding of contracts in construction;
- Define project requirements and objectives with the supervisor;
- Ascertain the capability of available resources with the supervisor and other team members;
- Communicate detailed instructions to supervisors and other team members;
- Undertake simple research projects in the construction industry.

EB10.3.3 Admission requirements and selection criteria

The minimum entry requirement is a BSc (Construction) or NQF level 7 equivalent.

EB10.3.4 Conferment of the degree

One year full-time.

EB10.3.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
Year Modules		Year Modules	
CCM8X00	Construction Management	HSM8X00	Health and Safety Management
CHR8X00	Human Resources Management for Construction	QMA8X00	Strategic Management
CPP8X00	Professional Practice	RPH8X00	Research Report: Construction Health and Safety Management
CRM8X00	Risk Management	SHC8X00	Safety Health and Construction Law
ESC8X00	Environment and Sustainable Construction		

EB10.4.1 Purpose of the qualification

The purpose of the Bachelor of Science Honours in Quantity Surveying is to provide students with the necessary professional attributes, project management skills and Quantity Surveying competencies, which would allow them to successfully fulfil the requirements of registration with the SACQSP as a professional Quantity Surveyor.

EB8.10.4.2 Qualification outcomes and assessment criteria.

- Analyse and solve problems related to the built environment
- Deal with commercial, entrepreneurial and management issues
- Communication effectively on all matters to which their skills and competencies have been applied
- Use and apply information technology
- Interpret and apply legal principles within the context of the built environment
- Execute tasks requiring numerical and quantification expertise
- Conduct research within the context of the built environment, including consideration for inter-disciplinary aspects
- Apply knowledge of technology within the context of the built environment.

EB8.10.4.3 Admission requirements and selection criteria

The minimum entry requirement is a BSc (Construction) or NQF level 7 equivalent.

EB8.10.4.4 Conferment of degree

One year full-time.

EB8.10.4.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
Year Modules		Year Modules	
ADQ8X00	Advanced Descriptive Quantification	PLE8X00	Property Law and Economics
CLA8X00	Construction Law & Contract Administration	QMS8X00	Strategic Management
CMP8X00	Construction Project Management	QRP8X00	Research Report: Quantity Surveying
CPP8X00	Professional Practice	SCI8X00	Sustainable Construction and Innovation
ICC8X00	International Construction		

EB10.5

**Bachelor of Mine Surveying Honours
(SAQA: 110056) (NQF 8)**

H6MS0Q**EB8.10.5.1 Purpose of the qualification**

The purpose of the Bachelor of Mine Surveying Honours is that it prepares students with the competencies required for industry and research in the mine surveying sector. The programme also allows students to meet the educational requirements needed for registration in the category Professional Geometrician (Mine Surveying).

EB8.10.5.2 Qualification outcomes and assessment criteria

The content, curriculum and exit level outcomes (ELO) are scrutinized by industry and accredited by SAGC to ensure conformance and standards are maintained in the new programme.

- Demonstrate competence to identify, formulate, analyse and solve complex mine surveying problems creatively and innovatively.
- Demonstrate competence to apply knowledge of mathematics, natural science and engineering sciences to the conceptualization of engineering models and to solve complex mine surveying problems.
- Demonstrate competence to perform creative, procedural and non-procedural design and synthesis of components, systems, mine surveying works, products or processes of a complex nature.
- Demonstrate competence to conduct investigations of complex mine surveying problems including engagement with the research literature and use of research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
- Demonstrate competence to use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modelling, for the solution of complex mine surveying problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints.
- Demonstrate competence to communicate effectively, both orally and in writing, with mine surveying audiences and the community at large.
- Demonstrate knowledge and understanding of the impact of mine surveying activities society, economy, industrial and physical environment.
- Demonstrate knowledge and understanding of mine surveying management principles.
- Demonstrate competence to engage in independent and life-long learning through well-developed learning skills.
- Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of mine surveying practices.

EB8.10.5.3 Admission requirements and selection criteria

A Bachelor's Degree or Advanced Diploma in Mine Surveying, at NQF level 7.

EB8.10.5.4 Conferment of degree

One year full-time.

EB8.10.5.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
Year Modules		Year Modules	
ADQ8X00	Advanced Descriptive Quantification	PLE8X00	Property Law and Economics
CLA8X00	Construction Law & Contract Administration	QMS8X00	Strategic Management
CMP8X00	Construction Project Management	QRP8X00	Research Report: Quantity Surveying
CPP8X00	Professional Practice	SCI8X00	Sustainable Construction and Innovation
ICC8X00	International Construction		

EB10.6

**Bachelor of Urban and Regional Planning
Honours
(SAQA: 108895) (NQF 8)**

H6URBQ**EB10.6.1 Purpose of the qualification**

The purpose of the Bachelor of Urban and Regional Planning Honours is to develop students such that they are capable of providing solutions to the complex and challenging problems being experienced in the ever-growing urban centres of modern day. It is purposed that this qualification facilitates the route towards professional accreditation as a Planner with SACPLAN.

EB10.6.2 Qualification outcomes and assessment criteria

- Evaluate relevant urban planning theory in conjunction with the practical problems associated with the planning, development and management of cities, in the developing world.
- Comprehend and apply concept of planning design and policy issues in urban and regional planning.
- Synthesise fundamental concepts, principles and applications of research methods.
- Apply urban information systems and GIS in planning applications to structuring and restructuring urban and regional settlements.
- Apply strategies, ideas, philosophies, and interpretations to community planning and environmental management.
- Analyse and demonstrate knowledge of land, infrastructure and transport planning skills in urban and regional planning spaces.

EB10.6.3 Admission requirements and selection criteria

A Bachelor's degree or NQF level 7 equivalent in Urban and Regional Planning.

EB10.6.4 Conferment of the degree

One year full-time.

EB10.6.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
Year Modules		Year Modules	
UCE8X00	Community Planning & Environmental Management	ULT8X00	Land, Infrastructure and Transport Planning
UDP8X00	Planning Design and Policy	UPR8X00	Research Methodology and Research Report
UIS8X00	Urban Information Systems	UTP8X00	Urban Planning Theory & Professional Practice

**BACHELOR OF
ENGINEERING TECHNOLOGY HONOURS
PROGRAMMES**

EB10.7	Bachelor of Engineering Technology Honours in Chemical Engineering (SAQA: 111186) (NQF 8)	H6CE0Q
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EB10.7.1 Purpose of the qualification

The Bachelor of Engineering Technology Honours in Chemical Engineering develops students for both industry and research, such that they are able to deepen their expertise in Chemical Engineering and develop research capacity in the methodology and techniques of the discipline.

EB10.7.2 Qualification outcomes

- Demonstrate competence to identify, formulate, analyse and solve complex engineering problems creatively and innovatively.
- Demonstrate competence to apply knowledge of mathematics, natural science and engineering sciences to the conceptualization of engineering models and to solve complex engineering problems.
- Demonstrate competence to perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes of a complex nature.
- Demonstrate competence to conduct investigations of complex engineering problems including engagement with the research literature and use of research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
- Demonstrate competence to use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modelling, for the solution of complex engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints.
- Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.
- Demonstrate knowledge and understanding of the impact of engineering activities society, economy, industrial and physical environment.
- Demonstrate knowledge and understanding of engineering management principles.
- Demonstrate competence to engage in independent and life-long learning through well-developed learning skills.
- Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of engineering practice.

EB10.7.3 Admission requirements and selection criteria.

- Bachelor of Engineering Technology in Chemical Engineering with a minimum average of 60%
- Bachelor of Technology in Chemical Engineering with a minimum average 65%
- Students with a bachelor's degree from a similar programme with a minimum average of 65% are required to do additional Chemical Engineering subjects from the Bachelor of Engineering Technology, as determined by the department board first, before admission is permitted.

EB10.7.4 Conferment of the degree

One year full-time.

EB10.7.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
AEE8X01	Advanced Environmental Engineering	ARE8X02	Advanced Reaction Engineering

BCE8X01	Biochemical Engineering	EMM8X02	Engineering Management
CEM8X80	Advanced Chemistry	ESY8X02	Energy Systems
EMC8X01	Engineering Mathematics and Computing	OHSCEB1	Occupational Health and Safety
RPC8X00	Research Project: Chemical Engineering	RPC8X00	Research Project: Chemical Engineering

EB10.8

**Bachelor of Engineering Technology
Honours in Industrial Engineering
(SAQA: 111233) (NQF 8)**

H6IN0Q

EB10.8.1 Purpose of the qualification

The purpose of the Bachelor of Engineering Technology Honours in Industrial Engineering is to develop students for both industry and research, such that they are able to deepen their expertise in Industrial Engineering and develop their research capacity in the methodology and techniques of the discipline.

EB10.8.2 Qualification outcomes

- Demonstrate competence to identify, formulate, analyse and solve complex engineering problems creatively and innovatively.
- Demonstrate competence to apply knowledge of mathematics, natural science and engineering sciences to the conceptualization of engineering models and to solve complex engineering problems.
- Demonstrate competence to perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes of a complex nature.
- Demonstrate competence to conduct investigations of complex engineering problems including engagement with the research literature and use of research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
- Demonstrate competence to use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modelling, for the solution of complex engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints.
- Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.
- Demonstrate knowledge and understanding of the impact of engineering activities society, economy, industrial and physical environment.
- Demonstrate knowledge and understanding of engineering management principles.
- Demonstrate competence to engage in independent and life-long learning through well-developed learning skills.
- Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of engineering practice.

EB10.8.3 Admission requirements and selection criteria

An NQF level 7 qualification or equivalent in Industrial Engineering or related field.

EB10.8.4 Conferment of the degree

One year full-time.

10.8.5 Curriculum

CODE	MODULE	CODE	MODULE
First semester		Second semester	
EMC8X01	Engineering Mathematics and Computing	EGS8X02	Engineering and Society
PHE8X80	Energy Physics	ENA8X02	Enterprise Architecture 4
RMI8X01	Research Methodology	MPC8X02	Manufacturing Planning and Control Systems 4
SCP8X01	Supply Chain Processes 4	IRP8X00	Research & Design Project: Industrial Engineering
IRP8X00	Research & Design Project: Industrial Engineering		

EB10.9.1 Purpose of the qualification

The Bachelor of Engineering Technology Honours in Electrical Engineering develops students for both industry and research, such that they are able to deepen their expertise in Electrical Engineering and develop research capacity in the methodology and techniques of the discipline.

EB10.9.2 Qualification outcomes

- Demonstrate competence to identify, formulate, analyse and solve complex engineering problems creatively and innovatively.
- Demonstrate competence to apply knowledge of mathematics, natural science and engineering sciences to the conceptualization of engineering models and to solve complex engineering problems.
- Demonstrate competence to perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes of a complex nature.
- Demonstrate competence to conduct investigations of complex engineering problems including engagement with the research literature and use of research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
- Demonstrate competence to use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modelling, for the solution of complex engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints.
- Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.
- Demonstrate knowledge and understanding of the impact of engineering activities society, economy, industrial and physical environment.
- Demonstrate knowledge and understanding of engineering management principles.
- Demonstrate competence to engage in independent and life-long learning through well-developed learning skills.
- Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of engineering practice.

EB10.9.3 Admission requirements and selection criteria.

The minimum admission requirement is a Bachelor of Engineering Technology degree or NQF level 7 equivalent in the field of Electrical Engineering.

EB10.9.4 Conferment of the degree

One year full-time.

EB10.9.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
EMC8X01	Engineering Mathematics and Computing	ARE8X02	Advanced Reaction Engineering
PHE8X01	Energy Physics	EGS8X02	Engineering and Society
ERP8X00	Research Project: Electrical Engineering	ERP8X00	Research Project: Electrical Engineering

EB10.10.1 Purpose of the qualification

The purpose of the Bachelor of Engineering Technology Honours in Mechanical Engineering is to develop students for both industry and research, such that they are able to deepen their expertise in Mechanical Engineering and develop their research capacity in the methodology and techniques of the discipline.

EB10.10.2 Admission requirements and selection criteria

An NQF level 7 or equivalent qualification in Mechanical Engineering.

EB10.10.3 Qualifications Outcome

- Demonstrate competence to identify, formulate, analyse and solve complex engineering problems creatively and innovatively.
- Demonstrate competence to apply knowledge of mathematics, natural science and engineering sciences to the conceptualization of engineering models and to solve complex engineering problems.
- Demonstrate competence to perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes of a complex nature.
- Demonstrate competence to conduct investigations of complex engineering problems including engagement with the research literature and use of research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
- Demonstrate competence to use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modelling, for the solution of complex engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints.
- Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.
- Demonstrate knowledge and understanding of the impact of engineering activities society, economy, industrial and physical environment.
- Demonstrate knowledge and understanding of engineering management principles.
- Demonstrate competence to engage in independent and life-long learning through well-developed learning skills.
- Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of engineering practice.

EB10.10.4 Conferment of the degree

One year full-time.

EB10. 10.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
EMC8X01	Engineering Mathematics and Computing	EGS8X02	Engineering and Society
ETF8X01	Thermofluids	EMM8X02	Engineering Management
PHE8X80	Energy Physics	ESM8X02	Solid Mechanics
RMM8X01	Research Methodology	MRP8X00	Research & Design Project: Mechanical Engineering
MRP8X00	Research & Design Project: Mechanical Engineering		

EB10.11.1 Purpose of the qualification

The purpose of the Master of Engineering in Physical Metallurgy is to develop a graduate with advanced abilities in appropriate analytical and research skills relevant for engineering design and synthesis, in order to solve engineering problems of society at large. One of the main objectives of this programme is to develop an advanced capability to conduct research independently and as such promoting a lifelong learning approach. The programme is also aimed at unveiling environmental issues in engineering, together with recognition of the role of other disciplines in engineering. Engineers working in public as well as private sector, and professionals with an interest in engineering research will find the programme very beneficial.

EB10.11.2 Qualification outcomes

- Identify and analyse problems within the physical metallurgical environment by researching problems creatively and innovatively by applying relevant interdisciplinary knowledge in the chosen field of research.
- 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.
- Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
- 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.
- Demonstrate, where applicable, environmental sensitivity across a range of environmental contexts in the execution of engineering management research/development activities.

EB10.11.3 Admission requirements and selection criteria.

An NQF level 7 qualification or equivalent in the field of Metallurgical Engineering.

EB10.11.4 Conferment of the degree

One year full-time.

EB10.11.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
PRT8X00	Research and Design Project - Metallurgy	PRT8X00	Research and Design Project - Metallurgy
TRM8X01	Research Methodology: Metallurgical	EIM8X02	Environmental Impact of Engineering Activities

EB10.12.1 Purpose of the qualification

The purpose of the Bachelor of Engineering Technology Honours in Mining Engineering is to develop students for both industry and research, such that they are able to deepen their expertise in Mining Engineering and to develop their research capacity in the methodology and techniques of the discipline.

EB10.12.2 Admission requirements and selection criteria.

The minimum admission requirement is an appropriate bachelor's degree.

Or;

Advanced Diploma in Mining Engineering, at NQF level 7.

EB10.12.3 Conferment of the degree

One year full-time.

EB10.12.4 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
EMC8X01	Engineering Mathematics and Computing	EGS8X02	Engineering and Society
PHE8X80	Energy Physics	GEM8X02	Geotechnical Engineering
ERM8X01	Research Methodology	MED8X02	Mine Environmental Design
RDP8X00	Research and Design Project: Mining Engineering	MME8X02	Mineral Economics
		MPD8X02	Mine Planning and Design
		RDP8X00	Research and Design Project: Mining Engineering

EB11.1.1 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.

EB11.1.2 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.

EB11.1.3 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.

EB11.1.4 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%

EB11.2

**MENG: MECHANICAL ENGINEERING
Research-based (SAQA 73989) (NQF 9)**

M6MR3Q**EB11.2.1 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.

EB11.2.2 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.

EB11.2.3 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.

EB11.2.4 Conferment of the degree

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

EB11.2.5 Curriculum

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

RESEARCH TIME: 100%

EB11.3**MENG: CIVIL
ENGINEERING****M6CR4Q****Research-based (SAQA 73986) (NQF 9)****EB11.3.1 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.

EB11.3.2 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.

EB11.3.3 Admission requirements and selection criteria

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

EB11.3.4 Conferment of the degree

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

EB11.3.5 Curriculum

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

RESEARCH TIME: 100%

EB11.4

**MENG: ENGINEERING MANAGEMENT
Lectured (SAQA 73988) (NQF 9)**

M6MC5Q

EB11.4.1 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.

EB11.4.2 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.

EB11.4.3 Admission requirements and selection criteria

An approved four-year bachelor's degree in Engineering.

EB11.4.4 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%.

EB11.4.5 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

EB11.5

MEng: ENGINEERING MANAGEMENT (SAQA 73987) (NQF 9)

M6MR6Q

EB11.5.1 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.

EB11.5.2 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, 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.

EB11.5.3 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.

EB11.5.4 Conferment of the degree

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

EB11.5.5 Curriculum

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

RESEARCH TIME: 100%

EB11.6.1 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.

EB11.6.2 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

EB11.6.3 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

EB11.6.4 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 two electives) and minor dissertation successfully. Weight of dissertation is 50%.

EB11.6.5 Curriculum

CODE	MODULE	CODE	MODULE
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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 (First Semester)

EB11.7 MASTER OF SUSTAINABLE URBAN PLANNING AND DEVELOPMENT (SAQA99782 -) (NQF 9) M6MUPQ

EB11.7.1 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 centres. 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.

EB11.7.2 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.

EB11.7.3 Admission Requirements and selection criteria

Any holder of a Bachelor honours 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 Honours 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 based on academic merit and an approved field(s) of study. An average mark of 65% in the previous degree qualification is generally required.

EB11.7.4 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.

EB11.7.5 Curriculum

CODE	MODULE	CODE	MODULE
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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

EB11.8.1 Purpose of the qualification

The purpose of the Master of Micro- and Nanoelectronics 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.

EB11.8.2 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.

EB11.8.3 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.

EB11.8.4 Curriculum

Module name	NQF level of the module	Compulsory / optional
Analogue and RF Microelectronics	9	Compulsory
Digital and Memory Design	8	Compulsory
Nanoelectronics Specialisation	8	Elective
Cross-Disciplinary Specialisation	8	Elective
Research Related Specialisation*	8	Elective
Engineering Research Proposal Writing	8	Compulsory
Minor Dissertation	9	Compulsory

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: Nanoelectronics 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). Nanoelectronics 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 Nanoelectronics Specialisation and Cross-Disciplinary Specialisation, if such module is deemed appropriate for student's research work.

EB11.9

**MASTER OF SUSTAINABLE MINING
SAQA: 108954**

M6SMMQ

EB11.9.1 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.

EB11.9.2 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.

EB11.9.3 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.

EB11.9.4 Conferment of the degree

Master of Sustainable Mining degree will be conferred on students who have completed the

research seminar and dissertation successfully.

EB11.9.5 Curriculum

First semester		Second semester	
MINR019	Dissertation	MINR029	Dissertation

EB11.10

**MASTER IN INDUSTRIAL ENGINEERING
Research-Based
(NQF 9) (SAQA 111122)**

M6IN0Q

EB11.10 .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.

EB11.10. 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.

EB11.10. 3 Admission requirements and selection criteria

An approved four-year bachelor's degree in Engineering or approved BEng Tech honours degree 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.

EB11.10. 4 Conferment of the degree

The Master of Industrial Engineering will be conferred on students who have completed the research seminar and dissertation successfully.

EB11.10.5 Curriculum

First semester		Second semester	
MINR019	Dissertation	MINR029	Dissertation

RESEARCH TIME: 100%

EB11.11

**Master of Urban and Regional planning (RD)
(SAQA 111190) (NQF 9)**

M6UP0Q

EB11.11.1 Purpose of the qualification

Analyse and research topics on land infrastructure and transport planning and urban and regional planning spaces.

EB11.11.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

1. Evaluate relevant urban planning theory useful in solving planning, development and management practical problems in cities of the developing world.
2. Comprehend and apply concept of planning design and policy issues in urban and regional planning.
3. Synthesize fundamental concepts, principles and applications of research methods, process and requirements and be able to complete a dissertation in urban and regional planning.
4. Understand and research urban information systems and GIS in planning applications to structuring and restructuring urban and regional settlements.
5. Apply thoughts, philosophies, debates and interpretations to community planning and environmental management.

EB11.11.3 Admission requirements and selection criteria.

Any holder of a Bachelor Honours Degree in Urban and Regional Planning or any four-year degree in any related field of study will be eligible for admission to study towards the Honours in Urban and Regional Planning

EB11.11.4 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
MUPR019	Dissertation	MUPR029	Dissertation

RESEARCH TIME: 100%

EB11.12.

**Master of Operation Management (RD)
(SAQA 111178) (NQF 9)**

M6OP0Q

EB11.12.1 Purpose of the qualification

The purpose of qualification is to develop a postgraduate student by offering the student the opportunity to show evidence of independent and exploratory research within the field of Operations Management. 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.

EB11.12.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

1. Analyze operational challenges within the operations management environment by researching problems creatively and innovatively by applying relevant inter-disciplinary knowledge in the chosen field of research.
2. Apply creative solutions to complex operational management problems.
3. Organize and manage him/herself and his/her activities responsibly, effectively and ethically, demonstrating skills required to be productive managerial leaders.
4. Plan and conduct applicable levels of investigation, research and/or experiments

EB11.12.3 Admission requirements and selection criteria.

NQF level 8 qualification in Operations Management, Management Services or Quality.

EB11.12.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
MOPR019	Dissertation	MOPR029	Dissertation

RESEARCH TIME: 100%

**EB11.13 Master of Science in Quantity Surveying (RD) M6QS0Q
(SAQA 111187) (NQF 9)**

EB11.13.1 Purpose of the qualification

The purpose of the qualification is to develop an intellectual with advanced abilities in applying construction economics (quantity surveying) and/design and synthesis, and related inter-disciplinary 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 construction cost engineering research of an exploratory nature. It will also promote lifelong learning approach as well as an aptitude for training other students in similar fields.

EB11.13.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

1. Identify and analyses quantity surveying related problems creatively and innovatively.
2. Organize 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.
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 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.
5. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of quantity surveying research/development activities.

EB11.13.3 Admission requirements and selection criteria.

NQF Level 8

EB11.13.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
MQSR019	Dissertation	MQSR029	Dissertation

RESEARCH TIME: 100%

EB11.14.1 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 mineral resource policy and strategies in Africa and to develop an advanced capability to conduct fundamental research of an inter-disciplinary nature independently. The programme will enable the students to acquire knowledge of the logic behind research and to master the different stages. The purpose of this master's degree in Mineral Resource Governance is to provide a programme to all persons involved within the mining value chain, from exploration to rehabilitation, to develop research and innovative practices to develop mining policies, standards and practices within the African continent that will ensure the sustainable development of Africa's mineral wealth.

This programme will propose to support the UJ strategic objectives including excellence in research and innovation and improving the international profile in global excellence and stature. This Master's degree will focus on independent research activities in industry, preferably in an active mining environment, addressing essential productivity and sustainability activities that will have a direct impact on a mining company and the surrounding community aimed at improving processes that will ensure sustainability within the mining sector in a broader context.

EB11.14.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

- Plan and manage policy development research projects, demonstrating underlying fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (vis-à-vis all local and other communities) policy development in the chosen field of research practice.
- Work effectively independently or with others as a member of a team, group, organisation, and community or in multidisciplinary environments in the chosen field of research.
- 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 exercise judgment commensurate with knowledge and expertise pertaining to the field of research.
- Plan and conduct applicable levels of investigation, research and /or experiments by applying appropriate theories and methodologies and perform data analysis, interpretation and discussion.
- Communicate effectively, both orally and in writing, with policy development professionals and particularly with research audiences and communities at large, in so far as they are affected by the research, by using appropriate structure, style and graphical support.
- Use and assess appropriate policy development and research methods, skills, tools, technology, and information technology effectively and critically in policy development practice, to show an understanding of and a willingness to accept responsibility for the impact that mineral resource governance and practice has on society and the environment.
- 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.

EB11.14.3 Admission requirements and selection criteria.

The minimum admission requirement is a relevant Bachelor Honours Degree or a relevant Postgraduate Diploma at NQF level 8. A relevant bachelor's degree with relevant work experience in policy development and policy research (equivalent to Honours level) may also be recognised as meeting the minimum entry requirement to the proposed master's degree programme.

EB11.14.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
MMRR019	Dissertation	MMRR029	Dissertation

RESEARCH TIME: 100%

EB9.15.1 Purpose of the qualification

The purpose of the Master of Engineering in Physical Metallurgy is to develop a graduate with advanced abilities in appropriate analytical and research skills relevant for engineering design and synthesis, in order to solve engineering problems of society at large. One of the main objectives of this programme is to develop an advanced capability to conduct research independently and as such promoting a lifelong learning approach. The programme is also aimed at unveiling environmental issues in engineering, together with recognition of the role of other disciplines in engineering. Engineers working in public as well as private sector, and professionals with an interest in engineering research will find the programme very beneficial.

EB11.15.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

1. Identify and analyse problems within the physical metallurgical environment by researching problems creatively and innovatively by applying relevant inter-disciplinary knowledge in the chosen field of research.
2. 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.
3. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
4. 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.
5. Demonstrate, where applicable, environmental sensitivity across a range of environmental contexts in the execution of engineering management research/development activities

EB11.15.3 Admission requirements and selection criteria.

Honours or an NQF level 8 qualification in Engineering, Mechanical Engineering or Metallurgy

EB11.15.4 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
MEMR019	Dissertation	MEMR029	Dissertation

RESEARCH TIME: 100%

EB11.16.1 Purpose of the qualification

The Master of Chemical Engineering is aimed at developing students for both industry and research, such that they deepen their expertise in Chemical Engineering and develop research capacity in high level methods and techniques of the discipline.

EB11.16.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

1. Identify and accurately analyses problems within the Chemical Engineering environment by researching problems creatively and innovatively.
2. Organize 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.
3. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies, and perform appropriate data

EB11.16.3 Admission requirements and selection criteria.

Bachelor of Engineering Technology Honours in Chemical Engineering or a similar Bachelor of Engineering at NQF 8.

EB11.16.5 Curriculum

CODE	MODULE	CODE	MODULE
First year			
First semester		Second semester	
MCER019	Dissertation	MCER029	Dissertation

RESEARCH TIME: 100%

EB11.17 Master in Sustainable Energy (CW) Lectured (SAQA 102064) (NQF 9)

M6SE0Q

EB11.17.1 Purpose of the qualification

The purpose of the programme is to develop professionals who are capable of conceptualising, planning, and managing sustainable energy projects in the context of developing economies. The programme adopts a multi-disciplinary approach by incorporating content that involves Sustainable Energy Technologies, Energy Efficiency and Green Buildings, Sustainable Energy Governance, and the economics in the sustainable energy sector.

EB11.17.2 Qualification outcomes

- Analyse and develop sustainable energy projects, creatively and innovatively by applying relevant fundamental and applied knowledge.
- Plan and manage sustainable energy research projects demonstrating underlying fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (vis-à-vis all local and other communities) research/development in the chosen field of research practice.
- Work effectively independently or with others as a member of a team, group, organization, and community or in multidisciplinary environments in the chosen field of research within the scope of sustainable energy.
- Communicate effectively, both orally and in writing, with relevant professionals and particularly with research audiences and communities at large in so far as they are affected by the research, using appropriate structure, style and graphical support.
- Employ various learning strategies and skills to master the outcomes required in preparing him/herself to engage in continuous learning to keep abreast of knowledge and skills in sustainable planning, development and management of sustainable energy.
Demonstrate cultural and aesthetic sensitivity with regards to the socio-economic impact of the execution of sustainable research activities, where applicable

EB11.17.3 Based on technical nature of the Programme it would not be advisable for students with a Social Sciences background to enrol in the Programme. Such students would be at-risk with a potential negative impact on the Programme throughput. Thus, the admission requirement needs to be revised to:

A Bachelor's (Honours) degree in Engineering or Sciences, or NQF level 8 equivalent.

EB11.17.5 Curriculum

CODE	MODULE	CODE	MODULE
First semester		Second semester	
SYE9X01	SYSTEMS ENGINEERING	M6MPD29	PRODUCT DEVELOPMENT AND MARKETING
M6MES19	ENGINEERING SYSTEMS MANAGEMENT	M6MRM29	RELIABILITY MANAGEMENT
EMC9X01	ENGINEERING MATHEMATICS AND COMPUTING	CSE9X02	CYBER SYSTEMS
Year Module			
EMR9X00	MINOR DISSERTATION: ENGINEERING		

EB11.18

**Masters in Sustainable
Mining (CW)
(SAQA 108954) (NQF 9)**

M6SMMQ**EB11.18.1 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 in Sustainable Mining master's degree is to provide a 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.

EB11.18.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

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.

EB11.18.3 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 RPL will be applied.

EB11.18.5 Curriculum

CODE	MODULE	CODE	MODULE
First semester		Second semester	
1	DISSERTATION: SUSTAINABLE MINING (Research : 1)	2	DISSERTATION: SUSTAINABLE MINING (Research : 1)
1	DISSERTATION: SUSTAINABLE MINING (Research : 1)	2	DISSERTATION: SUSTAINABLE MINING (Research : 1)

RESEARCH TIME: 100%

EB11.19

**Masters in Sustainable
Urban Planning and Development
(SAQA99782) (NQF 9)**

M6MUPQ

EB11.19.1 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.

EB11.19.2 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.

EB11.19.3 Curriculum

First semester (All Core/ Compulsory)		Second semester (Choose 3 of 6 electives)	
AUPT019	Advanced Urban Planning Theory (Compulsory)	IHSD029	Integrated Human Settlements Development (Elective)
PSUD019	Principles of Sustainable Urban Development (Compulsory)	UED9X02	Urban Entrepreneurial Dynamics (Elective)
SUSC019	Sustainable Urban Infrastructure and Smart Cities Development (Compulsory)	UEPG029	Urban Environmental Planning and GIS Applications (Elective)
		UFE9X02	Urban Financial and Economic Management (Elective)
		MUP9X02	Urban Policy and Design (Elective)
		USD9X01	Urban Sociology and Social Development (Elective)
MSUP019	Minor Dissertation (Compulsory)	MSUP029	Minor Dissertation (Compulsory)

EB11.20

Masters in Sustainable Urban Planning and Development (Sustainable and Smart Cities and Regions) (SAQA99782) (NQF 9)

M6MU1Q

EB11.20.1 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.

EB11.20.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

14. 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.
15. 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.
16. 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.
17. 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.
18. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
19. 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.
20. 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.
21. 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.
 22. 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.
 23. Participate as a responsible citizen in the life of local, national and global communities by acting ethically in the chosen field of research.
 24. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
 25. Explore, where applicable, education and career opportunities in research/development.
 26. Organise and develop entrepreneurial opportunities through technical research, development and/or managerial skills.

EB11.20.3 Curriculum

First semester (All Core/ Compulsory)		Second semester (Choose 3 of 6 electives)	
AUPT019	Advanced Urban Planning Theory (Compulsory)	IHSD029	Integrated Human Settlements Development (Elective)
PSUD019	Principles of Sustainable Urban Development (Compulsory)	UED9X02	Urban Entrepreneurial Dynamics (Elective)
SUSC019	Sustainable Urban Infrastructure and Smart Cities Development (Compulsory)	UEPG029	Urban Environmental Planning and GIS Applications (Elective)
		UFE9X02	Urban Financial and Economic Management (Elective)
		MUP9X02	Urban Policy and Design (Elective)
		USD9X01	Urban Sociology and Social Development (Elective)
MSUP019	Minor Dissertation (Compulsory)	MSUP029	Minor Dissertation (Compulsory)

EB11.21

Masters in Systems Engineering

M6SY0Q

(SAQA 73988(NQF 9))

EB11.21.1 Purpose of the qualification

The purpose of the programme is to develop an engineer with advanced abilities in applying fundamental engineering sciences and/design and synthesis and related principles to specific engineering 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 engineering research independently. It also promotes a lifelong learning approach.

EB11.21.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

1. Identify, assess, formulate, interpret, analyses and solve Systems Engineering problems creatively and innovatively by applying relevant fundamental knowledge of i.e., mathematics, science, and engineering sciences.
2. Plan and manage Systems Engineering research demonstrating an 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. Organize and manage him/herself and his/her activities responsibly, effectively, professionally

EB11.21.3 Admission requirements and selection criteria.

Bachelor Honours degree or NQF level 8 equivalent from programmes within engineering or Bachelor of Technology that is supported by considerable research experience and postgraduate learning or work experience at NQF level 8, may be admitted to study towards the degree qualification. Students are selected based on 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 engineering modules at undergraduate level to ease their transition to the field of Systems Engineering.

EB11.21.5 Curriculum

CODE	MODULE	CODE	MODULE
First semester		Second semester	
SYE9X01	SYSTEMS ENGINEERING	M6MPD29	PRODUCT DEVELOPMENT AND MARKETING
M6MES19	ENGINEERING SYSTEMS MANAGEMENT	M6MRM29	RELIABILITY MANAGEMENT
EMC9X01	ENGINEERING MATHEMATICS AND COMPUTING	CSE9X02	CYBER SYSTEMS
Year Module			
EMR9X00	MINOR DISSERTATION: ENGINEERING		

EB11.22

**Masters in Sustainable Energy Engineering
(SAQA102064) (NQF 9)**

M6SE0Q

EB9.4.1 Purpose of the qualification

The purpose of the programme is to develop professionals who are capable of conceptualizing, planning, and managing sustainable energy projects in the context of developing economies. The programme adopts a multi-disciplinary approach by incorporating content that involves Sustainable Energy Technologies, Energy Efficiency and Green Buildings, Sustainable Energy Governance, and the economics in the sustainable energy sector.

EB9.4.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

1. Analyze and develop sustainable energy projects, creatively and innovatively by applying relevant fundamental and applied knowledge.
2. Plan and manage sustainable energy research projects demonstrating underlying fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (vis-à-vis all local and other communities) research/development in the chosen field of research practice.
3. Work effectively independently or with others as a member of a team, group, organization, and community or in multidisciplinary environments in the chosen field of research within the scope of sustainable energy.
4. Communicate effectively, both orally and in writing, with relevant professionals and particularly with research audiences and communities at large in so far as they are affected by the research, using appropriate structure, style, and graphical support.
5. Employ various learning strategies and skills to master the outcomes required in preparing him/herself to engage in continuous learning to keep abreast of knowledge and skills in sustainable planning, development, and management of sustainable energy.
6. Demonstrate cultural and aesthetic sensitivity with regards to the socio-economic impact of the execution of sustainable research activities, where applicable.

EB9.4.3 Admission requirements and selection criteria.

A Bachelor's (Honours) degree in Engineering, Sciences, or the Social Sciences, or NQF level 8 equivalent. Students are selected based on academic merit and an approved field(s) of study. An average mark of 65% in a previous qualification is generally required.

EB9.4.5 Curriculum

CODE	MODULE	CODE	MODULE
Compulsory Modules			
M6SET19	SUSTAINABLE ENERGY TECHNOLOGIES		
M6MGB19	ENERGY EFFICIENCY AND GREEN BUILDINGS		
M6MED19	ENERGY AND DEVELOPMENT		
Choose 1 combination of the 2 combinations of Electives			
Option 1		Option 2	
EAD8X01	ENERGY AND DEVELOPMENT	ENS8X03	ENERGY ECONOMICS
ENS8X01	ENERGY POLICY FORMULATION	ENS8X02	INTERNATIONAL, GEOG & POL ASPECTS OF ENERGY
Year 2 (Compulsory)			
Semester 1		Semester 2	
M6SED19	MINOR DISSERTATION: SUSTAINABLE ENERGY (Research: 0.5)	M6SED29	MINOR DISSERTATION: SUSTAINABLE ENERGY (Research: 0.5)

EB12

**MAGISTER PHILOSOPHIAE
ENGINEERING SCIENCE PROGRAMMES**

EB12.1	MPhil: ELECTRICAL AND ELECTRONIC ENGINEERING Research-based (SAQA 74008) (NQF 9)	M6ER7Q
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EB12.1.1 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.

EB12.1.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

- 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.
- 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.
- 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.
- 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.
- Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
- 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.
- 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.

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

EB12.1.3 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.

EB12.1.4 Conferment of the degree

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

EB12.1.5 Curriculum

CODE	MODULE	CODE	MODULE
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First year

First semester		Second semester	
M6E0109	Dissertation	M6E0209	Dissertation

RESEARCH TIME: 100%

EB12.2

MPHIL: MECHANICAL ENGINEERING Research-based (SAQA 74015) (NQF 9)

M6MR8Q

EB12.2.1 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.

EB12.2.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

27. 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.
28. 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.
29. 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.
30. 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.
31. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
 32. 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.
 33. 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.
 34. 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.
 35. 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.
 36. Participate as a responsible citizen in the life of local, national and global communities by acting ethically in the chosen field of research.
 37. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
 38. Explore, where applicable, education and career opportunities in research/development.
 39. Organise and develop entrepreneurial opportunities through technical research, development and/or managerial skills.

EB12.2.3 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.

EB12.2.4 Conferment of the degree

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

EB12.2.5 Curriculum

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

RESEARCH TIME: 100%

EB12.3

MPhil: CIVIL ENGINEERING Research-based (SAQA 74006) (NQF 9)

M6CR9Q

EB12.3.1 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.

EB12.3.2 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.

EB12.3.3 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.

EB12.3.4 Conferment of the degree

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

EB12.3.5 Curriculum

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

RESEARCH TIME: 100%

EB12.4

MPhil: ENGINEERING MANAGEMENT Lectured (SAQA 74010) (NQF 9)

M6MC0Q

EB12.4.1 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.

EB12.4.2 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.

EB12.4.3 Admission requirements and selection criteria

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

EB12.4.4 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%.

EB12.4.5 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

EB12.5

**MPhil: ENGINEERING MANAGEMENT
Research-based (SAQA 74010) (NQF 9)**

M6MR2Q

EB12.5.1 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.

EB12.5.2 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.

EB12.5.3 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.

EB12.5.4 Conferment of the degree

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

EB12.5.5 Curriculum

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

RESEARCH TIME: 100%

**EB13 DOCTOR PHILOSOPHIAE
ENGINEERING PROGRAMMES**

EB13.1	PHD: ELECTRICAL AND ELECTRONIC (NQF 10)	P6E01Q
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EB13.1.1 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.

EB13.1.2 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.

EB13.1.3 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

EB13.1.4 Conferment of the degree

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

EB13.1.5 Curriculum

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

EB13.2

**PhD: MECHANICAL
ENGINEERING
(NQF 10)**

P6M02Q

EB13.2.1 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.

EB13.2.2 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.

EB13.2.3 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.

EB13.2.4 Conferment of the degree

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

EB13.2.5 Curriculum

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

EB13.3

**PhD: CIVIL
ENGINEERING
(NQF 10)**

P6C03Q

EB13.3.1 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.

EB13.3.2 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.

EB13.3.4 Conferment of the degree

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

EB13.3.5 Curriculum

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

EB13.4

PhD: ENGINEERING MANAGEMENT (NQF 10)

P6EM4Q

EB13.4.1 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.

EB13.4.2 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.

EB13.4.3 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.

EB13.4.4 Conferment of the degree

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

EB13.4.5 Curriculum

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

EB13.5.1 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.

EB13.5.2 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.

EB13.5.3 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.

EB13.5.4 Conferment of the degree

The PhD: Chemical Engineering will be conferred on students who have completed the research

seminar and thesis successfully.

EB13.5.5 Curriculum

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

EB13.6

PhD: METALLURGICAL ENGINEERING (NQF 10)

P6METQ

EB13.6.1 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.

EB13.6.2 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.

EB13.6.3 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.

EB13.6.4 Conferment of the degree

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

EB13.6.5 Curriculum

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

EB13.7

PhD: OPERATIONS MANAGEMENT (NQF 10)

P6OPMQ

EB13.7.1 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.

EB13.7.2 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.

EB13.7.3 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.

EB13.7.4 Conferment of the degree

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

EB13.7.5 Curriculum

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

EB13.8

PhD: QUANTITY SURVEYING (NQF 10)

P6QSUQ

EB13.8.1 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.

EB13.8.2 Qualification Outcomes

Exit Level Outcomes:

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

1. Analyse 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.

EB13.8.3 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.

EB13.8.4 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.

EB13.8.5 Conferment of the degree

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

EB13.8.6 Curriculum

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

EB13.9

PhD: CONSTRUCTION MANAGEMENT (NQF 10)

P6CONQ

EB13.9.1 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.

EB13.9.2 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.

EB13.9.3 Admission requirements

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

EB13.9.4 Selection Criteria

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

EB13.9.5 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.

EB13.9.6 Curriculum

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

EB13.10 PhD: INDUSTRIAL ENGINEERING Research Based (NQF 10)

P6INDQ

EB13.10.1 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.

EB13.10.2 Qualification 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.

EB13.10.3 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.

EB13.10.4 Conferment of the degree

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

CODE	MODULE
P6INDQ	Thesis: Industrial semester 1
P6INDQ	Thesis: Industrial semester 2

RESEARCH TIME: 100%

EB13.11 PhD: ENGINEERING EDUCATION (NQF 10)

P6EE0Q

EB13.11.1 Purpose of the qualification

The purpose of the qualification is to develop an engineering educator with advanced abilities in designing and applying appropriate research methodologies to engineering education related problems. One of the main objectives in this process is to develop an advanced capability to conduct engineering education research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields.

EB13.11.2 Qualification outcomes

The qualified student will be able to:

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

1. Analyse and solve engineering education research/development problems of an original nature creatively and innovatively by applying relevant methodologies and methods to the chosen topic of research.
2. Plan and manage research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute academically responsible engineering education research practices.
3. 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.
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 engineering education research methods, skills, tools and information technology effectively and critically in engineering education research/development practice and show an understanding and a willingness to accept responsibility for the impact of research/development activities on society.
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. 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 education research/development field.
8. 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.
9. Demonstrate ethical and cultural sensitivity and awareness across a range of engineering education contexts in the execution of engineering education research/development activities.

EB13.11.3 Admission requirements and selection criteria

An approved master's degree in engineering or engineering education-related discipline.

EB13.11.4 Conferment of the degree

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

CODE	MODULE
P6UE010	Thesis: Engineering Education 1
P6UE020	Thesis: Engineering Education 2

RESEARCH TIME: 100%

EB13.12

**PhD: QUALITY ENGINEERING
(NQF 10) SAQA: 96969**

P6QE1Q

EB13.12.1 Purpose of the qualification

The purpose of the qualification is to develop an engineering educator with advanced abilities in designing and applying appropriate research methodologies to engineering education related problems. One of the main objectives in this process is to develop an advanced capability to conduct engineering education research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields.

EB13.12.2 Qualification outcomes

The qualified student will be able to:

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

10. Analyse and solve engineering education research/development problems of an original nature creatively and innovatively by applying relevant methodologies and methods to the chosen topic of research.
11. Plan and manage research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute academically responsible engineering education research practices.
12. 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.
13. 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.
14. Apply and assess appropriate advanced engineering education research methods, skills, tools and information technology effectively and critically in engineering education research/development practice and show an understanding and a willingness to accept responsibility for the impact of research/development activities on society.

15. 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.
16. 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 education research/development field.
17. 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.
18. Demonstrate ethical and cultural sensitivity and awareness across a range of engineering education contexts in the execution of engineering education research/development activities.

EB13.12.3 Admission requirements and selection criteria

An approved master's degree in Quality / Operations

CODE	MODULE
P6OM110	THESIS: OPERATIONS MANAGEMENT (RESEARCH: 2)
P6OM110	THESIS: OPERATIONS MANAGEMENT (RESEARCH: 2)

RESEARCH TIME: 100%

EB13.13

**PhD: URBAN AND REGIONAL
PLANNING
(NQF 10) SAQA: 96969**

P6UP0Q

EB13.13.1 Purpose of the qualification

The purpose of the qualification is to develop an engineering educator with advanced abilities in designing and applying appropriate research methodologies to engineering education related problems. One of the main objectives in this process is to develop an advanced capability to conduct engineering education research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields.

EB13.13.2 Qualification outcomes

The qualified student will be able to:

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

1. Analyse and solve engineering education research/development problems of an original nature creatively and innovatively by applying relevant methodologies and methods to the chosen topic of research.
2. Plan and manage research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute academically responsible engineering education research practices.
3. 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.
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 engineering education research methods, skills, tools and information technology effectively and critically in engineering education research/development practice and show an understanding and a willingness to accept responsibility for the impact of research/development activities on society.
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. 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 education research/development field.
8. 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.
9. Demonstrate ethical and cultural sensitivity and awareness across a range of engineering education contexts in the execution of engineering education research/development activities.

EB13.13.3 Admission requirements and selection criteria

CODE	MODULE
P6URP10	THESIS: URBAN AND REGIONAL PLANNING (RESEARCH: 2)
P6URP10	THESIS: URBAN AND REGIONAL PLANNING (RESEARCH: 2)

RESEARCH TIME: 100%

EB13.14

**PhD: Data Science
(NQF 10)**

P6DS1Q

EB12.2.1 Purpose of the qualification

The purpose of the qualification is to develop an engineer with advanced abilities in applying fundamental data science and analysis technologies/techniques 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 data science related 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 data science related research/development problems as well as societal problems of an original nature creatively and innovatively by applying relevant advanced fundamental knowledge of Scipy, Numpy, Artificial Intelligence, Machine Learning, Pandas and relevant techniques in the chosen field of research.
2. Plan and manage advanced research projects, demonstrating fundamental knowledge, portraying understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) data science 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 based on data science technologies and techniques 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 data science research/development practice and show a responsibility for the impact of data science research/development activities on society and the environment.
8. Perform procedural and non-procedural design and synthesis of component 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 data science 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 data science research/development activities.
12. Explore, where applicable, education and career opportunities in advanced data science research/development.
13. Organise and develop, where applicable, entrepreneurial opportunities through data science, 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: Data Science will be conferred on students who have completed the research seminar and thesis successfully.

EB12.2.5 Curriculum

CODE	MODULE
P6DS110	THESIS: DATA SCIENCE
P6DS210	THESIS: DATA SCIENCE

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	<p>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:</p> <ul style="list-style-type: none"> • 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 lifecycle from development through operation to phase-out and disposal.
Content	Reliability, definitions, evaluation, statistical methods, catastrophically failure models, reliability functions, distribution functions and applications, reliability and maintenance, preventative maintenance, reliability and systems (series, 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.
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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, isoperimetric, 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.
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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.