UNIVERSITY OF JOHANNESBURG

Faculty of Engineering and the Built Environment

POSTGRADUATE

2025

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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Academic Departments

SCHOOL OF CIVIL ENGINEERING AND THE BUILT ENVIRONMENT

Civil Engineering Science – Auckland Park Campus
Head of Department: Dr Sophia Rwanga
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Civil Engineering Technology – Doornfontein Campus
Head of Department (Acting): Dr German Nkhonjera
Departmental Secretary: Ms Kedibone Maganadisa
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Construction Management and Quantity Surveying – Doornfontein Campus
Head of Department: Prof Lerato Aghimien
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Telephone: 011 559 6056

Urban and Regional Planning – Doornfontein Campus
Head of Department: Prof Thulisile Mphambukeli
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SCHOOL OF ELECTRICAL ENGINEERING

Department of Electrical and Electronic Engineering Science – Auckland Park Campus
Head of Department: Prof Sune Von Solms
Departmental Secretary: Ms Mudzunga Roana
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Department of Electrical Engineering Technology – Doornfontein Campus
Head of Department: Prof Kingsley Ogudo
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Department of Mechanical Engineering Science – Auckland Park Campus
Head of Department: Prof Nkosinathi Madushele
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Head of Department: Dr Mfundo Nkosi
Departmental Secretary: Ms Lindelwa Bolilitye
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Department of Quality and Operations Management – Doornfontein Campus
Head of Department Dr Nelson Madonsela
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SCHOOL OF MINES, METALLURGY AND CHEMICAL ENGINEERING

Department of Chemical Engineering Technology – Doornfontein Campus

Head of Department: Dr Major Mabuza
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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, and 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 (MSc, MEng, MPhil, PhD) are offered on the Auckland Park Campus (APK) and Doornfontein Campus (DFC), the Engineering Management programmes are offered on the Auckland Park Bunting Road Campus (APB). The pipeline Tech qualifications (Advanced Diploma, Postgraduate Diploma and Honours) 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 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 or research focus form**. PhD applicants need to include their CVs for the application as well.

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 Masters 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.
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 the 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 Masters Degrees (Coursework)

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 have 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 a 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:

a) Duration:

(i) Students must complete an undergraduate programme in the minimum period of study specified for the programme, unless the Executive Dean has approved a longer period of study for legitimate reasons.

(ii) Students must complete 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 Marks:

(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.

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

(vii) 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.

(viii) Students for an honours qualification, advanced diploma or postgraduate diploma must have been registered for the full curriculum as prescribed for each academic year on a full-time or part-time basis, as the case may be. If students are transferred from another Higher Education Institution

(ix) In the same qualification to UJ, the same requirements as stated shall apply 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.

(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 ear 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) Renewal of registration takes place during the first semester of the academic year.

(c) Failure to submit the research proposal within the specified time frame may result in cancellation of registration.

(d) 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

"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.

EB 9 EXAMINATION

a) Two months from submitting your final work your supervisor needs to nominate assessors to the School Higher Degrees Committee for recommendation and submit your final title for approval. The SHDC submits the recommendation to the Faculty Higher Degrees Committee for approval.
b) Postgraduate students must be **fully registered** with the University of Johannesburg to submit the dissertation/Thesis for final exam and throughout the examination process.
c) If there is request for reassessment from the assessors, the student will receive the feedback from their supervisor and work on corrections. Students need to re-submit to the assessors within 3 weeks.
d) The **final date of submission** for final exams are the **31st of October.** Submission after this date may lead to full registration in the following academic year.
e) Final examinations need to be submitted directly to the faculty examination officer with the supervisor included. (The faculty has a specific format on how to submit. The format can be obtained from the supervisor or the faculty examination officer)
f) Once feedback has been received from all assessors the feedback is communicated to the supervisor.
g) The supervisor combines a *Result Pack* the FHDC. Masters results are approved at FHDC. PhD results are recommended for approval by the FHDC to UJ Senate.
h) In order to receive a completion letter the student must submit the final electronic copy of their work with completed and signed library publishing form to the postgraduate examination officer.

Postgraduate Examination Officer

Mr Tshepo Sathekge
tsathekge@uj.ac.za

EB 10 FEBE FACULTY HIGHER DEGREES COMMITTEE

The Faculty Higher Degrees Committee is a Faculty Committee dealing with higher degree and postgraduate matters and is a subcommittee of the Faculty Board. The FEBE FHDC shall exercise Faculty Postgraduate responsibilities as per UJ Higher Degrees and Postgraduate Studies Policy stipulations.

EB11	POSTGRADUATE DIPLOMA PROGRAMMES

EB11.1	Postgraduate Diploma: Quality (SAQA: 111191) (NQF 8)	E6Q20Q

EB11.1.1 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 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 the application of an integrated system. Students will undertake 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.

EB11.1.2 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 to assist small, medium and large-scale industries to establish sound quality techniques.

EB11.1.3 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 based on academic merit and an approved field(s) of study. An average mark of 65% in the previous degree qualification is required.

EB11.1.4 Conferment of the degree
One year full-time.

EB11.1.5 Curriculum

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

EB11.2	Postgraduate Diploma: Operations Management (SAQA: 110834) (NQF 8)	E6OM0Q

EB11.2.1 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.

EB11.2.2 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.

EB11.2.3 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 65 % in the previous degree qualification is required.

EB11.2.4 Conferment of the degree

One year full-time.

EB11.2.5 Curriculum

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

OMP8X00	Operations Management Project	**OMP8X00**	Operations Management Project

EB11.3	**Postgraduate Diploma: Management Services (SAQA: 115555) (NQF 8)**	**E6MS0Q**

EB11.3.1 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.

EB11.3.2 Qualification outcomes

i. Evaluate the source of organisational management service problems at their earliest stage.
ii. Design advanced project management plans to enhance Management Services projects and deploy project leadership skills.
iii. Compare research strategies to produce and collate data, perform rigorous interpretations and disseminate quality information.
iv. 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.
v. 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.

EB11.3.3 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 65 % in the previous degree qualification is required.

EB11.3.4 Conferment of the degree
One year full-time.

EB11.3.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
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

EB12	BACHELOR OF SCIENCE HONOURS PROGRAMMES

EB12.1	Bachelor of Science Honours in Construction Management (SAQA: 112121) (NQF 8)	H6CM0Q

EB12.1.1 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.

EB12.1.2 Qualification outcomes and assessment criteria

- **i.** Demonstrate knowledge of advanced construction methods and techniques.
- **ii.** 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.
- **iii.** Confirm the supervisor's role and client's requirements.
- **iv.** Confirm an understanding of contracts in construction.
- **v.** Define project requirements and objectives with the supervisor.
- **vi.** Ascertain the capability of available resources with the supervisor and other team members.
- **vii.** Communicate detailed instructions to supervisors and other team members.
- **viii.** Undertake simple research projects in the construction industry.
- **ix.** The qualifying learning is expected to apply construction principles in all construction work.
- **x.** The qualifying learner is expected to apply project management principles in all construction work.
- **xi.** The qualifying learner must demonstrate professional decorum and conduct in project by understanding different roles, when working with supervisors.
- **xii.** The qualifying learner must demonstrate the ability to solve problems using knowledge available in legal studies.
- **xiii.** The qualifying learner must demonstrate professional decorum and conduct in project by understanding different roles, when working with supervisors.
- **xiv.** The qualifying learner must demonstrate the capability to manage resources and must demonstrate professional decorum and conduct when working with supervisors and team members.
- **xv.** The qualifying learner is expected to communicate ideas, theories, and concepts to all professionals involved in construction activities.
- **xvi.** 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.

EB12.1.3 Admission requirements and selection criteria

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

EB12.1.4 Conferment of the degree

One year full-time.

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
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		

EB12.1.5 Curriculum

EB12.2	Bachelor of Science Honours in Construction Project Management (SAQA: 110061) (NQF 8)	H6CP0Q

EB12.2.1 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.

EB12.2.2 Qualification outcomes and assessment criteria

i. Demonstrate knowledge of advanced construction methods and techniques.
ii. 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.
iii. Confirm the supervisor's role and client's requirements.
iv. Confirm an understanding of contracts in construction.
v. Define project requirements and objectives with the supervisor.
vi. Ascertain the capability of available resources with the supervisor and other team members.
vii. Communicate detailed instructions to supervisors and other team members.
viii. Undertake simple research projects in the construction industry.

EB12.2.3 Admission requirements and selection criteria
The minimum entry requirement is a BSc (Construction) or NQF level 7 equivalent.

EB12.2.4 Conferment of the degree
One year full-time.

EB12.2.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
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

EB12.3	Bachelor of Science Honours in Construction Health and Safety Management (SAQA: 110061) (NQF 8)	H6HS0Q

EB12.3.1 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.

EB12.3.2 Qualification outcomes and assessment criteria

i. Demonstrate knowledge of advanced construction methods and techniques.
ii. 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.

iii. Confirm the supervisor's role and client's requirements.
iv. Confirm an understanding of contracts in construction.
v. Define project requirements and objectives with the supervisor.
vi. Ascertain the capability of available resources with the supervisor and other team members.
vii. Communicate detailed instructions to supervisors and other team members.
viii. Undertake simple research projects in the construction industry.

EB12.3.3 Admission requirements and selection criteria
The minimum entry requirement is a BSc (Construction) or NQF level 7 equivalent.

EB12.3.4 Conferment of the degree
One year full-time.

EB12.3.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
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		

EB12.4	**Bachelor of Science Honours in Quantity Surveying (SAQA: 110061) (NQF 8)**	**H6QS0Q**

EB12.4.1 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.

EB12.4.2 Qualification outcomes and assessment criteria.
i. Analyse and solve problems related to the built environment.
ii. Deal with commercial, entrepreneurial and management issues.
iii. Communication effectively on all matters to which their skills and competencies have been applied.
iv. Use and apply information technology.
v. Interpret and apply legal principles within the context of the built environment.
vi. Execute tasks requiring numerical and quantification expertise.
i. Conduct research within the context of the built environment, including consideration for inter disciplinary aspects.
vii. Apply knowledge of technology within the context of the built environment.

EB12.4.3 Admission requirements and selection criteria
The minimum entry requirement is a BSc (Construction) or NQF level 7 equivalent.

EB12.4.4 Conferment of degree
One year full-time.

EB12.4.5 Curriculum

First year

CODE	MODULE	CODE	MODULE
First Semester		**Second Semester**	
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		

***Compulsory module:** Final mark weighting = Semester mark (50%) + Exam mark (50%)

EB12.5	Bachelor of Mine Surveying Honours (SAQA: 110056) (NQF 8))	H6MS0Q

EB12.5.1 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).

EB12.5.2 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.

- **i.** Demonstrate competence to identify, formulate, analyse and solve complex mine surveying problems creatively and innovatively.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** 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.
- **vi.** Demonstrate competence to communicate effectively, both orally and in writing, with mine surveying audiences and the community at large.
- **vii.** Demonstrate knowledge and understanding of the impact of mine surveying activities society, economy, industrial and physical environment.
- **viii.** Demonstrate knowledge and understanding of mine surveying management principles.
- **ix.** Demonstrate competence to engage in independent and life-long learning through well-developed learning skills.
- **x.** Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of mine surveying practices.

EB12.5.3 Admission requirements and selection criteria
A Bachelor's Degree or Advanced Diploma in Mine Surveying, at NQF level 7.

EB12.5.4 Conferment of degree
One year full-time.

EB12.5.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**

First Semester		Second Semester	
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		

***Compulsory module:** Final mark weighting = Semester mark (50%) + Exam mark (50%)

EB12.6	Bachelor of Engineering Technology Honours in Chemical Engineering (SAQA: 111186) (NQF 8)	H6CE0Q

EB12.6.1 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.

EB12.6.2 Qualification outcomes

- **i.** Demonstrate competence to identify, formulate, analyse and solve complex engineering problems creatively and innovatively.
- **ii.** Demonstrate competence to apply knowledge of mathematics, natural science and engineering sciences to the conceptualization of engineering models and to solve complex engineering problems.
- **iii.** Demonstrate competence to perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes of a complex nature.
- **iv.** 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.
- **v.** 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.
- **vi.** Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.
- **vii.** Demonstrate knowledge and understanding of the impact of engineering activities society, economy, industrial and physical environment.
- **viii.** Demonstrate knowledge and understanding of engineering management principles.
- **ix.** Demonstrate competence to engage in independent and life-long learning through well-developed learning skills.
- **x.** Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of engineering practice.

EB12.6.3 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.

EB12.6.4 Conferment of the degree
One year full-time.

EB12.6.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
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

EB12.7	**Bachelor of Urban and Regional Planning Honours (SAQA: 108895) (NQF 8)**	**H6URBQ**

EB12.7.1 Purpose of the qualification
The purpose of the Bachelor of Urban and Regional Planning Honours is to develop students such that they can provide 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.

EB12.7.2 Qualification outcomes and assessment criteria

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

EB12.7.3 Admission requirements and selection criteria
A Bachelor's degree or NQF level 7 equivalent in Urban and Regional Planning.

EB12.7.4 Conferment of the degree
One year full-time.

EB12.7.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
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

EB12.8	**Bachelor of Engineering Technology Honours in Civil Engineering (SAQA: 115918) (NQF 8)**	**H6CV0Q**

EB12.8.1 Purpose of Qualification
The purpose of the Bachelor of Engineering Technology Honours in Civil Engineering is to improve on the skills developed at an undergraduate level. This qualification allows students to work on individual but supervised research while other modules further develop and prepare students for industry experience by deepening their expertise in Civil Engineering.

EB12.8.2 Qualification Outcomes

i. Demonstrate competence to identify, formulate, analyse, and solve complex engineering problems.
ii. Demonstrate competence to apply knowledge of mathematics, natural sciences, engineering fundamentals, and an engineering speciality to solve complex engineering problems.
iii. Demonstrate competence in performing creative, procedural, and non-procedural design and synthesis of components, systems, engineering works, products, or processes.
iv. Demonstrate competence to design and conduct investigations and experiments.
v. Demonstrate competence to use appropriate engineering methods, skills, and tools, including those based on information technology.
vi. Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.
vii. Demonstrate critical awareness of the sustainability and impact of engineering activity on the social, industrial, and physical environment.
viii. Demonstrate knowledge and understanding of engineering management principles.
ix. Demonstrate competence to work effectively individually, in teams, and in multidisciplinary environments.
x. Demonstrate competence to engage in independent learning through well-developed learning skills.
xi. Demonstrate critical awareness of the need to act professionally and ethically, exercise judgment, and take responsibility within own limits of competence.
xii. Demonstrate knowledge and understanding of engineering management principles and economic decision-making.

EB12.8.3 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
CRP8X00	Research Project: Civil Engineering	**CRP8X00**	Research Project: Civil Engineering
CMS8X01	Material Science	**CSM8X02**	Structural Mechanics
CEM8X01	Environmental Management	**CCM8X02**	Construction Materials & Structures
EMC8X01	Engineering Mathematics and Computing	**CFE8X02**	Foundation Engineering
CRM8X01	Research Methodology	**CWR8X02**	Water Resource Management
		CTS8X02	Transportation Studies
		CCP8X02	Construction Planning & Earthworks
		CDS8X02	Drainage & Storm Water Management

EB12.9	**Bachelor of Engineering Technology Honours in Industrial Engineering (SAQA: 111233) (NQF 8)**	**H6IN0Q**

EB12.9.1 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.

EB12.9.2 Qualification outcomes

i. Demonstrate competence to identify, formulate, analyse and solve complex engineering problems creatively and innovatively.
ii. Demonstrate competence to apply knowledge of mathematics, natural science and engineering sciences

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

EB12.9.3 Admission requirements and selection criteria
An NQF level 7 qualification or equivalent in Industrial Engineering or a related field.

EB12.9.4 Conferment of the degree
One year full-time.

EB12.9.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
IRP8X00	Research & Design Project: Industrial Engineering	**IRP8X00**	Research & Design Project: Industrial Engineering
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		

EB12.10	**Bachelor of Engineering Technology Honours in Electrical Engineering (SAQA: 111188) (NQF 8)**	**H6EL0Q**

EB12.10.1 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.

EB12.10.2 Qualification outcomes
i. Demonstrate competence to identify, formulate, analyse and solve complex engineering problems creatively and innovatively.
ii. Demonstrate competence to apply knowledge of mathematics, natural science and engineering sciences to the conceptualization of engineering models and to solve complex engineering problems.
iii. Demonstrate competence to perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes of a complex nature.

iv. 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.
v. 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.
vi. Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.
vii. Demonstrate knowledge and understanding of the impact of engineering activities society, economy, industrial and physical environment.
viii. Demonstrate knowledge and understanding of engineering management principles.
ix. Demonstrate competence to engage in independent and life-long learning through well-developed learning skills.
x. Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of engineering practice.

EB12.10.3 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.

EB12.10.4 Conferment of the degree
One year full-time.

EB12.10.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
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

***Compulsory module:** Final mark weighting = Semester mark (50%) + Exam mark (50%)

EB12.11	**Bachelor of Engineering Technology Honours in Mechanical Engineering (SAQA: 108876) (NQF 8**	**H6ME0Q**

EB12.11.1 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.

EB12.11.2 Admission requirements and selection criteria
An NQF level 7 or equivalent qualification in Mechanical Engineering.

EB12.11.3 Qualifications Outcome
i. Demonstrate competence to identify, formulate, analyse and solve complex engineering problems creatively and innovatively.
ii. Demonstrate competence to apply knowledge of mathematics, natural science and engineering sciences to the conceptualization of engineering models and to solve complex engineering problems.
iii. Demonstrate competence to perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes of a complex nature.
iv. 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.
v. 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.

vi. Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.
vii. Demonstrate knowledge and understanding of the impact of engineering activities society, economy, industrial and physical environment.
viii. Demonstrate knowledge and understanding of engineering management principles.
ix. Demonstrate competence to engage in independent and life-long learning through well-developed learning skills.
x. Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of engineering practice.

EB12.11.4 Conferment of the degree
One year full-time.

EB12.11.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
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		

EB12.12	**Bachelor of Engineering Technology Honours in Metallurgical Engineering (SAQA: 111406) (NQF 8)**	**H6MTIQ**

EB12.12.1 Purpose of the qualification
The Bachelor of Engineering Technology Honours in Metallurgical Engineering lies within the engineering sector and is considered to be a scarce skill. Given this, the programme has been designed such that it directly meets the needs of the sector, contributing ultimately towards the National Development Plan, benefiting not only the student, but society at large. The qualification meets the specific needs of the sector by meeting and providing for the growing demand for skilled professionals in the metallurgical engineering domain. In addition to this, there also exists a demand by holders of technology-related qualifications to obtain a postgraduate qualification that enhances their professional and technical knowledge and grants them access towards pursuing a Master's degree in engineering. As the University of Johannesburg has been the first institution to implement the new ECSA endorsed Bachelor of Engineering Technology programmes in South Africa, the Bachelor of Engineering Technology Honours programme provides for articulation within University and from other intuitions that will be implementing the undergraduate programme in the near future

EB12.12.2 Qualification outcomes
Qualified and skilled metallurgists with a balance and relevant industry acumen will be among the main outcomes from the Bachelor of Engineering Technology Honours programme in Metallurgical Engineering at the University of Johannesburg.

EB12.12.3 Admission requirements and selection criteria.
An NQF level 7 qualification or equivalent in the field of Metallurgical Engineering.

EB12.12.4 Conferment of the degree
One year full-time.

EB12.12.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
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

EB12.13	**Bachelor of Engineering Technology Honours in Mining Engineering (SAQA: 115920) (NQF 8)**	**H6EM0Q**

EB12.13.1 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.

EB12.13.2 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.

EB12.13.3 Conferment of the degree
One year full-time.

EB12.13.4 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
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

EB13	MASTER OF ENGINEERING ENGINEERING SCIENCE PROGRAMMES

EB13.1	MENG: ELECTRICAL AND ELECTRONIC (RD) (SAQA 73987) (NQF 9)	M6ER1Q

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 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.

EB13.1.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
- **vi.** 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.
- **vii.** 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.
- **viii.** 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.
- **ix.** 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.
- **x.** 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.
- **xi.** Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
- **xii.** Explore, where applicable, education and career opportunities in engineering research/development.
- **xiii.** Organise and develop entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB13.1.3 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.

EB13.1.4 Conferment of the degree

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

EB13.1.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**

First Semester		Second Semester	
M6E0109	Dissertation	**M6E0209**	Dissertation

RESEARCH TIME: 100%

EB13.3	MENG: MECHANICAL (RD) (SAQA 73989) (NQF 9)	M6MR3Q

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 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.

EB13.3.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform data analysis and interpretation.
- **vi.** 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.
- **vii.** 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.
- **viii.** 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,
- **ix.** health, safety and environmental impact and benefits, where applicable, in the chosen field of research.
- **x.** 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.
- **xi.** 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.
- **xii.** Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research and development activities.
- **xiii.** Explore, where applicable, education and career opportunities through engineering problem-solving, design, technical research and managerial skills.
- **xiv.** Organise and develop entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB13.3.3 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.

EB13.3.4 Conferment of the degree

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

EB13.3.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
M6M0109	Dissertation	**M6M0209**	Dissertation

RESEARCH TIME: 100%

EB13.4	MENG IN EXTRACTION METALLURGY (RD) (SAQA 111246) (NQF 9)	M6EM0Q

EB13.4.1 Purpose of the qualification
The purpose of the Master of Engineering in Extraction Metallurgy is to develop a graduate with advanced abilities in appropriate analytical and research skills relevant for engineering design and synthesis to solve engineering problems of society at large. The programme will develop an advanced capability to conduct research independently and as such promoting a lifelong learning approach.

EB13.4.2 Qualification outcomes
Exit Level Outcomes

- **i.** 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 research in the field of extraction metallurgy.
- **ii.** Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
- **iii.** 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 in the field of extraction metallurgy, using appropriate data analysis and interpretation.
- **iv.** Demonstrate, where applicable, environmental sensitivity across a range of environmental contexts in the execution of engineering management research/development activities.

EB13.4.3 Admission requirements and selection criteria.
Honours or NQF Level 8 qualification in Engineering, Mechanical Engineering or Metallurgy.
Students are selected on the basis of academic merit and an approved field(s) of study. An average mark of a 65% in the previous degree qualification is required.

EB13.4.4 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
MEMR019	Dissertation	**MEMR029**	Dissertation

RESEARCH TIME: 100%

EB13.5	MENG IN PHYSICAL METALLURGY (RD) (SAQA 111246 (NQF 9)	M6PM0Q

EB13.5.1 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.

EB13.5.2 Qualification outcomes
Exit level outcomes:

The qualified student will be able to:

i. 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. Demonstrate, where applicable, environmental sensitivity across a range of environmental contexts in the execution.
ii. Organise and manage him/herself and his/her activities responsibly, effectively and ethically, accept taking responsibility within his/her limits of competence, and exercise judgement based on knowledge and expertise, pertaining to the field of research.
iii. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
iv. 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.
v. ion of engineering management research/development activities

EB13.5.3 Admission requirements and selection criteria.
Honours or an NQF level 8 qualification in Engineering, Mechanical Engineering or Metallurgy

EB13.5.4 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
MPMR019	Dissertation	**MPMR029**	**Dissertation**

RESEARCH TIME: 100%

EB13.6	**MENG: CIVIL ENGINEERING (RD) (SAQA 73986) (NQF 9)**	**M6CR4Q**

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 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.

EB13.6.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

i. 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.
ii. 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.
iii. 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.
iv. Organise and manage him/herself and his/her activities responsibly, effectively, professionally and ethically, accept responsibility within his/her limits of competence,
v. and exercise judgement based on knowledge and expertise, pertaining to the field of research.
vi. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform data analysis and interpretation.
vii. 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.
viii. 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.
ix. 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.

x. 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.
xi. 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.
xii. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research and development activities.
xiii. Explore, where applicable, education and career opportunities in engineering research/development.
xiv. Organise and develop entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB13.6.3 Admission requirements and selection criteria
An approved four-year bachelor's degree in engineering or a similar approved degree at honours level.

EB13.6.4 Conferment of the degree
The MEng: Civil degree will be conferred on students who have completed the research projects and dissertation successfully.

EB13.6.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
M6C0109	Dissertation	**M6C0209**	Dissertation

RESEARCH TIME: 100%

EB13.7	**MENG: STRUCTURAL ENGINEERING (Coursework) (SAQA - 97389) (NQF 9)**	**M6CSEQ**

EB13.7.1 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.

EB13.7.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

i. 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.
ii. 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.
iii. 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
iv. 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
v. Plan and conduct applicable level of investigations, research and /or experiments by applying appropriate theories and methodologies and perform data analysis and interpretation
vi. 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
vii. 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
viii. 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

ix. 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
x. 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
xi. Demonstrate where applicable cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research and development activities
xii. Explore, where applicable, education and career opportunities through engineering problem solving, design, technical research and structural engineering skills
xiii. Organise and develop entrepreneurial opportunities through engineering research, development and/or structural engineering skills

EB13.7.3 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

EB13.7.4 Conferment of the degree
The MEng: Structural Engineering degree will be conferred on students who have completed the six coursework modules (4 core modules and to electives) and minor dissertation successfully. Weight of dissertation is 50%.

EB13.7.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
M6CCT29	Advanced Concrete Technology	**M6PAD19**	Plastic Analysis and Design of Structures
		M6ARC19	Advanced Reinforced Concrete Analysis and Design
Second year			
M6FEA19	Finite Element Analysis	**M6SOS19**	Stability of Steel Structures
M6CSE19	Minor Dissertation	**M6CSE29**	Minor Dissertation
Choose two electives			
M6SPE19	Special topics in civil engineering materials and structures	**M6DAR26**	Durability, assessment and repair of concrete structures
M6DCS29	Design of cold-formed steel structures	**M6DYS29**	Dynamic analysis of structures

EB13.8	**MENG: ENGINEERING MANAGEMENT (Coursework) (SAQA 73988) (NQF 9)**	**M6MC5Q**

EB13.8.1 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.

EB13.8.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:
i. 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.
ii. 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.

iii. Work effectively, individually or with others, as a member of a team, group, organization, and the community or in multi-disciplinary environments in the chosen field of research.

iv. 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.

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

vi. 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.

vii. 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.

viii. 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.

ix. Employ various learning strategies and skills to master outcomes required for preparing him/herself to engage in continuous learning, and to keep abreast of knowledge and skills required in the engineering management field.

x. 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.

xi. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering management research and development activities.

xii. Explore, where applicable, education and career opportunities in engineering management research/development.

xiii. Organise and develop entrepreneurial opportunities through engineering, technical research, development, and/or managerial skills.

EB13.8.3 Admission requirements and selection criteria
An approved four-year bachelor's degree in engineering.

EB13.8.4 Conferment of the degree
The MEng: Engineering Management degree will be conferred on students who have completed the six prescribed modules and minor dissertations successfully. The weight of the minor dissertation is 50%.

EB13.8.5 Curriculum

First-year			
CODE	**MODULE**	**CODE**	**MODULE**
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)			
M6MMD19	Minor Dissertation: Engineering Management	**M6MMD29**	**Minor Dissertation**: Engineering Management

EB13.9	**MENG: ENGINEERING MANAGEMENT (RD) (SAQA 73988) (NQF 9)**	**M6MR6Q**

EB13.9.1 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.

EB13.9.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform data analysis and interpretation.
- **vi.** 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.
- **vii.** 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.
- **viii.** 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.
- **ix.** 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.
- **x.** 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.
- **xi.** Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering management research and development activities.
- **xii.** Explore, where applicable, education and career opportunities in engineering management research/development.
- **xiii.** Organise and develop entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB13.9.3 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.

EB13.9.4 Conferment of the degree

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

EB13.9.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
M6M1109	Dissertation: Engineering Management	**M6M1209**	Dissertation: Engineering Management

RESEARCH TIME: 100%

EB13.10	MASTER OF SCIENCE IN QUANTITY SURVEYING (RD) (SAQA 111187) (NQF 9)	M6QS0Q

EB13.10.1 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.

EB13.10.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

- **i.** Identify and analyses quantity surveying related problems creatively and innovatively.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of quantity surveying research/development activities.

EB13.10.3 Admission requirements and selection criteria.
NQF Level 8

EB13.10.4 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
MQSR019	Dissertation	**MQSR029**	**Dissertation**

RESEARCH TIME: 100%

EB13.11	MASTER OF MICRO- AND NANOELECTRONIC ENGINEERING (Online Programme) (SAQA: 105102) (NQF 9)	M6MNE0Q

EB13.11.1 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.

EB13.11.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

i. 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.
ii. 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.
iii. 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.
iv. 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.
v. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
vi. 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.
vii. 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.
viii. 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.
ix. 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.
x. Participate as a responsible citizen in the life of local, national and global communities by acting ethically in the chosen field of research.
xi. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
xii. Explore, where applicable, education and career opportunities in research/development.
xiii. Organise and develop entrepreneurial opportunities through technical research, development and/or managerial skills.

EB13.11.3 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.

EB13.11.4 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
ARFM1E1	Analogue And Rf Microelectronics	**CRDS2E1**	Cross-Disciplinary Specialisation
DIMD1E1	Digital And Memory Design	**NANS2E1**	Nanoelectronic Specialisation
ERPW1E1	Engineering Research Proposal Writing	**RRSP2E1**	Research Related Specialisation

MNEM1E1	Minor Dissertation: Micro and Nanoelectronic Eng	**MNEM2E1**	Minor Dissertation: Micro and Nanoelectronic Eng

EB13.12	**MASTERS IN SYSTEMS ENGINEERING (SAQA 100887(NQF 9)**	**M6SY3Q**

EB13.12.1 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.

EB13.12.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** Organize and manage him/herself and his/her activities responsibly, effectively, professionally

EB13.12.3 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.

EB13.12.4 Curriculum

First year			
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
EMR9X00	Minor Dissertation: Engineering	**EMR9X00**	Minor Dissertation: Engineering

EB13.13	**MASTER OF ARTIFICIAL INTELLIGENCE (Coursework) SAQA ID 118671 NQF 9**	**M6AI2Q**

EB13.13.1 Purpose of the qualification
The purpose of the Master of Artificial Intelligence is to develop skilled graduates who can work at a high level of competence with cutting-edge Artificial Intelligence applications and concepts across various fields, including engineering, commerce and economics, mathematical sciences, natural sciences, and computer science. Graduates will be equipped with the skills, knowledge, and expertise in Artificial Intelligence (AI) research relevant

to research, development, and practice in this field. The programme will also provide specialized AI training and promote lifelong learning appropriate to the evolving discipline. To this end, the programme will provide students with insights into Psychology and AI, the importance of ethics, and a variety of aspects of machine learning, etc. The focus on the research project ensures graduates can undertake advanced reflection on issues in the field of AI.

EB13.13.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

- **i.** Design and create computer programmes using a high-level programming language for Artificial Intelligence applications.
- **ii.** Critically evaluate and construct machine learning solutions for computational problems in applied Artificial Intelligence.
- **iii.** Analyse, interpret and demonstrate knowledge of the factual frameworks of human anatomy, physiology, and psychology in the context of Artificial Intelligence.
- **iv.** Creatively and innovatively research, investigate and analyse problems in various Artificial Intelligence use cases.
- **v.** Solve Artificial Intelligence-based problems using mathematical and statistical techniques and reasoning.
- **vi.** Plan and conduct research applying appropriate theories and methodologies and perform proper data analysis and interpretation.
- **vii.** Communicate effectively, both orally and in writing, with research audiences and the community at large, in so far as they are affected by the research and development, using appropriate data analysis and interpretation.
- **viii.** Demonstrate and critically evaluate, where applicable, ethical sensitivity across a range of social and environmental contexts in the execution of Artificial Intelligence research and development activities, and apply critical thinking on fair, secure, and inclusive use of Artificial Intelligence applications in the contemporary African context.

EB13.13.3 Admission requirements and selection criteria.
Honours or NQF level 8 in Engineering, Commerce or Economics, or Mathematical Sciences Natural Sciences or Computer Science
Bachelor of Technology in disciplines/fields with at least one year work experience or research experiences. Students are selected on the basis of academic merit and an approved field(s) of study. Student must have completed a minimum of NQF level 5 Mathematics during undergraduate studies.

EB13.13.4 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
AMS9X01	Mathematics And Statistics for AI	**AIP9X02**	Research Project AI
APA9X01	Programming For AI	**ALP9X02**	Natural Language Processing
ARM9X01	Research Methodology	**AML9X02**	Machine Learning
BMF9X01	Brain Morphology and Functionality	**PHL9X56**	Ethics Of AI
PSY9X12	Psychology and AI		

EB13.14	**MASTER IN SUSTAINABLE ENERGY (Coursework) (SAQA 102064) (NQF 9)**	**M6SE0Q**

EB13.14.1 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.

EB13.14.2 Qualification outcomes

i. Analyse and develop sustainable energy projects, creatively and innovatively by applying relevant fundamental and applied knowledge.
ii. 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.
iii. 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.
iv. 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.
v. 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

EB13.14.3 Admission requirements and selection criteria

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.

EB13.14.4 Curriculum

First year			
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
EMR9X00	Minor Dissertation: Engineering	**EMR9X00**	Minor Dissertation: Engineering

EB13.15	**MASTERS IN SUSTAINABLE MINING (Coursework) SAQA 108954) (NQF 9)**	**M6SMMQ**

EB13.15.1 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.

EB13.15.2 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:

i. 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.
ii. 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.
iii. 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.
iv. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
v. 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.
vi. Participate as a responsible citizen in the life of local, national and global communities by acting ethically in the chosen field of research.
vii. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering management research/development activities.

EB13.15.3 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.

EB13.15.4 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
MINR019	Dissertation: Sustainable Mining (Research: 1)	**MINR029**	Dissertation: Sustainable Mining (Research : 1)

RESEARCH TIME: 100%

EB13.16	**MASTER OF MINERAL RESOURCE GOVERNANCE (RD) (SAQA 111395) (NQF 9)**	**M6MR0Q**

EB13.16.1 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.

EB13.16.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

i. 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.
ii. 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.
iii. 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.
iv. Plan and conduct applicable levels of investigation, research and /or experiments by applying appropriate theories and methodologies and perform data analysis, interpretation and discussion.
v. 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.
vi. 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.
vii. 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.

EB13.16.3 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.

EB13.16.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
MMRR019	Dissertation	**MMRR029**	Dissertation

RESEARCH TIME: 100%

EB13.17	**MASTER IN INDUSTRIAL ENGINEERING (RD) (NQF 9) (SAQA 111122)**	**M6IN0Q**

EB13.17.1 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.

EB13.17. 2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:
i. 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.
ii. 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.
iii. 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.
iv. 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.

v. 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.
vi. 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.
vii. 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.
viii. 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.
ix. 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.
x. 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.
xi. Demonstrate, where applicable, cultural, and aesthetic sensitivity across a range of social contexts in the execution of engineering research/development activities.
xii. Explore, where applicable, education and career opportunities in advanced engineering research/development.
xiii. Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB13.17.3 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.

EB13.17.4 Conferment of the degree
The Master of Industrial Engineering will be conferred on students who have completed the research seminar and dissertation successfully.

EB13.17.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
MINR019	Dissertation	**MINR029**	**Dissertation**

RESEARCH TIME: 100%

EB13.18	**MASTER OF CHEMICAL ENGINEERING (RD) (SAQA111478) (NQF 9)**	**M6CE0Q**

EB13.18.1 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.

EB13.18.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:
i. Identify and accurately analyses problems within the Chemical Engineering environment by researching problems creatively and innovatively.
ii. 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.

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

EB13.18.3 Admission requirements and selection criteria.
Bachelor of Engineering Technology Honours in Chemical Engineering or a similar Bachelor of Engineering at NQF 8.

EB13.18.4 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
MCER019	Dissertation	**MCER029**	Dissertation

RESEARCH TIME: 100%

EB13.19	**MASTER OF OPERATION MANAGEMENT (RD) (SAQA 111178) (NQF 9)**	**M6OP0Q**

EB13.19.1 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.

EB13.19.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

i. 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.
ii. Apply creative solutions to complex operational management problems.
iii. Organize and manage him/herself and his/her activities responsibly, effectively and ethically, demonstrating skills required to be productive managerial leaders.
iv. Plan and conduct applicable levels of investigation, research and/or experiments

EB13.19.3 Admission requirements and selection criteria.
NQF level 8 qualification in Operations Management, Management Services or Quality.

EB13.19.4 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
MOPR019	Dissertation	**MOPR029**	Dissertation

RESEARCH TIME: 100%

EB13.20	**MASTER OF URBAN AND REGIONAL PLANNING (RD) (SAQA 111190) (NQF 9)**	**M6UP0Q**

EB13.20.1 Purpose of the qualification
Analyse and research topics on land infrastructure and transport planning and urban and regional planning spaces.

EB13.20.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

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

EB13.20.3 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

EB13.20.4 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
MUPR019	Dissertation	**MUPR029**	Dissertation

RESEARCH TIME: 100%

EB13.21	**MASTER OF SUSTAINABLE URBAN PLANNING AND DEVELOPMENT (Coursework) (SAQA: 99782) (NQF 9)**	**M6MUPQ**

EB13.21.1 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.

EB13.21.2 Qualification outcomes
Exit level outcomes:
On completion of this programme the student will be able to: -

i. Have understanding of relevant theory useful in solving planning, development and management problems in cities of the developing world;
ii. reflect on the usefulness of principles of sustainable development to understand the socio-economic and environmental imperatives in urban areas
iii. demonstrate a high level of understanding of smart cities and the need for provision
iv. of adequate and intelligent infrastructure in urban areas
v. demonstrate the imperatives in managing the rapidly growing cities of the developing world
vi. exhibit an understanding of the research process and requirements in urban planning and development
vii. engage theoretical frameworks relevant to the development of urban space and be able to complete a dissertation within the built environment and related fields
viii. Organise and develop entrepreneurial opportunities through urban research, development and management skills.

EB13.21.3 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.

EB13.21.4 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.

EB13.21.5 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.

EB13.21.6 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
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	**UFE9X02**	Urban Financial and Economic Management
Second year			
MSUP019	Minor Dissertation	**MSUP029**	Minor Dissertation
Choose two electives (Second Semester)			
UFE9X02	Urban Financial and Economic Management	**SOC9X07**	Urban Sociology and Social Development
UEPG029	Urban Environmental Planning and GIS Applications	**MUP9X02**	Urban Policy and Design
UED9X02	Urban Entrepreneurial Dynamics	**IHSD029**	Integrated Human Settlements Development

EB13.22	**MASTERS IN SUSTAINABLE URBAN PLANNING AND DEVELOPMENT (SAQA99782) (NQF 9)**	**M6MUPQ**

EB13.22.1 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.

EB13.22.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.

v. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
vi. 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.
vii. 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.
viii. 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.
ix. 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.
x. Participate as a responsible citizen in the life of local, national and global communities by acting ethically in the chosen field of research.
xi. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
xii. Explore, where applicable, education and career opportunities in research/development.
xiii. Organise and develop entrepreneurial opportunities through technical research, development and/or managerial skills.

EB13.22.3 Curriculum

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

***Elective Module**

EB13.23	**MASTERS IN SUSTAINABLE URBAN PLANNING AND DEVELOPMENT (Sustainable and Smart Cities and Regions) (SAQA99782) (NQF 9)**	**M6MU1Q**

EB13.23.1 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.

EB13.23.2 Qualification outcomes

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

i. 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.
ii. 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.
iii. 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.
iv. 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.
v. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
vi. 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.
vii. 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.
viii. 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.
ix. 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.
x. Participate as a responsible citizen in the life of local, national and global communities by acting ethically in the chosen field of research.
xi. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
xii. Explore, where applicable, education and career opportunities in research/development.
xiii. Organise and develop entrepreneurial opportunities through technical research, development and/or managerial skills.

EB13.23.3 Curriculum

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

***Elective Module**

EB13.24	**MASTERS IN SUSTAINABLE ENERGY ENGINEERING (SAQA102064) (NQF 9)**	**M6SE0Q**

EB13.24.1 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.

EB13.24.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

i. Analyse and develop sustainable energy projects, creatively and innovatively by applying relevant fundamental and applied knowledge.
ii. 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.
iii. 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.
iv. 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.
v. 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.
vi. Demonstrate cultural and aesthetic sensitivity with regards to the socio-economic impact of the execution of sustainable research activities, where applicable.

EB13.24.3 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.

EB13.24.4 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
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	**M6SED29**	Minor Dissertation: Sustainable Energy

EB13.25	**MASTER OF ENGINEERING IN SUSTAINABLE ADVANCED MATERIALS (Coursework)**	**M6SA4Q**

EB13.25.1 Purpose of the qualification
The Master of Engineering in Sustainable Advanced Materials is aimed towards developing the next generation of skilled material engineers such that they are able to apply advanced materials technologies across a range of engineering fields such as automotive, aerospace, mining, chemical, as well as bio-medical, environmental and sciences. It seamlessly integrates research and coursework to provide a comprehensive educational experience.

It is 12-month programme for full-time students or a 2-year programme for part-time students. Through a blend of theoretical learning, hands-on experience, and collaborative projects, graduates are well equipped to drive innovation in sustainable materials technology across diverse industries, and to further their advanced materials doctoral studies at any top universities in the globe. This programme is structured holistically, taking into consideration, and integrating scientific and engineering approaches of advanced materials to;

- **i.** Enhance the intellectual capabilities and cognitive skills of students in the field of advanced materials design and development, sustainable and innovative processing technologies, and advanced characterization and analytical techniques.
- **ii.** Equip engineering students with the intellectual and technical skills required to function effectively locally and globally, and as game players in the 4th IR and Sustainable Development Goal
- **iii.** Contribute towards the development of the next generation of talented material scientists and engineers, to drive engineering innovation to the forefront.

EB13.25.2 Qualification outcomes

The Master of Engineering in Sustainable Advanced Materials by coursework degree is designed to provide BScEng (Hons), BEng and BEngTech (Hons), BTech, and BSc holders with a unique ability and upon the completion of this programme students should be able to:

- **i.** Apply molecular dynamics, thermodynamic theories and computational modelling principles for designing and predicting the properties and behaviour of advanced engineering materials
- **ii.** Apply phase transformation, strength of materials theory, and strengthening mechanisms for developing, processing and manufacturing engineering materials and components
- **iii.** Evaluate and apply electrochemical techniques for designing innovative corrosion control and prevention methods, and for designing and fabricating electrochemical systems and devices such batteries, fuel cells and supercapacitors
- **iv.** Analyse nanoscale and microscale structural and phase properties of advanced engineering materials.
- **v.** Critically evaluate the nanoscale, microscale and macroscale mechanical and tribological properties of conventional and advanced materials using emerging materials testing techniques.
- **vi.** Apply appropriate theories and methodologies for planning and conducting engineering materials-related research.

EB13.25.3 Admission requirements and selection criteria.

Open to graduates (NQF 8) of all Engineering fields and Physical Sciences with an interest in Advanced Materials.

BTech holders with minimum of 3 years industrial experience in the field of materials engineering

Students are selected on the basis of academic merit and an approved field(s) of study.

EB13.25.4 Conferment of the degree

One year full-time / Two years part-time

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
MSA9X01	Integrated Computational Materials Engineering	**MSA9X05**	Advanced Materials Characterization and Analytical Techniques
MSA9X02	Sustainable Advanced and Nanoengineered Materials Technology*	**MSA9X06**	Research Project: Sustainable Advanced Materials (II)
MSA9X03	Sustainable Electrochemical Energy Materials and Technology*		
MSA9X04	Research Project: Sustainable Advanced Materials (I)		

* Application is submitted to change the names of the two modules starting from 2025:

  - *from "Sustainable Advanced and Nanoengineered Materials Technology" to "Sustainable Advanced Engineering Materials" with the same Code.*
  - *from "Sustainable Electrochemical Energy Materials and Technologies" to "Sustainable Advanced and Nanomaterials Manufacturing Technologies" with the same Code*

The combined outcomes for the two modules are not changed; The topics/contents are only rearranged/regrouped in the modules

EB14	MAGISTER PHILOSOPHIAE ENGINEERING SCIENCE PROGRAMMES

EB14.1	MPhil: ELECTRICAL AND ELECTRONIC ENGINEERING Research-based (SAQA 74008) (NQF 9)	M6ER7Q

EB14.1.1 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.

EB14.1.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

i. 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.
ii. 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.
iii. 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.
iv. 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.
v. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
vi. 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.
vii. 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.
viii. 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.
ix. 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.
x. Participate as a responsible citizen in the life of local, national and global communities by acting ethically in the chosen field of research.
xi. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
xii. Explore, where applicable, education and career opportunities in research/development.
xiii. Organise and develop entrepreneurial opportunities through technical research, development and/or managerial skills.

EB14.1.3 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.

EB14.1.4 Conferment of the degree
The MPhil: Electrical and Electronic degree will be conferred on students who have completed the research seminar and dissertation successfully.

EB14.1.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
M6E0109	Dissertation	**M6E0209**	Dissertation

RESEARCH TIME: 100%

EB14.2	MPhil: MECHANICAL ENGINEERING Research-based (SAQA 74015) (NQF 9)	M6MR8Q

EB14.2.1 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.

EB14.2.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
- **vi.** 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.
- **vii.** 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.
- **viii.** 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.
- **ix.** 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.
- **x.** Participate as a responsible citizen in the life of local, national and global communities by acting ethically in the chosen field of research.
- **xi.** Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
- **xii.** Explore, where applicable, education and career opportunities in research/development.
- **xiii.** Organise and develop entrepreneurial opportunities through technical research, development and/or managerial skills.

EB14.2.3 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.

EB14.2.4 Conferment of the degree
The MPhil: Mechanical degree will be conferred on students who have completed the research seminar and dissertation successfully.

EB14.2.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
M6M0109	Dissertation	**M6M0209**	Dissertation

RESEARCH TIME: 100%

EB14.3	**MPhil: CIVIL ENGINEERING Research-based (SAQA 74006) (NQF 9)**	**M6CR9Q**

EB14.3.1 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.

EB14.3.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
- **vi.** 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.
- **vii.** 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.
- **viii.** 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.
- **ix.** 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.
- **x.** Participate as a responsible citizen in the life of local, national and global communities by acting ethically in the chosen field of research.
- **xi.** Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of research/development activities.
- **xii.** Explore, where applicable, education and career opportunities in research/development.

xiii. Organise and develop entrepreneurial opportunities through technical research, development and/or managerial skills.

EB14.3.3 Admission requirements and selection criteria
An approved four-year bachelor's degree in engineering or a 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.

EB14.3.4 Conferment of the degree
The MPhil: Civil degree will be conferred on students who have completed the research seminar and dissertation successfully.

EB14.3.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
M6C0109	Dissertation	**M6C0209**	Dissertation

RESEARCH TIME: 100%

EB14.4	**MPhil: ENGINEERING MANAGEMENT Coursework (SAQA 74010) (NQF 9)**	**M6MC0Q**

EB14.4.1 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.

EB14.4.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

i. 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.
ii. 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.
iii. 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.
iv. 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.
v. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.
vi. 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.
vii. 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.
viii. 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.
ix. 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.

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

EB14.4.3 Admission requirements and selection criteria
A Baccalaureus Technologiae, Engineering **or** an equivalent qualification of an equivalent standard. With 1.5 years appropriate experience.

EB14.4.4 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%.

EB14.4.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
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)			
M6MMD19	Minor Dissertation: Engineering Management	**M6MMD29**	Minor Dissertation: Engineering Management

EB14.5	**MPhil: ENGINEERING MANAGEMENT Research-based (SAQA 74010) (NQF 9)**	**M6MR2Q**

EB14.5.1 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.

EB14.5.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

i. 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.
ii. 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.
iii. 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.
iv. 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.
v. Plan and conduct applicable levels of investigation, research and/or experiments by applying appropriate theories and methodologies and perform appropriate data analysis and interpretation.

vi. 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.
vii. 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.
viii. 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.
ix. 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.
x. Participate as a responsible citizen in the life of local, national and global communities by acting ethically in the chosen field of research.
xi. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering management research/development activities.
xii. Explore, where applicable, education and career opportunities in engineering management research/development.
xiii. Organise and develop entrepreneurial opportunities through inter-disciplinary research, development and/or managerial skills.

EB14.5.3 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.

EB14.5.4 Conferment of the degree
The MPhil: Engineering Management degree will be conferred on students who have completed the research seminar and dissertation successfully.

EB14.5.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
M6M1109	Dissertation: Engineering Management	**M6M1209**	Dissertation: Engineering Management

RESEARCH TIME 100%

EB14.6	**MPhil: QUALITY ENGINEERING (SAQA 117903) (NQF 9)**	**M6QE3Q**

EB14.6.1 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.

EB14.6.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:
i. Analyse 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.
ii. Apply creative solutions to complex operational management problems.
iii. Organise and manage him/herself and his/her activities responsibly, effectively and ethically, demonstrating skills required to be productive managerial leaders.
iv. Plan and conduct applicable levels of investigation, research and/or experiments

EB14.6.3 Admission requirements and selection criteria.
NQF level 8 qualification in Operations Management, Management Services or Quality.

EB14.6.4 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
MQER019	Dissertation	**MQER029**	Dissertation

RESEARCH TIME: 100%

EB15	DOCTOR PHILOSOPHIAE ENGINEERING PROGRAMMES

EB15.1	PhD: ELECTRICAL AND ELECTRONIC Research Based (NQF 10)	P6E01Q

EB15.1.1 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.

EB15.1.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** 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.
- **vi.** 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.
- **vii.** 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.
- **viii.** 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.
- **ix.** 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.
- **x.** 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.
- **xi.** Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research/development activities.
- **xii.** Explore, where applicable, education and career opportunities in advanced engineering research/development.
- **xiii.** Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB15.1.3 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

EB15.1.4 Conferment of the degree
The PhD: Electrical and Electronic will be conferred on students who have completed the research seminar and thesis successfully.

EB15.1.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6E0110	Thesis: Electrical and Electronic	**P6E0210**	Thesis: Electrical and Electronic

RESEARCH TIME: 100%

EB15.2	**PhD: MECHANICAL ENGINEERING Research Based (NQF 10)**	**P6M02Q**

EB15.2.1 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.

EB15.2.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** 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.
- **vi.** 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.
- **vii.** 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.
- **viii.** 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.
- **ix.** 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.
- **x.** 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.
- **xi.** Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research/development activities.
- **xii.** Explore, where applicable, education and career opportunities in advanced engineering

research/development.

xiii. Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB15.2.3 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.

EB15.2.4 Conferment of the degree

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

EB15.2.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6M0110	Thesis: Mechanical	**P6M0210**	Thesis**:** Mechanical

RESEARCH TIME: 100%

EB15.3	**PhD: CIVIL MANAGEMENT Research Based (NQF 10)**	**P6C03Q**

EB15.3.1 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.

EB15.3.2 Qualification outcomes

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

i. 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.

ii. 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.

iii. 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.

iv. 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.

v. 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.

vi. 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.

vii. 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.

viii. 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.

ix. 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.

x. 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.
xi. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research/development activities.
xii. Explore, where applicable, education and career opportunities in advanced engineering research/development.
xiii. Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB15.3.3 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.

EB15.3.4 Conferment of the degree
The PhD: Civil will be conferred on students who have completed the research seminar and thesis successfully.

EB15.3.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6C0110	Thesis: Civil	**P6C0210**	Thesis: Civil

RESEARCH TIME: 100%

EB15.4	**PhD: ENGINEERING MANAGEMENT Research Based (NQF 10)**	**P6EM4Q**

EB15.4.1 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.

EB15.4.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

i. 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.
ii. 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.
iii. 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.
iv. 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.
v. 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.
vi. 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.

vii. 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.

viii. 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.

ix. Employ various learning and research strategies and skills to master outcomes required for preparing him/herself to engage in continuous learning and research, and to keep abreast of knowledge and skills required in the engineering management research/development field.

x. 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.

xi. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering management research/development activities.

xii. Explore, where applicable, education and career opportunities in advanced engineering management research/development.

xiii. Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development, and/or managerial skills.

EB15.4.3 Admission requirements and selection criteria

An approved master's degree in engineering or a similar approved degree at the 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.

EB15.4.4 Conferment of the degree

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

EB15.4.5 Curriculum

First-year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6EM110	Thesis: Engineering Management	**P6EM120**	Thesis**:** Engineering Management

RESEARCH TIME: 100%

EB15.5	**PhD: CHEMICAL ENGINEERING Research Based (NQF 10)**	**P6CHEQ**

EB15.5.1 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.

EB15.5.2 Qualification outcomes

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

i. 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.

ii. 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.

iii. 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.

iv. 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.

v. 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.
vi. 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.
vii. 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.
viii. 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.
ix. 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.
x. 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.
xi. Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research/development activities.
xii. Explore, where applicable, education and career opportunities in advanced engineering research/development.
xiii. Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB15.5.3 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.

EB15.5.4 Conferment of the degree

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

EB15.5.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6CH110	Thesis: Chemical	**P6CH210**	Thesis: Chemical

RESEARCH TIME: 100%

EB15.7	**PhD in Mining Engineering Research Based (NQF 10) (SAQA ID 96969)**	**P6ME2Q**

EB15.7.1 Purpose of the qualification

PhD specialisation in Mining Engineering
The purpose of the qualification is to develop a Mining Engineer with advanced abilities in designing and applying appropriate research methodologies to Mining Engineering related problems concerned with ensuring a safe, sustainable, and responsible mining industry. One of the main objectives in this process is to develop an advanced capability to conduct research of an original nature in the field of Mining Engineering processes, technologies, and mineral resource management. The qualification will promote the philosophy of lifelong learning that will provide new knowledge to industry and contribute significantly to the improvement of the current body of knowledge in the field of Mining Engineering and related fields such as Resource management.

EB15.7.2 Qualification Outcomes

Exit Level Outcomes:
Student should be able to:

i. Analyze problems and propose solutions of an original nature to address Mining Engineering research and development challenges in a realistic, creative and innovative manner through the application of relevant research methodologies in the identified topic of research.
ii. Plan and manage research projects, demonstrate fundamental knowledge, display in-depth understanding and insight into the principles, methodologies and concepts that constitute safe, sustainable and responsible Mining Engineering research practices.
iii. Plan and conduct advanced investigations, research and experiments of an original nature by applying or developing appropriate theories and methodologies and perform appropriate data analysis and interpretation.
iv. Communicate effectively, both orally and in writing, with specific research institutions, industrial audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
v. Apply and assess appropriate advanced Mining Engineering research methods, skills, tools and information technology effectively and critically in Mining Engineering related research and development practice. Demonstrate a deep understanding of all the factors impacting on the research outcomes and display a willingness to accept responsibility for the impact of research and development activities on all affected parties, the local community and society at large.
vi. Perform synthesis of components, systems, works, products or processes as a set of related systems and assess their health, safety, social, legal, market and environmental impact and benefits, where applicable, in the chosen field of inter-disciplinary research.
vii. Employ various research strategies and skills to encourage ethical, safe and sustainable behavior in the mining industry and keep abreast of ethical and responsible mining practices, knowledge and skills required to ensure a safe, sustainable and responsible mining industry on both the National and International playing field.
viii. 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.
ix. Demonstrate ethical and cultural sensitivity and awareness across a range of Mining Engineering contexts in the execution of the research and development activities.

EB15.7.3 Admission requirements
An approved master's degree in mining engineering or an equivalent mining related discipline with substantial relevant industrial experience.

EB15.7.4 Selection Criteria
Students are selected based on academic merit, mining industry experience and an approved field of study.

EB15.7.5 Conferment of the degree
The PhD will be conferred on students who have completed the research seminar and thesis successfully.

EB15.7.6 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6ME110	Thesis: Mine Engineerimg	**P6ME110**	Thesis: Mine Engineerimg

RESEARCH TIME: 100%

EB15.8	**PhD: Mine Surveying Research Based (NQF 10) (SAQA ID 96969)**	**P6MS2Q**

EB15.8.1 Purpose of the qualification
The purpose of the qualification is to develop a Mine Surveyor with advanced abilities in designing and applying appropriate research methodologies to Mine Surveying related problems concerned with ensuring a safe, sustainable, and responsible mining industry. Mine Surveying is defined by the International Society of Mine Surveying (ISM) as the branch of mining science responsible for all measurements, calculations and mapping to document all stages of the prospecting top exploitation of mineral deposits. These activities include the location and interpretation of the geology of a mineral deposit, the investigation, negotiation and management of mineral properties. The mine surveyor measures, records and develops plans to be used as a basis for the planning, direction and control of mining excavations in safe and economical manner and is responsible to monitor ground movement caused by mining activities (ISM, 2009).

One of the main objectives in this process is to develop an advanced capability to conduct research of an original nature in the field of Mine Surveying processes, technologies, resource modelling, ground monitoring and mineral resource management. The qualification will promote the philosophy of lifelong learning that will provide new knowledge to industry and contribute significantly to the improvement of the current body of knowledge in the field of Mine Surveying and related fields such as spatial positioning and resource management.

EB15.8.2 Qualification Outcomes

Exit Level Outcomes:

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

- **i.** Analyze problems and propose solutions of an original nature to address Mine Surveying research and development challenges in a realistic, creative and innovative manner through the application of relevant research methodologies in the identified topic of research.
- **ii.** Plan and manage research projects, demonstrate fundamental knowledge, display in-depth understanding and insight into the principles, methodologies and concepts that constitute safe, sustainable and responsible management of mineral resources as described by Mine Surveying research practices.
- **iii.** Plan and conduct advanced investigations, research and experiments of an original nature by applying or developing appropriate theories and methodologies, and perform appropriate data analysis and interpretation.
- **iv.** Communicate effectively, both orally, graphically and in writing, with specific research institutions, industrial audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support.
- **v.** Apply and assess appropriate advanced Mine Surveying research methods, skills, tools and information technology effectively and critically in Mine Surveying related research and development practice. Demonstrate a deep understanding of all the factors impacting on the research outcomes and display a willingness to accept responsibility for the impact of research and development activities to maximize mineral resource utilization while considering all affected parties, the local community and society at large.
- **vi.** Perform synthesis of components, systems, works, products or processes as a set of related systems and assess their health, safety, social, legal, market and environmental impact and benefits, where applicable, in the chosen field of inter-disciplinary research to ensure safe and sustainable extraction of mineral resources.
- **vii.** Employ various research strategies and skills to encourage ethical, safe and sustainable behavior in the mining and geospatial industry, while keeping abreast of ethical and responsible mining practices, knowledge and skills required to ensure a safe, sustainable and responsible mining industry on both the National and International playing field.
- **viii.** 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. Increase the benefits of mineral resource management to local communities and society at large.
- **ix.** Demonstrate ethical and cultural sensitivity and awareness across a range of Mine Surveying and mineral resource management contexts in the execution of the research and development activities.

EB15.8.3 Admission requirements

An approved master's degree in a Mine Surveying or an equivalent Mining or Mineral Resource management related discipline with substantial relevant industrial experience.

EB15.8.4 Selection Criteria

Students are selected on the basis of academic merit, mining industry experience and an approved field of study.

EB15.8.5 Conferment of the degree

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

EB15.8.6 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6MS110	Thesis: Mine Surveying	**P6MS210**	Thesis: Mine Surveying

RESEARCH TIME: 100%

EB15.9	PhD: METALLURICAL ENGINEERING Research Based (NQF 10)	P6METQ

EB15.9.1 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.

EB15.9.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** 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.
- **vi.** 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.
- **vii.** 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.
- **viii.** 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.
- **ix.** 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.
- **x.** 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.
- **xi.** Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research/development activities.
- **xii.** Explore, where applicable, education and career opportunities in advanced engineering research/development.
- **xiii.** Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB15.9.3 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.

EB15.9.4 Conferment of the degree

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

EB15.9 5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6MT110	Thesis: Metallurgy	**P6MT210**	Thesis: Metallurgy

RESEARCH TIME: 100%

EB15.10	PhD: OPERATIONS MANAGEMENT Research Based (NQF 10)	P6QSUQ

EB15.10.1 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.

EB15.10.2 Qualification outcomes

Exit level outcomes:

The qualified student will be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** 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.
- **vi.** 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.
- **vii.** 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.
- **viii.** 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.
- **ix.** 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.
- **x.** 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.
- **xi.** Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research/development activities.
- **xii.** Explore, where applicable, education and career opportunities in advanced engineering research/development.
- **xiii.** Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and/or managerial skills.

EB15.10.3 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.

EB15.10 4 Conferment of the degree
The PhD: Operations Management will be conferred on students who have completed the research seminar and thesis successfully.

EB15.10.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P60M110	Thesis: Operations Management	**P60M210**	Thesis: Operations Management

RESEARCH TIME: 100%

EB15.11	**PhD: QUANTITY SURVEYING Research Based (NQF 10)**	**P6QSUQ**

EB15.11.1 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.

EB15.11.2 Qualification Outcomes
Exit Level Outcomes:
Upon completion of this programme, a student should be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** 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.
- **vi.** 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.
- **vii.** 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.

EB15.11.3 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.

EB15.11.4 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.

EB15.11 5 Conferment of the degree
The PhD: Quantity Surveying will be conferred on students who have completed the research seminar and thesis successfully.

EB15.11.6 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6CO110	Thesis: Quantity Surveying	**P60M210**	Thesis: Quantity Surveying

RESEARCH TIME: 100%

EB15.12	**PhD: CONSTRUCTION MANAGEMENT Research Based (NQF 10)**	**P6CONQ**

EB15.12.1 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.

EB15.12.2 Qualification Outcomes Exit Level Outcomes:
Upon completion of this programme, a student should be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** 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.
- **vi.** 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.
- **vii.** Demonstrate cultural and aesthetic sensitivity across a range of social contexts in the execution of construction engineering management research/development activities.

EB15.12.3 Admission requirements
An approved master's degree in construction management or any Built Environment discipline or a similar approved degree at master's level.

EB15.12.4 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.

EB15.12.5 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.

EB15.12.6 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6CO110	Thesis: Construction Management	**P6CO210**	Thesis: Construction Management

RESEARCH TIME: 100%

EB15.13	**PhD: INDUSTRIAL ENGINEERING Research Based (NQF 10)**	**P6INDQ**

EB15.13.1 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.

EB15.13.2 Qualification outcomes
The qualified student will be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** 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.
- **vi.** 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.
- **vii.** 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.
- **viii.** 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.
- **ix.** 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.
- **x.** 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.

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

EB15.13.3 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.

EB15.13.4 Conferment of the degree
The PhD: Industrial Engineering will be conferred on students who have completed the research seminar and thesis successfully.

EB15.13.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6INDQ	Thesis: Industrial	**P6INDQ**	Thesis: Industrial

RESEARCH TIME: 100%

EB15.14	**PhD: ENGINEERING EDUCATION (NQF 10)**	**P6EE0Q**

EB15.14.1 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.

EB15.14.2 Qualification outcomes
The qualified student will be able to:
Upon completion of this programme, a student should be able to:
i. 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.
ii. 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.
iii. 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.
iv. 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.
v. 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.
vi. 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.
vii. 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.
viii. 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.

ix. Demonstrate ethical and cultural sensitivity and awareness across a range of engineering education contexts in the execution of engineering education research/development activities.

EB15.14.3 Admission requirements and selection criteria
An approved master's degree in engineering or engineering education-related discipline.

EB15.14.4 Conferment of the degree
The PhD: Engineering Education will be conferred on students who have completed the research seminar and thesis successfully.

EB15.14.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6UE010	Thesis: Engineering Education	**P6UE020**	Thesis: Engineering Education

RESEARCH TIME: 100%

EB15.15	**PhD: QUALITY ENGINEERING (NQF 10) SAQA: 96969**	**P6QE1Q**

EB15.15.1 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.

EB15.15.2 Qualification outcomes
The qualified student will be able to:
Upon completion of this programme, a student should be able to:

i. 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.
ii. 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.
iii. 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.
iv. 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.
v. 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.
vi. 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.
vii. 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.
viii. 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.
ix. Demonstrate ethical and cultural sensitivity and awareness across a range of engineering education contexts in the execution of engineering education research/development activities.

EB15.15.3 Admission requirements and selection criteria
An approved master's degree in quality / Operations

EB15.15.3 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P60M110	Thesis: Operations Management	**P6OM110**	Thesis: Operations Management

RESEARCH TIME: 100%

EB15.16	PhD: URBAN AND REGIONAL PLANNING (NQF 10) SAQA: 96969	P6UP0Q

EB15.16.1 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.

EB15.16.2 Qualification outcomes
The qualified student will be able to:
Upon completion of this programme, a student should be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** 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.
- **vi.** 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.
- **vii.** 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.
- **viii.** 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.
- **ix.** Demonstrate ethical and cultural sensitivity and awareness across a range of engineering education contexts in the execution of engineering education research/development activities.

EB15.16.3 Admission requirements and selection criteria
An approved master's degree in a related field

EB15.16.4 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6URP10	Thesis: Urban And Regional Planning	**P6URP10**	Thesis: Urban And Regional Planning

RESEARCH TIME: 100%

EB15.17	PhD: Data Science (NQF 10)	P6DS1Q

EB15.17.1 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.

EB15.17.2 Qualification outcomes
Exit level outcomes:
The qualified student will be able to:

- **i.** 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.
- **ii.** 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.
- **iii.** 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.
- **iv.** 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.
- **v.** 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.
- **vi.** 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.
- **vii.** 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.
- **viii.** 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.
- **ix.** 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.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.
- **x.** Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of data science research/development activities.
- **xi.** Explore, where applicable, education and career opportunities in advanced data science research/development.
- **xii.** Organise and develop, where applicable, entrepreneurial opportunities through data science, technical research, development and/or managerial skills.

EB15.17.3 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.

EB15.17.4 Conferment of the degree
The PhD: Data Science will be conferred on students who have completed the research seminar and thesis successfully.

EB15.17.5 Curriculum

First year			
CODE	**MODULE**	**CODE**	**MODULE**
First Semester		**Second Semester**	
P6DS110	**Thesis: Data Science**	**P6DS210**	Thesis: Data Science

RESEARCH TIME: 100%

EB16 MODULE DESCRIPTIONS

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

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

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

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

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

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

M6MRM29	RELIABILITY MANAGEMENT
Calculation Criteria	Final mark weighting = Semester mark (100%)
Credits	15
Purpose	To study specific technology management principles related to the reliability management in the engineering product 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.

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.

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.

SYE9X01	SYSTEMS ENGINEERING
Credits	15
Purpose	Module purpose: To familiarise the student with advance principles and applications of Systems Engineering at post graduate level.
Content	**Module content:** Unit 1 Principles of Systems Engineering Unit 2 Introduction to the Systems Engineering Management Plan Unit 3 Requirements Engineering Unit 4 System Specifications Unit 6 System Safety Unit 7 Dynamic Systems Modelling **Module outcomes:** At the end of the module the students shall be able to apply basic systems engineering processes. At the end of the module the student shall be cable of drafting a Systems Engineering Management Plan At the end of the module the student shall be capable of expressing system requirements At the end of the module the student shall understand specification systems At the end of the module the student shall have a basic understanding of system safety methods and be able to apply them. At the end of the module the student shall understand the basics of systems dynamic modelling and be able to draft basic system dynamic models.

CCM8X02	Construction Materials and Structures		
NQF Level	8	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of this module is to introduce learners to the principles and methodology of designing engineering materials as structural elements.		
Content	▪ Review of basic concepts ▪ Section and shape properties ▪ Stress and strain transformations ▪ Bending moment ▪ Transverse Shear ▪ Torsion of structural elements ▪ Combined loading ▪ Beams deflection ▪ Buckling of columns		

CCP8X02	Construction Planning and Earthworks		
NQF Level	8	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The main purpose of this module is to: • Extend students technical knowledge of construction planning techniques and skills that will enable them to undertake complex projects independently • distinguish between various activities involved in earthworks		
Content	• Project planning and Scheduling practices • Planning and Scheduling Methods • Time and cost over-run in Construction • Earthworks and the environment • Design of cuts an fill • Preparation of the works • Excavation Methods • Health and safety measures in construction • Technical and economics risks associated with earthworks		

CDS8X02	Drainage and Stormwater Management		
NQF Level	8	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of this module is to: • Develop student's ability to plan, design and manage sustainable stormwater drainage systems. • Analyse the impact of stormwater systems on the environment as well as the impact of the environment on stormwater systems. • Train students on the modern philosophy of stormwater management.		
Content	• Definitions of stormwater • The need for stormwater management • Stormwater quantity and quality issues • Drainage regulations for the City of Johannesburg • Effects of Urbanization on stormwater systems • Impacts of stormwater systems on the environment • Modern philosophy of stormwater management. • Planning consideration. • Design consideration.		

CEN8X01	Environmental Management		
NQF Level	8	**Credits**	14
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of this module is to: • Help students understand the physical environment and ecosystems, and highlight impact of civil engineering projects on natural and social environment • Examine environmental problems and sustainable development in Civil Engineering		
Content	• Definition of the environment and its impact on sustainable development • Environmental impact assessment (EIA), social impact assessment (SIA) • Principles and practice of integrated environmental management • Legal framework (South African Environmental Law) • Sustainable development • Resource economics		

CFE8X02	Foundation Engineering		
NQF Level	8	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	Successful completion of this module should equip the learner with detailed knowledge, which is required for the design of shallow and deep foundations.		
Content	• Site Investigations (including safety aspects) • Laboratory and field testing and result analysis • Settlement • Bearing Capacity • NHBRC site designations • Shallow foundations and design • Pile foundation systems and design • Sustainable development aspects		

CTS8X02	Transportation Studies		
NQF Level	8	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of this module is to investigate and develop solutions relating to Transportation Engineering challenges.		
Content	▪ Transportation System Issues and Challenges ▪ Highway Safety ▪ Transit Operations (managing congestion, improving equal access, etc) ▪ Pavement Management (incorporating new technologies etc.) ▪ Mitigation of Environmental Impacts. ▪ Transportation Projects Evaluation (managing aging infrastructure)		

CRM8X01	Research Methodology		
NQF Level	8	**Credits**	14
Semester module, year 1, semester 1			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of this module is to introduce learners to the basic concepts of academic research writing. Learners are expected to learn the act of research report writing in the form of a research proposal submitted in partial fulfilment of the qualification registered for. This proposal is a structured report on a proposed research, in accordance with acknowledged scientific principles and processes, under the supervision of the course lecturer.		
Content	Introduction to Research. Research Proposal. Problem Identification and formulation. Literature Review. Plagiarism and Copyright. Research Approach. Research Strategies. Data collection. Sampling. Referencing and Citation		

CRP8X00	Research Project		
NQF Level	8	**Credits**	42
Year module			
Calculation Criteria	Final Mark = Year Mark (100%)		
Purpose	The purpose of this module is to: • develop student's understanding of the methods of research through the identification, planning, design and execution of an appropriate research project in a chosen field.		
Content	Individual Research and Design project based on a real world Civil engineering problem. Students to produce structured deign and research solutions, under any of the following disciplines:		

	• Transportation Engineering; • Water Engineering; • Structural Engineering or • Any other Civil Engineering related topic.

CSM8X02	**Structural Mechanics**		
NQF Level	8	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The purpose of this modules is to: • advance the student's understanding of structural behavior • Teach student essential concepts of structural mechanics with application in various engineering structures.		
Content	• Theory of elasticity • Theory of elastic failure; • Introduction to:- ▪ Finite elements ▪ Plate theory ▪ Structural dynamics ▪ Buckling of frames		

CWR8X02	**Water Resources Management**		
NQF Level	8	**Credits**	14
Semester module, year 1, semester 2			
Calculation Criteria	Final Mark = Semester Mark (100%)		
Purpose	The main purpose of this module is to: • introduce students to the concepts of planning, developing and implemention of water resources projects and programmes. This module offers students an opportunity to deepen their knowledge in design and management of water infrastructure including water supply		
Content	• Introduction to water resources management • Water Resources Planning • Water and Environmental Law • Water conservation • Water demand management • Water transfer • Intergrated water management • Water Resources Management Policy • Catchment management		

	Construction Law & Contract Administration		
NQF Level	**8**	**NQF CREDITS**	**24**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%) compulsory		
Purpose	This module provides the student the opportunity to apply and understand the Law of Contract and the impact on standard Construction Contracts & ADR		
Content	Students should: Apply knowledge of South African Law, including construction law, to determine and appropriate procedure for various construction projects and cases of dispute. Correctly demonstrate knowledge of the South African Legal system. Correctly apply the fundamental principles of commercial and mercantile law. Demonstrate the correct understanding of Contractual claims, administration of construction contracts and procurement processes.		

	Construction Project Management		
NQF Level	**8**	**NQF CREDITS**	**24**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%) compulsory		
Purpose	This module provides the student the opportunity to understand the application of principles of project Management.		
Content	Students should: Apply construction project management principles to one's own work, as a member and leader in a team and to manage projects. Demonstrate principles of planning, organising, leading and controlling. Correctly illustrate the functions of a team leader. Critically evaluate the role and impact of communication in projects.		

	Human Resource Management		
NQF Level	**8**	**NQF CREDITS**	**12**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%) compulsory		
Purpose	To develop students with the knowledge of current perspectives and procedures in Human Resource Management in the Construction Management Industry.		
Content	Students should: Critically evaluate the current and future role of Human Resource Management processes and principles within the Construction Management Industry. Correctly apply Human Resource Management principles to the Construction Industry. Critically discuss the challenges and benefits of the role of Human Resource Management in the Construction Industry. Demonstrate knowledge of Industrial Relations issues as they pertain to the Construction industry.		

	International Construction		
NQF Level	**8**	**NQF CREDITS**	**12**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%) compulsory		
Purpose	This module provides the student the opportunity to apply knowledge and understanding of construction across borders and internationally		
Content	Students should: Apply international construction systems and techniques. Demonstrate knowledge of international construction techniques. Correctly apply international systems to local scenarios. Contextually illustrate the challenges and benefits of international construction systems or techniques.		

	Professional Practice		
NQF Level	**8**	**NQF CREDITS**	**12**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%) compulsory		
Purpose	The overall objective of this course is to provide the student with the realities of running a professional consultancy practice		
Content	Students should: Correctly calculate Professional scale of fees. Critically evaluate the ID of work. Demonstrate knowledge of the Quantity Surveying Act. Critically evaluate the role of Ethics and professional practice in the discipline.		

	Research Report		
NQF Level	**8**	**NQF CREDITS**	**36**
Calculation Criteria	Final mark weighting = Semester mark (100%) compulsory		
Purpose	This module provides the student the opportunity to undertake an independent piece of research, investigating in depth a subject in which the student has a particular interest and selection.		
Content	Students should: Conduct investigations of broadly defined problems; locate, search and select relevant data from codes, databases and literature. Demonstrate the ability to independently investigate and conduct research within the discipline. Accurately analyse and interpret results to provide valid conclusions.		

	Strategic Management		
NQF Level	**8**	**NQF CREDITS**	**12**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%) compulsory		
Purpose	Strategic Management is all about identification and description of the strategies that managers can carry so as to achieve better performance and a competitive advantage for their organization. An organization is said to have competitive advantage if its profitability is higher than the average profitability for all companies in its industry.		
Content	Students should: Apply alternative methods of construction. Critically evaluate traditional construction methods and processes. Appropriately incorporate sustainable construction practices.		

	Sustainable Construction & Innovation		
NQF Level	**8**	**NQF CREDITS**	**12**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%) compulsory		
Purpose	This module provides the student the opportunity to appreciate and evaluate sustainable construction and innovation in the field.		
Content	Students should: Apply alternative methods of construction. Critically evaluate traditional construction methods and processes. Appropriately incorporate sustainable construction practices.		

PLE8X00	**Property Law & Economics**		
NQF Level	**8**	**NQF CREDITS**	**12**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%) compulsory		
Purpose	This module provides the student the opportunity to apply the principles of Property.		
Content	Students should: Correctly apply the principles of property law using case studies. Critically evaluate the role of Property finance and tax. Apply the appropriate rights related to real estate property. Demonstrate knowledge of the laws dealing with servitudes.		

	Risk Management		
NQF Level	**8**	**NQF CREDITS**	**12**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%) compulsory		
Purpose	This course is intended to develop the knowledge and expertise of a student, that may be required to both manage and minimise risk at all levels is to be an invaluable asset to any contemporary brand or organisation.		

Content	Students should: Critically evaluate the risk management process and its impact on project success. Correctly differentiate between the various types of risk. Robustly develop a risk management plan. Critically evaluate the impact of risk management processes.

	Environmental And Sustainable Construction		
NQF Level	**8**	**NQF CREDITS**	**12**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%) compulsory		
Purpose	This module provides the student the opportunity to evaluate environmental impact, sustainable construction and innovation in the field.		
Content	Students should: Apply alternative methods of sustainable construction. Critically evaluate traditional construction methods and processes and its relation to the environment. Appropriately incorporate sustainable construction practices		

	Construction Management		
NQF Level	**8**	**NQF CREDITS**	**24**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%) compulsory		
Purpose	This module develops a student's ability to apply principles of Construction Management.		
Content	Students should: Apply construction management principles to the process of construction management, both as a team member and team leader. Correctly apply construction management principles to practical issues and problems in the construction industry. Clearly illustrate the roles as a team member and team leader, in the construction management process.		

	Facilities Management		
NQF Level	**8**	**NQF CREDITS**	**24**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%) compulsory		
Purpose	The overall objective of the course is to provide an integrated understanding of the complementary disciplines applicable to the management of real estate assets.		
Content	Students should: Critically evaluate and apply the principles and alternative real estate strategies and corporate real estate strategic value management. Correctly formulate a facilities management plan. Illustrate the application of cash flow, debtors, and cost recovery in buildings. Critically evaluate the function of a facility manager. Demonstrate knowledge of building plans and floor area measurements.		

	Geostatistics		
NQF Level	**8**	**credits**	**14**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	The module is designed develop the student's ability to produce and manage mineral reserves for a mine		
Content	Students should: Analyse geostatistical data using classical and geostatistical methods of valuation: Calculate orebody values using classical and geostatistical methods; Evaluate case-studies based on the principles developed; Calculate cut-off limits for orebodies.		

	Geotechnical Engineering		
NQF Level	**8**	**credits**	**14**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	The module is designed to cover the module content for the Rock Engineering Certificate of Competency. This module will enable the student to analyse, plan and develop support requirements in underground and surface mining operations		
Content	Students should: Analyse efficient mining layouts and designs based on geotechnical fundamentals: Describe ideal mining layouts based on broadly defined design criteria and limited information; Evaluate case-studies based on the principles developed; Calculate safety factors, support requirements and design criteria; Evaluate the risk of support designs; Test support design criteria; Compare monitoring equipment and procedures for efficiency		

	Mine Environmental Design		
NQF Level	**8**	**credits**	**14**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	Ability to demonstrate complex mine planning skills based on broadly defined, geological, mining methods and financial parameters		
Content	Analyse efficient mining layouts and designs based on environmental control fundamentals: Describe ideal mining layouts based on broadly defined design criteria and limited information; Evaluate case-studies based on the principles developed; Calculate design criteria based on broadly defined information; Evaluate the risk of various designs; Test ventilation design criteria		

	Mineral Economics		
NQF Level	**8**	**credits**	**14**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To develop the essential skills of senior officials, policy makers and decision makers in understanding and analyzing of Mineral Economics on a National and corporate level in order to create sustainable economic exploitation of the mineral wealth of a country or corporate entity which will ensure economic stability and social upliftment in the region.		
Content	Students should: Develop an effective economic policy to be incorporated in the mineral policy to ensure sustainable development of mineral resources: Describe the fundamental elements contained in an effective economic policy; Critically analyse current national and corporate policies; Discuss the impact of social and economic requirements on the formulation of an effective mining policy; Identify the fundamental requirements of effective strategy to stimulate investment in mineral resources		

	Mine Planning and Design		
NQF Level	**8**	**credits**	**14**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	The purpose of this module is to raise awareness on health and safety issues related to the working environment.		
Content	Students should: Evaluate various mining methods and designs for optimal reserve extraction: Describe ideal mining layouts based on broadly defined design criteria and limited geological information; Evaluate case-studies based on the principles developed.; Perform a detailed risk analysis of a project (financial, health and safety).		

	Minerals Policy		
NQF Level	**8**	**NQF CREDIT**	**14**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	To develop the critical skills senior officials, policy makers and decision makers in analyzing and developing Mineral policy on a National and corporate level in order to create sustainable economic exploitation of the mineral wealth of a country or corporate entity which will ensure economic stability and social upliftment in the region. Such policy development must be built on clear visions of the requirements for development within the continent.		
Content	Students should: Prepare an outline for an effective mineral policy: Describe the fundamental elements contained in an effective mining policy; Critically analyse current mining policies; Discuss the impact of social and economic requirements on the formulation on a mining policy; Discuss different approaches to mining policy; Identify the fundamental requirements of effective mining policy given specific parameters; Develop a strategy within pre-defined parameters in order to ensure sustainable and economically sound policies		

	Research and Design Project		
NQF Level	**8**	**NQF CREDIT**	**42**
Calculation Criteria	Final mark weighting = Semester mark (100%)		
Purpose	The purpose of this module is to produce a research and design project as experienced in practice in the profession of engineering.		
Content	Students should: Execute an engineering-related research project that investigates a relevant problem within a pre-defined budget and time limit; Design a research statement based on an engineering related problem; Link various aspects of their studies to investigate viable solutions; Independently acquire new theoretical or empirical knowledge; Produce a research project as experienced in practice in the profession of engineering; Produce a coherent, professional report outlaying methodologies used and findings; Communicate the outcomes of the project to engineering audiences; Complete within the specified time allocation; Demonstrate independent research.		

	Mineral Geographic Information Systems		
NQF Level	**8**	**NQF CREDIT**	**14**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	The purpose of the module in Minerals Information Systems and Geographic Information Systems for Mineral Governance will provide the student with an understanding of the various methods of information collection and classification of data for GIS and MIS systems. The understanding of system requirements will enable the student to appraise the efficiency of systems and compare the efficiency of information management systems when evaluating the impact of decision-making tools when formulating mineral industry policies.		
Content	Students should: Evaluate current methods of decision making based on minerals industry information: Appraise current decision making tools used when formulating minerals policies; Argue the benefits and disadvantages of GIS systems within this context; Assess accurately the requirements of MIS and GIS systems and evaluate the benefit of decision making using such systems; Analyse various proposals relating to the implementation of a specific design strategy within the context of a mineral industry problem; Correctly interpret information retrieved from a GIS or MIS system to support a specific decision.		

	Precise Surveying optional		
NQF Level	**8**	**NQF CREDIT**	**14**
Calculation Criteria	Final mark weighting = Semester mark (50%) + Exam mark (50%)		
Purpose	The module is designed to develop the student's ability to apply precise surveying techniques to resolve complex mining activities		
Content	Students should: Evaluate efficient mining layouts and designs based on geotechnical fundamentals: Describe ideal survey networks and methods based on broadly defined design criteria and limited information; Evaluate case-studies based on the principles developed; Design survey networks for precision applications; Evaluate the risk of support designs; Test network design criteria; Compare monitoring equipment and procedures for efficiency		

SYE9X01	**SYSTEMS ENGINEERING**
NQF credits	15
Calculation Criteria	
Purpose	Module purpose: To familiarise the student with advance principles and applications of Systems Engineering at post graduate level.
Content	**Module content:** Unit 1 Principles of Systems Engineering Unit 2 Introduction to the Systems Engineering Management Plan Unit 3 Requirements Engineering Unit 4 System Specifications Unit 6 System Safety Unit 7 Dynamic Systems Modelling **Module outcomes:** At the end of the module the students shall be able to apply basic systems engineering processes. At the end of the module the student shall be cable of drafting a Systems Engineering Management Plan At the end of the module the student shall be capable of expressing system requirements At the end of the module the student shall understand specification systems At the end of the module the student shall have a basic understanding of system safety

	methods and be able to apply them. At the end of the module the student shall understand the basics of systems dynamic modelling and be able to draft basic system dynamic models.

NAME MODULE	NQF LEVEL	CREDITS	MODULE PURPOSE	MODULE OUTCOME	MODULE ASSESSMENT CRITERIA
ADVANCED PROJECT MANAGEMENT	8	20	This module aims to develop a student's project management abilities, such that they are able to apply these skills to the Operations Management Projects.	• Integrate project control into the e-business environment.	• Use sophisticated scoring models, such as the Analytical Hierarchy Process. • Employ financial analyses and options analysis to evaluate the potential for new project investments. • Apply contingency funds for cost estimation.
				• Evaluate traits that are strongly linked to effective project leadership.	• Evaluate the role of leadership within the realm of project success. • Discuss and apply appropriate leaderships skills to effect project completion. • Integrate negotiating techniques to project contracts; • Apply negotiating skills to various stages of project execution.
OPERATIONS MANAGEMENT 5	8	20	This module is aims to enable a student to optimise the management of resources that may fall under the management of the production/operations management department of an organisation.	• Evaluate the improvement of corporate governance and ethics within an organisation.	• Evaluate selected tools and technologies and developing strategic plans • World Class Manufacturing principles are identified and applied in context. • The King 3 report is used as a basis to improve corporate governance.
				• Evaluate the use of green technologies within an organisation.	• Demonstrate an understanding of Environmental legislation (ISO14001) when applied to business scenarios. • Apply green technological methods to improve operations. • Critically discuss the challenges of green technology implementation.
OPERATIONS MANAGEMENT TECHNIQUES 5	8	20	The purpose of this module is to develop students with specific operations management techniques such that they are able to make sound decisions within the operational	• Apply relevant optimisation, simulation, probabilistic and analytic operations management techniques	• Solve a range of operational problems by applying optimisation, simulation, probabilistic and modelling tools and techniques. • Solve network problems using network analysis and optimisation model. • Integrate the techniques learned in relation to high level quality control, decision

			context of an organisation.		making and forecasting scenarios.
				• Discuss and apply game theory	• Students must demonstrate the application of game theory within an operational context. • Students must be able to apply game theory to solve operational issues within the workplace. • Analyse and improve the performance of a physical system using game theory. • Critically evaluate the role of game theory to co-ordinate and integrate multi-party divisions/departments.
MANAGEMENT OF CHANGE	8	20	The purpose of this module is to develop a student's change management capabilities in areas of organisation strategy.	• Evaluate change management processes in relation to strategic intent	• Critically discuss the internal and external drivers and impact of change on projects and the organisational system at large. • Differentiate the ways people respond to change and develop strategies to gain commitment and build stakeholder engagement. • Select and apply appropriate models of change. • Synthesise, and evaluate change management responses for successful .IT-driven organisational change.
				• Formulate SMART change objectives	• Effectively use appropriate change methods, tools and techniques in planning and implementing change. • Discuss the role of information management in relation to organisational change. • Evaluate the role of learning in the change process. • Evaluate the importance of building resilience into organisational processes. • Gain insight into their own personal effectiveness in leading and managing change.
RESEARCH PROJECT	8	40	The purpose of this module is to introduce a student to research within the context of quality management within an organisation.	• Plan and execute an investigative project within the fields of Operations Management.	• Students able to collect data • And carry out research in Operations management. • Demonstrate Presentation and project work skills • Demonstrate data collection methods.
				• Formally report the results of the investigative project along with relevant and practical recommendations.	• Produce a coherent final report of the findings of the project. • Demonstrate integration of knowledge, data collected and findings in relation to theoretical underpinnings of the discipline.

MODULE NAME	NQF LEVEL	CREDITS	MODULE PURPOSE	MODULE OUTOME	MODULE ASSESSMENT CRITERIA	ASSESSMENT METHODS CALCULATION CRITERIA
Advanced Project Management	8	20	This module aims to develop a student's project management abilities, such that they are able to apply these skills to the Operations Management Projects.	• Integrate project control into the e-business environment.	• Use sophisticated scoring models, such as the Analytical Hierarchy Process. • Employ financial analyses and options analysis to evaluate the potential for new project investments. • Apply contingency funds for cost estimation.	Formative: 2 written assessments (1st assessment = 35%, 2nd assessment = 35%); Group assignment (30%) Summative: 1 written final examination (100%) Calc Criteria: Overall weight of formative assessments = 50% Overall weight of summative assessment = 50%
				• Evaluate traits that are strongly linked to effective project leadership.	• Evaluate the role of leadership within the realm of project success. • Discuss and apply appropriate leaderships skills to effect project completion. • Integrate negotiating techniques to project contracts. • Apply negotiating skills to various stages of project execution.	
Integrated Management Systems	8	20	The purpose of this module is to train students to audit management systems in accordance with the guidelines of the current ISO standard at the time.	• Extensive knowledge of quality management systems • Develop and enhance integrated management system audit skills.	• apply the structure of an integrated management framework • Conduct a simulated audit process of integrated quality systems in an organisational setting	Formative: 2 written assessments (1st assessment = 35%, 2nd assessment = 35%); Group assignment (30%) Summative: 1 written final examination (100%) Calc Criteria: Overall weight of formative assessments = 50% Overall weight of summative assessment = 50%
				• Evaluate the structure and purposed of risk management	• Develop integrated management systems policies • Perform risk assessment • Conduct a risk analysis • Formulate and implement an audit process	
Strategic Quality Management	8	20	The purpose of the module aims to develop students to effectively integrate strategic endeavours, policy and	• Apply and evaluate methods and techniques from the quality management subject discipline to solve related problems.	• Evaluating and assessing key principles and processes in the quality management environment and the application of difference strategies.	Formative: 2 written assessments (1st assessment = 35%, 2nd assessment = 35%); Group assignment (30%)

			interventions, that would ensure the success of an organisation.		• Critically evaluate the relevant theories of planning, monitoring and control. • Influence the implementation of change in organisation strategies through successful management of objectives	Summative: 1 written final examination (100%) Calc Criteria: Overall weight of formative assessments = 50% Overall weight of summative assessment = 50%
				• Integrate methods and techniques in relation to quality management principles.	• Solve problems of various types with quality related environment and strategically evaluate solutions • Develop critical skills with regards to strategic planning and synthesizing results	
Ethics in Quality	8	20	The purpose of this module is to provide sufficient knowledge of business law principles and challenges in relation to the success of an organisation.	• provide basic legal advice regarding the choice of business form • provide a framework for ethics in quality management	• differentiate between and compare the legal forms and different types of partnership, company, close corporation and business trust in a practical set of facts • provide written guidance and advice on the choice of an appropriate business form • provide written advice to clients on possible legal developments in respect of the partnership, company, close corporation and business trust	Formative: 2 written assessments (1st assessment = 35%, 2nd assessment = 35%); Group assignment (30%) Summative: 1 written final examination (100%) Calc Criteria: Overall weight of formative assessments = 50% Overall weight of summative assessment = 50%
				• analyse and provide advice on the legal structure of the partnership, company, close corporation and business trust	• provide a written exposition of key legal principles regarding the rights and duties of the different role players in the partnership, the company, the close corporation and the business trust • identify and resolve both basic and complex legal problems regarding the identification and enforcement of the rights and duties of the different role players in the	

					partnership, the company, the close corporation and the business trust • advise a client in writing on both basic and complex legal problems regarding contractual and other relationships between the partnership, company, close corporation and business trust, its internal role players as well as third parties	
Research Project	8	40	The purpose of this module is to introduce a student to research within the context of quality management within an organisation.	• Plan and execute an investigative project within the fields of Quality. • Formally report the results of the investigative project along with relevant and practical Recommendations.	• Students able to collect data • and carry out research in quality management. • Demonstrate Presentation and project work skills • Demonstrate data collection methods. • Produce a coherent final report of the findings of the project. • Demonstrate integration of knowledge, data collected and findings in relation to theoretical underpinnings of the discipline.	Formative: 1 research proposal submission, 1 progress report, and 1 oral presentation (Research proposal = 35%, Progress report = 35%, Oral presentation = 30%) Summative: 1 final project report submission (100%) Calc Criteria: Overall weight of formative assessments = 50% Overall weight of summative assessment = 50%

ADVANCED PROJECT MANAGEMENT	8	20	This module aims to develop a student's project management abilities, such that they are able to apply these skills to the Management Service Projects.	• Integrate project control into the e-business environment. • Evaluate traits that are strongly linked to effective project leadership.	• Use sophisticated scoring models, such as the Analytical Hierarchy Process. • Employ financial analyses and options analysis to evaluate the potential for new project investments. • Apply contingency funds for cost estimation. • Evaluate the role of leadership within the realm of project success.	Formative: 2 written assessments (1st assessment = 35%, 2nd assessment = 35%); Group assignment (30%) Summative: 1 written final examination (100%) Calc Criteria: Overall weight of formative assessments = 50% Overall weight of summative assessment = 50%

					• Discuss and apply appropriate leaderships skills to effect project completion. • Integrate negotiating techniques to project contracts; • Apply negotiating skills to various stages of project execution.	
RESEARCH PROJECT	8	40	The purpose of this module is to introduce a student to research within the context of management within an organisation.	Plan and execute an investigative project within the fields of Management Services	• Students able to collect data and carry out research in Management Services. • Demonstrate Presentation and project work skills • Demonstrate data collection methods.	Formative: 1 research proposal submission, 1 progress report, and 1 oral presentation (Research proposal = 35%, Progress report = 35%, Oral presentation = 30%) Summative: 1 final project report submission (100%) Calc Criteria: Overall weight of formative assessments = 50% Overall weight of summative assessment = 50%
				• Formally report the results of the investigative project along with relevant and practical recommendations .	• Produce a coherent final report of the findings of the project. • Demonstrate integration of knowledge, data collected and findings in relation to theoretical underpinnings of the discipline.	
ETHICS IN QUALITY	8	20	The purpose of this module is to provide sufficient knowledge of business law principles and challenges in relation to the success of an organisation.	• provide basic legal advice regarding the choice of business form	• differentiate between and compare the legal forms and different types of partnership, company, close corporation and business trust in a practical set of facts • provide written guidance and advice on the choice of an appropriate business form • provide written advice to clients on possible legal developments in respect of the partnership, company, close corporation and business trust	Formative: 2 written assessments (1st assessment = 35%, 2nd assessment = 35%); Group assignment (30%) Summative: 1 written final examination (100%) Calc Criteria: Overall weight of formative assessments = 50% Overall weight of summative assessment = 50%
				• analyse and provide advice on the legal structure of the partnership, company, close corporation and business trust	• provide a written exposition of key legal principles regarding the rights and duties of the different role players in the partnership, the company, the	

					close corporation and the business trust • identify and resolve both basic and complex legal problems regarding the identification and enforcement of the rights and duties of the different role players in the partnership, the company, the close corporation and the business trust • advise a client in writing on both basic and complex legal problems regarding contractual and other relationships between the partnership, company, close corporation and business trust, its internal role players as well as third parties	
ORGANISATIONAL EFFECTIVENESS 5A	8	20	This module reviews the criteria for effectiveness at individual, group, and organisational levels, and surveys the diagnostic tools available to assess organisational effectiveness and identify the source of problems at their earliest stage.	• Evaluate Organisation Theory in Action by assessing the Organisation's Environments	• Correctly articulate the role of Strategic Direction in Organisation Design • Illustrate a Framework for Selecting Strategy and Design • Assess Organisational Effectiveness: Traditional Effectiveness Approaches,	Formative: 2 written assessments (1st assessment = 35%, 2nd assessment = 35%); Group assignment (30%) Summative: 1 written final examination (100%) Calc Criteria: Overall weight of formative assessments = 50% Overall weight of summative assessment = 50%
				• Apply designing structure to fit global strategy	• Critically discuss institutionalism (*the institutional view and organisation design, institutional similarity)* • evaluate and critique the impact cultural differences in coordination and control (*national value systems*) • Apply of the transnational model of	

					organisation to case scenarios	
ORGANISATIONAL EFFECTIVENESS 5B	8	20	The module, further, develops ways for leaders to build a case for exploring the organisation's corporate culture and changing it when needed.	• Discuss and evaluate the information technology evolution	• Demonstrate an understanding of impact on organisation design • Demonstrate an understanding of e-business organisation design • Demonstrate an understanding of the level and focus of control systems • Evaluate technological gaps/impediments as change is implemented.	Formative: 2 written assessments (1st assessment = 35%, 2nd assessment = 35%); Individual assignment (30%) Summative: 1 written final examination (100%) Calc Criteria: Overall weight of formative assessments = 50% Overall weight of summative assessment = 50%
				• Analyse the strategic role of change	• Critically discuss elements for successful change • Investigate organisational decisions for change • Apply contingency decision-making framework to case scenarios • Illustrate the impact of change using power, politics, and collaboration • Measure the impact of cultural change on morale, performance, and the bottom line within organisations.	

MODULE NAME	NQF LEVEL	CREDITS	MODULE PURPOSE	MODULE OUTCOME AT THE END OF THIS MODULE, A STUDENT SHOULD BE ABLE TO:	MODULE CONTENT	MODULE ASSESSMENT CRITERIA A STUDENT SHOULD CORRECTLY:
Planning Design & Policy (UPD8X00)	8	18	To sensitise students to the methods and dynamics that help govern modern cities from a Global South perspective. In particular, the module is	• Demonstrate a fundamental understanding of planning concepts as applicable to the governance and operation of metropolitan cities. • Demonstrate an appreciation of the deficits or overtures of	• Strategic Spatial Planning • Metropolitan Planning • Competitive/Entrepreneurial Cities • Power Dynamics/Coproduction • Advanced Drawings,	Show knowledge and understanding of specific concepts as contained under each of the four broad learning areas. Final mark weighting = Semester mark (50%) + Exam mark

			designed to bring to the fore the different tensions, agendas of different stakeholders in the planning processes of city governments. As such, the module is particularly interested in studying the abovementioned issues in metropolitan settings.	theoretical frameworks underpinning metropolitan planning. • Apply different strategies for the improvement of ailing cities from an economic perspective. • Understand and be sensitive to the nuances of power between different stakeholders in cities. • Synthesise models of increasing democracy in city spaces and in governance issues.	Township Layout and Urban Design, CAD, Autocad & Studio Practices.	(50%)
Urban information systems (UIS8X00)	8	18	To introduce the concept of information systems and Geographic Information Systems (GIS), Geographic Information Science (GI Science) and its applications in urban and regional planning fields. The module involves the development and use of planning-related software and the spatial analysis tools and systems (such as GIS, remote sensing) that are becoming increasingly important parts of metropolitan information infrastructures. Planners are increasingly using big data, data into planning and this course also deals with the impacts of	• Understand the historical background, developments and applications of urban information and GIS in urban and regional planning and other fields. • Gain adequate theoretical and practical exposure in handling latest GIS software's. • Able to hand big data and information for use in urban planning • Create web maps • Comprehend planning support systems and develop them • Engage in coding using various software • Contextualize GIS projects, ability to collect, tabulate, present and analyse information in GIS platform to make diagnosis for an urban area as spatial strategies, frameworks and dimensions for large scale and local level urban planning and development process. • Identify GIS project	• UIS-GIS Introduction / Overview • Coordinate Systems • ArcGIS software and cartography + lab session • Data Models + lab session • Data acquisition and remote sensing + lab session • Data science, city knowledge and information systems • Spatial Data Management+ lab session • Web mapping and big data • Data exploration, modeling and land suitability analysis and lab session • Planning support systems and decision support systems in urban planning • GIS applications in urban planning+ lab session Current trends and the future of urban information systems	Student would be assessed in terms of: • Class attendance, module specific assessments, tests • Understanding and practical skills gained in key GIS software's. • Data science • Advanced project work. Final mark weighting = Semester mark (50%) + Exam mark (50%)

			data science on planning's and planning. The course will also equip the students with the science behind GIS and basic principles of remote sensing	components and principles to create an appropriate synthesis in terms of organizing a project from concept to implementation. • Document GIS projects and produce GIS output in terms of maps. • Able to apply appropriate GIS technology and concepts in the process of urban and regional planning and related developmental fields. • Develop skills in GIS and its application areas in urban and regional planning and related matters and be competent in the process of using GIS as a tool for spatial planning and decision support system.		
Research Methodology and Research report (UPR8X00)	8	40	The purpose of this module is to introduce Planning students on how to produce a piece of academic research and requisite skills in academic writing. Research is conducted to prove or disprove a hypothesis or to learn new facts about something / problem. The built environment and the social world are characterized with so many challenges and problems. Research is conducted to gain a better understandin g of some of these challenges or someone or	• Able to understand the meaning of Research, uses and applications in Social Sciences and specifically Urban and Regional Planning in both developed and developing economies. • To formulate a research question and stimulate scholarly debate. • Gain practical experience and skills on how to conduct research and gather information for decision making purposes. • Understan d Research Protocol and how to write research proposal. • Able to search, retrieve and review relevant literatures through several digital data bases. • Be abreast with local and	• Introducti on and meaning of research • Choosing a research topic • Structure of a proposal • The literature review • Methodol ogy • Data collection and analysis • The research report and compilation	At the end of completion of each module, the learner would be assessed on the learning outcomes as explained in previous section under module learning outcomes. Final mark weighting = Semester mark (100%)

			to provide a solution to a problem or insight. It also embraces further debate and discuss on issue of interest or phenomenon. The module seeks to equip students in seven critical areas: with the tools to perform urban and regional planning work in our complex world; building knowledge and efficient learning; Means to understandin g various issues; Ways to prove lies and support truth; Seed to love reading, writing, analysis of information and sharing valuable information in a Professional manner to aid business and advance society. The course would acquaint students with best practices and international guidelines in terms of Research Protocols. The course will also equip the students with best practice on current trends in urban and regional planning on a global scale.	international best practices and guidelines in urban planning research • Contextual ize how to research problems, design studies and how to conduct data collections and synthesis. • To present their findings / results and to share this information in public domain of body of knowledge. • Students will understand the essence of citations and how to reference sources accurately. • Students will be introduced broadly to wider research community in the built environment. • Be abreast with both local and international best practice research guidelines and how to share and exchange knowledge with wider society of professionals. • The students will also learn how to work with supervisors and the relationship that exists thereof.		
Community planning and Environmental management (UCE8X00)	8	18	To introduce and enable the students to comprehend	• Comprehe nd the basic concepts of environment and	• What environmental planning is • Anthropo cene-	At the end of completion of each module, the learner would be assessed on all the learning

			the concept of environmental policy and theory and how it can be used in environmental planning	environmental planning • Conduct ecosystem services assessments, • Utilise PB concept in planning • Apply and comprehend SDGs in urban and regional planning • Apply Landscape ecology in planning • Define climate change and devise a climate change mitigation and adaptation plan • Prepare an environmental plan or strategy • Utilize public participation techniques in environmental planning • Collect environmental data • Apply the landscape approach to planning • Comprehend Anthropocene and how it affects planning Formulate personal theory on environmental planning	Consumption, waste and energy • Ecosystems services • Landscape planning and ecology • Planning for climate change and global and local environmental laws and policies • Planning for sustainable natural resources and land use	outcomes. The student would be assessed in terms of: • Class attendance, module specific assessments, tests Final mark weighting = Semester mark (50%) + Exam mark (50%)
Land, Infrastructure and Transport Planning (ULT8X00)	8	18	The purpose of this module is to provide a deeper understanding of the land, infrastructure, and transport planning sector. The module acquaints students with understanding regarding various aspects of land planning and development, urban infrastructure and service delivery and transport planning domains at the national, provincial, and local levels and provides	• Demonstrate understanding of conceptual knowledge of land development, urban infrastructure, services delivery, and urban transportation and its significance in the provision of sustainable cities. • Reflect on various types of land, infrastructure, and transport planning and development approaches in creating integrated development of cities. • Analyze case studies on urban land development, urban infrastructure and service delivery, and transport planning	• Land Development • Urban Infrastructure and Services • Transport Planning and Development	Assessment opportunities will be given to students in areas of theoretical and applied knowledge in areas of specialised themes completed as part of the contact sessions, assignments, case studies, and discussions. Final mark weighting = Semester mark (50%) + Exam mark (50%)

			learners with the necessary knowledge, skills, and competencies. The students would be equipped thoroughly in several thematic domain areas of these sectors to apply the knowledge, skills, and competencies gained in planning and integrated development of cities. The module unpacks the critical themes around sustainable land development and takes through different approaches towards urban infrastructure and service delivery for land development, and its integration with transport planning. The module also engages students on real-world problems and case studies, which enables learners to apply knowledge, skills, and competencies in areas of identification, assessment, planning, and development, designing and implementation of sustainable solutions in areas of integrated land	and identify key challenges and opportunities for sustainable development. • Demonstrate understanding of programmes, project development, technologies and government policies on land development, infrastructure, and transport planning. • Appraise and conduct case study analysis of projects to evaluate economic/ technical feasibility. • Propose effective strategies to improve the impact of sustainable urban land development, infrastructure, and transport planning towards effective, efficient and productive cities. • Demonstrate a high level of understanding of city/ urban complexities and effective master planning approaches and strategies for integrated development. • Apply urban development principles to make contemporary cities more sustainable towards 'integrated and smart sustainable cities.		

			development, infrastructure, and transport planning at city-wide and in the regional context.			
Urban Planning Theory and Professional Practice (UTP8X00)	8	18	This module introduces students to contemporary thinking on the urban planning profession as well as the ethics guiding the profession. As an Honours module, the course is aimed at preparing students for the 'world of work' in various sectors, i.e., civil society, the government as well as private enterprises. As such, the module strives to bring together both theories and practicals critical for the realisation of the aim.	• Have a sound understand professional conduct and ethics in planning. • Have a sound understanding of the world of work as well as professional conduct expected of planners. • Running a successful urban and regional planning practice. Working as part of a multidisciplinary team within the built environment profession.	• Planning theories & their application to planning practices • Professional ethics & planning practice • Planning in a corporate environment • Planning in the public sector • Planning in civil society Principles of project management in planning	Assignments and tests will be scored based on their merit, taking into account the soundness, logic and coherence of the argument(s) presented Final mark weighting = Semester mark (50%) + Exam mark (50%)
Total Credits:	130					

MODULE NAME	NQF LEVEL	CREDITS	MODULE PURPOSE	MODULE OUTCOME AT THE END OF THIS MODULE, A STUDENT SHOULD BE ABLE TO:	MODULE CONTENT	MODULE ASSESSMENT CRITERIA A STUDENT SHOULD CORRECTLY:
ENGINEERING MATHEMATICS AND COMPUTING	8	14	This module will provide an overview of the practical application of advanced engineering mathematical and computing techniques.	• Apply Modelling and optimisation tools to engineering problems	• Markov-analysis • Monte Carlo simulations • Deterministic and Stochastic models • Programming languages such as C / C++/ Java • Software and database design	• Demonstrate the application of Markov-analysis • Apply Monte Carlo simulation • Discuss and evaluate Deterministic and Stochastic models • Implement Programming C / C++/ Java • Demonstrate the application of software and database design Final mark weighting = Semester mark (100%)

				• Formulate and solve mathematical and programming problems	• Numerical analysis methods • Modeling and Optimization processes • Probability and Statistics	• Illustrate various Numerical analysis methods • Demonstrate Modeling and Optimization processes • Evaluate and apply Probability and Statistics in given case scenarios
ADVANCED CHEMISTRY	8	14	The purpose of this module is to provide students with common analytical and characterization skills so that they can be able to use these techniques in their experimental research.	• Identify and apply appropriate characterization techniques related to a particular system.	• Spectroscopic techniques such as IR, UV; XRD, XRF • Thermal analysis methods such as TGA, DCS • Microscopic analysis techniques such as TEM, SEM Liquid and gas analysis techniques	• Correctly evaluate Spectroscopic techniques: IR, UV; XRD, XRF • Critically evaluate Thermal analysis: TGA, DCS, • Critically evaluate Microscopic analysis: TEM, SEM • Correctly compare Liquid and gas analysis techniques Final mark weighting = Semester mark (50%) + Exam mark (50%)
OCCUPATIONAL HEALTH AND SAFETY	8	7	The purpose of this module is to raise awareness on health and safety issues related to the working environment.	• Critically evaluate occupational health and safety legislation;	• Occupational Health and Safety Legislation • Industrial Hazards • Monitoring Hazardous Substances • Risk Assessments • Workplace Control • Risk Mitigation Strategies	• Demonstrate an understanding of Occupational Health and Safety Legislation; Industrial Hazards (Recognition and identification, Risk and exposure, Clearance Mechanisms, Adverse health effects); Monitoring Hazardous Substances (Sampling and evaluation, Quality control, Health surveillance, Hazardous substances handling-MSDS); Risk Assessment (Task analysis, Incident Investigation-Root cause analysis;); Workplace Control (Ventilation, Noise, respirators); • Identify and evaluate the impact of risks and exposure to hazardous situation • Appropriately propose mitigation strategies. Final mark weighting = Semester mark (50%) + Exam mark (50%)
ADVANCED REACTION ENGINEERING	8	14	The purpose of this module is to provide appropriate skills that will enable students to understand the complexity associated with industrial chemical reactors.	• Critically evaluate complex chemical reaction mechanisms and kinetics.	• Complex chemical reaction mechanisms and kinetics • Bio-reactions and bioreactors • Multiphase reactive systems • Reactor design and stability • Computational tools	• Correctly demonstrate complex chemical reaction mechanisms and kinetics. • Correctly illustrate Bio-reactions and bioreactors engineering • Transport effects in multiphase reactive systems. • Advanced reactor design and stability, including consideration of the energy balance. Appropriately apply computational tools for reaction engineering Final mark weighting = Semester mark (50%) + Exam mark 50%

ADVANCED ENVIRONMENTAL ENGINEERING	8	14	The purpose of this module is to develop environmental awareness such that students consider environmental impact during process development phase.	• Evaluate the environmental impact of chemical processes and identify alternative processes that can minimize emissions.	• Environmental Assessments • Industrial ecology • Sustainable engineering • Wastewater treatment • Solid waste management • Air quality monitoring and modelling • Water and wastewater minimisation	• Demonstrate an understanding of Environmental Assessments (EIA, life cycle assessments etc); • Correctly evaluate the relationship between Industrial ecology and sustainable engineering; • Critically evaluate Wastewater treatment; • Critically evaluate Solid waste management; • Correctly analyse Air pollution control (Air quality monitoring and modelling); • Critically evaluate Water and wastewater minimisation (drinking and wastewater treatment); Wetlands for Quality; Solid waste management Final mark weighting = Semester mark (50%) + Exam mark (50%)
ENGINEERING MANAGEMENT	8	14	To introduce students to principles of management and leadership in a technical environment.	• Differentiate the different roles of management in an engineering environment	• Maintenance Management • Project Management • Management Information Systems • Logistics and Supply Chain Management • Quality Management • Occupation Health and Safety • Production Engineering	• Demonstrate the link, impact and relationship of the following areas of management, in relation to each other: Maintenance Management, Project Management, Management Information Systems, Logistics and Supply Chain Management, Quality Management, Occupation Health and Safety, Production Engineering • Leadership and Organizational Behaviour must be evaluated as applied in a project.
				• Evaluate the financial and human resource performance of an organisation	• Inventory Management • Financial and human resources • Case studies	• Inventory Management must be applied in given case scenarios • The impact, challenges and benefit of financial and human resources must be in-depthly discussed. • Financial and human resource processes within engineering projects must correctly applied to given project scenarios.
ENERGY SYSTEMS	8	14	The purpose of this module is to illustrate the importance of energy in the society and worldwide developments in the energy sector with all requirements towards sustainability and environmental protection. The course covers energy supply and consumption, discusses resources of fossil and renewable	• Analyse energy systems in relation to development of urban and rural areas.	• Conventional Electric Power Generation Technologies • Efficiency and impacts of fuel resources • Alternative Generation Technologies • Energy systems management • Innovative and Sustainable Energy Engineering	• Correctly illustrate Conventional Electric Power Generation Technologies, • Critically evaluate the efficiency and impacts of fuel resources • Critically evaluate the emergence of Alternative Generation Technologies • Demonstrate a thorough understanding of Energy systems management and its integration • Critically reflect on Innovative and Sustainable Energy Engineering **Final mark weighting = Semester mark (50%) + Exam mark (50%)**

			energies, and describes technologies of fuel exploration and the variety of energy conversion technologies in large, medium and small scale.			
BIOCHEMICAL ENGINEERING	8	7	This course aims to prepare learners to work with materials, systems, and processes that interact with living organisms and biomaterials. It deals with the interaction of biochemistry, microbiology, reactor design and analysis, and transport phenomena.	• Critically evaluate biochemical processes and explore opportunities for energy generation from wastes.	• Biochemical pathways • Kinetics of enzyme-catalyzed reactions • Enzymes • Michaelis-Menten kinetics • Fundamental kinetics • Microbial genetics and mutant populations • Bioreactors (batch, continuous-flow stirred-tank, tubular and tower reactors)	• Correctly map Bio chemicals: biochemical pathways. • Correctly analyse the Kinetics of enzyme-catalyzed reactions: Enzymes, Michaelis-Menten kinetics, and fundamental kinetics. • Correctly illustrate the commercial application of microbial genetics and mutant populations. • Critically evaluate the design and analysis of bioreactors: continuous-flow stirred-tank, tubular and tower reactors, and batch and continuous bioreactors. **Final mark weighting = Semester mark (50%) + Exam mark (50%)**
RESEARCH PROJECT	8	42	The purpose of this module is to produce a research project as experienced in practice in the profession of engineering.	• Execute an engineering-related research project that investigates a relevant problem within a pre-defined budget and time limit	• Designing a research statement • Investigation of viable solutions • Project specific theoretical or empirical knowledge	• Design a research statement based on an engineering related problem. • Links various aspects of their studies to investigate viable solutions. • Independently acquires new theoretical or empirical knowledge.
				• Produce a research project as experienced in practice in the profession of engineering.	• Report writing • Presentation skills	• Produce a coherent, professional report outlaying methodologies used and findings. • Communicate the outcome of the Research Project to engineering audiences. • Complete within the specified time allocation. • Demonstrate independent research. Final mark weighting = Semester mark (100%)
Total Credits:		(6)				

MODULE NAME	**NOF LEVEL**	**CREDITS**	**MODULE PURPOSE**	**MODULE CONTENT**	**MODULE OUTCOME** (Refer to Blooms and SAQA Level Descriptors) Pitch outcome at correct	MODULE ASSESSMENT CRITERIA

					level of competence (1 or 2 outcomes per module)		What evidence will there be to prove competence of outcome? i.e. What specific aspect will be tested? (2X per outcome)
Engineering Mathematics and Computing	8	14	This module will provide an overview of the practical application of advanced engineering mathematical and computing techniques.	• Numerical analysis methods • Modeling and Optimization • Probability and Statistics • Scientific Programming and Applications • Markov-analysis • Monte Carlo simulation • Deterministic and Stochastic models • Constrained optimization • Goal Programming • Programming C / C++/ Java • Software and database design.	On completion of this module students should be able to: • Formulate and solve mathematical and programming problems • Modelling and optimization of engineering problems • Implement various algorithms on a computing platform	Continuous Assessment will be used for this module. Students will be assessed through: • Tests • Projects • Assignments and • Computer labs
Energy Physics	8	14	This module will focus on conceptual understanding of the conversion, storage, and transmission of energy in its various forms.	• Photovoltaics • Solar Concentrators • Wind Energy • Nuclear Energy • Principles of Fuel Cells • Power Plants • Hydroelectric Generation • Geothermal Energy • Bio-fuels • Fossil fuels • Transmission and Distribution of Electricity	On completion of this module students should be able to: Distinguish the different ways of energy generation, application, transmission and distribution.	Continuous Assessment will be used for this module. Students will be assessed through: • Tests • Projects • Assignments Compulsory Final mark weighting = Semester mark (50%) + Exam mark (50%)
Research Methodology II	8	14	The purpose of the module is to provide students with tools and techniques for conducting research and producing technical reports within a given time frame.	• Development of research proposals • Literature review • Research projects structuring and planning • Research and project reporting • Citation, referencing and plagiarism • Design of Experiments • Data Analysis using Statistical techniques such as ANOVA • Research Ethics	On completion of this module the student should be able to: • Write a formal research project proposal • Review technical literature including journals and conference articles and books, and systematically document that review • Identify the research gaps and define the scope and objectives of his/her research • Design and plan experiments • Perform analysis of data and check statistical fitness • Derive conclusion and explain trends/effects Identify and include ethical aspects related to the research problem/project.	Continuous Assessment will be the method to assess this module. • Assignments which may include: Review of past work in terms of Literature Review Oral Presentation based on that Review Mini Project proposal • Assignment/Test based on Design of Experiments and Data Analysis Problems

Manufacturing Planning and Control Systems	8	14	The purpose of the module is to provide students with knowledge of tools and techniques that improves manufacturing processes with a focus on reduced costs, increased efficiency and enhanced reliability.	• Manufacturing planning and control • Enterprise resource planning • Demand management • Sales and operations planning • Master production scheduling • Material requirements planning • Capacity planning and management • Production activity control • Advanced scheduling • Distribution requirements planning • Order point inventory control methods • Strategy and MPC system design	On successful completion of this module, students will be able to: • To design a manufacturing planning and control (MPC) system that suit a company's needs.	Students will be assessed through: • Tests • Assignments • Examination Final mark weighting = Semester mark (100%)
Supply Chain Processes	8	14	The purpose of the module is to provide students with knowledge of supply chain processes that focusses on important business functions within the company and across the network that make-up the supply chain.	• Customer relationship management process • Supplier relationship management process • Customer service management process • Demand management process • Order fulfilment process • Manufacturing flow management (planning and control) processes • Product development and commercialisation process • Return management process	On successful completion of this module, students will be able to: • To analyse integrated supply chain processes that coordinates both the company's internal and external activities • To identify strategic and operational supply chain processes • To organise and analyse key supply chain performance measurements	Students will be assessed through: • Tests • Assignments Final mark weighting = Semester mark (100%)
Enterprise Architecture	8	14	The purpose of the module is to provide students with knowledge of purpose, structure and functioning of enterprises, (public, private and non-profit), including systems and technologies that supports them.	• Systems Engineering and Design • Enterprise Architecture and Design • Enterprise Modelling • Application of Enterprise Architecture • Future Trends in Enterprise Architecture • Change Management	On successful completion of this module, students will be able to: • To identify systems analysis and design • To identify and analyse business strategy and planning • To analyse component-based and service oriented architectures • To relate change management to business activities	Students will be assessed through: • Tests • Assignments • Examination Final mark weighting = Semester mark (100%)
Engineering and Society	8	14	This module will prepare students for the working environment and the understanding of the code of practice in the engineering profession	• Work Motivation and Job Design • Individual Differences • Work Attitudes • Leadership • Groups, Teams and Teamwork	On completion of this module students should be able to: • Understand the roles and responsibilities of an engineer • Relate engineering activities to environmental, social and economic impacts	Continuous Assessment will be used for this module. Students will be assessed through: • Projects • Case Study Assignments (Compulsory module)

				• Culture and Change • Positive Impact of Work • Role of engineering in society • Contracts and law • Codes of practice • Environmental impacts and social responsibility	• Understand basic knowledge of psychology in the workplace	Final mark weighting = Semester mark (100%)
Research and Design Project	8	42	A research and design project must comprise substantial individual work identifying, formulating, analyzing, and solving a complex engineering problem and completing an appropriate engineering design. Students must demonstrate achievement of specified graduate attributes through oral presentations and written reports.	Advanced research topics in industrial engineering as proposed by staff members in the department from year to year.	After completing this module, the student should be able to complete an engineering research project as typically experienced in practice. This will require that the student: • Professionally executes an investigation within a pre-defined budget and time limit; • Applies the knowledge he/she has acquired thus far during his/her studies in order to solve the problem that is presented to him/her; • Acquires, by his/her own effort and initiative, new theoretical or empirical knowledge required to master the task; • Communicates the outcome of the Research Project to engineering audiences and to the community in general.	Continuous Assessment will be used for this module. Students will be assessed through: • Progress report assessment • A publishable manuscript • Oral presentation of the manuscript in a symposium

MODULE NAME	NQF LEVEL	CREDITS	MODULE PURPOSE	MODULE OUTCOME AT THE END OF THIS MODULE, A STUDENT SHOULD BE ABLE TO:	MODULE CONTENT	MODULE ASSESSMENT CRITERIA A STUDENT SHOULD CORRECTLY:
Power Systems and High Voltage Engineering	8	14	The purpose of Power Systems and High Voltage Engineering is to apply basic principles (circuit law, steady state and transient response, magnetic circuits, etc.) to complex design and analysis of power transmission systems under both steady and transient state conditions; unsymmetrical faults and protection components;	• To evaluate design criteria for performance analysis of long transmission lines; • To apply relevant techniques associated with load flow techniques; • To determine the magnitude and phase of prospective unsymmetrical fault currents and surge or transient	• Design and Performance of Transmission Lines • Power Flow Analysis • Unsymmetrical Faults and system Protection • Transient Overvoltage Phenomena and Insulation Coordination in Power Systems • Transient Stability and Power system Controls • Economic Operation and State Estimation of Power Systems	• To correctly evaluate the performance of transmission lines under both steady and transient states using complex models • To apply appropriate models to determine power flow and losses between different bus bars • To correctly predict the magnitudes

			control and stability; and insulation coordination.	currents in order to design and implement correct protection; • To analyse power system control and stability problems		of unsymmetrical faults using appropriate models • To correctly apply the equal area criterion in stability problems
Total Credits:		0				

RESEARCH PROJECT	8	42	The purpose of this module is to produce a research project as experienced in practice in the profession of engineering.	• Execute an engineering-related research project that investigates a relevant problem within a pre-defined budget and time limit • Produce a research project as experienced in practice in the profession of engineering.	• Designing a research statement • Investigation of viable solutions • Project specific theoretical or empirical knowledge • Report writing • Presentation skills	• Design a research statement based on an engineering related problem. • Links various aspects of their studies to investigate viable solutions. • Independently acquires new theoretical or empirical knowledge. • Produce a coherent, professional report outlaying methodologies used and findings. • Communicate the outcome of the Research Project to engineering audiences. • Complete within the specified time allocation. • Demonstrate independent research.
Electromagnetic Field theory & Waves (EFW8X02)	8	14	• This module is designed to analyze time-varying electromagnetic fields and waves. The successful learner will be able to describe, discuss, design, analyze and evaluate key • Concepts, techniques, devices and	• Apply ELECTROMAGNETIC FIELD THEORY AND WAVE concept, to solve electronics communication signal design well-defined engineering problem. • Apply ELECTRIC FIELD INTENSITY THEORY, MAXWELL'S EQUATIONS [Electrostatics] to	• Introduction to fundamental field theory and laws • Coulomb's law electric field intensity • Time varying field and Maxwell equations • The uniform plane wave • Plane wave at boundaries and in dispersive media • Transmission lines	• The demonstration design ability of a working project, with knowledge and understanding in terms of appropriate techniques, resources and with engineering professionalism in electromagnetic field theory and wave propagation. • The demonstration of knowledge and understanding in

			systems relating to electromagnetic field wave propagation and antenna radiations.	analyze electromagnetic wave signal in different media of communication • Understand and demonstrate the concept and techniques of TIME VARYING FIELD AND MAXWELL'S EQUATIONS. • Demonstrate the concept of UNIFORM PLANE WAVE PROPAGATION AND WAVE POLARIZATION, and apply the knowledge gain to solve well defined associated engineering problem. • Understand the different types of TRANSMISSION-LINES and the associated parameters. • Apply knowledge gain in RADIO WAVE PROPAGATIONS characteristics to RF signal attenuation problem in terms of receive power and transmitted power. Conduct simple measuring and testing activities on RF communication links. Explained and demonstrate understanding of ELECTROMAGNETIC WAVEGUIDES • and the different types of WAVEGUIDES • Understand the different types of ANTENNAS and the principle of antenna radiations. • Understand the basic ANTENNA OPERATION PRINCIPLES AND DESIGN.	• Wave guides and antennas fundamentals	terms of modern engineering tools including QUICK FIELD Simulation tool for the solution of well-defined electromagnetic field theory and waves propagation problems • Personal, social, economic, cultural values and requirements are taken into consideration for those who are affected by the engineering activity. • Demonstrate and show awareness of the limitations, restrictions, premises, assumptions and constraints in implementing the GA 9 stated above. • Engineering Professionalism: Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of engineering technology practice.
ENGINEERING AND SOCIETY	8	14	A purpose of this module is to prepare students for a rewarding practice in a highly demanding working world,	• Execute the engineering role with an understanding of the connection between the engineering and society	Entrepreneurship • Corporate Governance • Environmental Issues • Impact of	• Demonstrate knowledge of • The engineering practitioner lifecycle • Engineer's responsibility in an

			roles of engineers in an organization, the importance of an engineering lifecycle, being aware of the current needs of society, the importance to address environmental issues and to deal with other factors for example climate change, etc.	• Engage students to professional registration • An ability to practice independently and transform the built environment	Engineering in Society • Ethics • Report writing • Presentation skills	organization and society • History and future impact of engineering • Engineers as entrepreneurs • Environmental impact of engineering in Society • Professionalism • Produce a coherent, professional report outlaying methodologies used and findings. • Communicate the outcome of the Research Project to engineering audiences. • Complete within the specified time allocation • Demonstrate independent research.
RESEARCH METHODOLOGY	8	14	To introduce the learner to research methodology providing the learner with skills to perform academic research.	• Contrast different types of research. • Articulate what theory is. • Contrast deductive and inductive theorising. • Provide a detailed strategy for a theoretical framework. • Distinguish between independent and dependent variables. • Propose a research hypothesis. • Perform a literature review. • Construct logical arguments and problematise a research topic. • Utilise different sampling methods. • Provide a methodology that aligns to the research approach. • Perform academic citations and referencing. • Understand ethical behaviour in research.	• Research paradigms • Research questions • Aims of research • Ethics in research • Formulating a hypothesis • Research rationale • Literature review • Constructing arguments • Sampling methods • Quantitative data collection • Validity and reliability • Limitations • Referencing • Proposal writing	• Correctly differentiate between different research paradigms and their methods. • Critically analyse research designs. • Create logical and coherent research proposals that follow the quantitative approach. • Perform descriptive and inferential statistics.

Advanced Digital Communication	8	14	The purpose of this module is to provide students with a sound knowledge in a sub-field of Telecommunications called digital communications. This module will enable students to understand how information is communicated via digital transmission, starting from the anologue signal which is sampled and digitized for digital transmission.	• Assemble the blocks of a digital communications system and explain their function. • Apply the theory of Fourier series to the analysis of signals. • Use the theory of probability to describe, analyse and evaluate signals and noise in telecommunications • Critically evaluate the process of sampling an analogue signal • Create line codes of sampled data • Critically evaluate a given error correcting coding scheme to correct errors in transmission • Distinguish different bandpass digital modulation schemes and give an analysis of their differences.	• Digital communications (Introduction) • Periodic and transient signals. • Random signals and noise. • Analog to digital Sampling techniques. • Baseband transmission and line coding. • Optimum filtering for transmission and reception. • Information theory concepts and coding. • Bandpass digital modulation.	• Assemble blocks of a digital communication system • Apply signal processing theory and concepts to analyse telecommunications signals • Apply probability theory to analyse and evaluate the performance of a telecommunications system in the presence of noise. • Assess the performance of source coding and error correcting codes (block codes) in a communications system. • Differentiate between baseband and bandpass modulations and also tell apart the different bandpass modulations based on their performance.

DIGITAL SIGNAL PROCESSING	8	14	**The purpose of this module is:** to give to student some knowledge in the basic concepts underlying linear discrete-time systems, sampling of analogue signals, difference equations, convolution summation, z-transform, frequency response, digital Fourier transform techniques and digital filters.	**To** critically evaluate information sources; identify, respond to and devise solutions to problems; understand basic design problems and utilize a variety of methods in their solution; use knowledge of basic science , IT and engineering fundamentals to solve complex problems	**Introduction to Digital Signal Processing** Digital Signal Processing, basic Digital Signal Processing Examples in Block Diagrams, overview of Typical Digital Signal Processing in Real-World Applications, and digital Signal Processing Applications **Signal Sampling and Quantization** Sampling of continuous signal, signal Reconstruction, analog-to-Digital Conversion, Digital-to-Analog, Conversion, and Quantization **Discrete-Time Signals and**	**There will be three tests**. Each of 90 minutes duration and 50 Marks and above. Two/Three software based practical will be given. You are required to do all the practical. You will be required to pass (i.e get 50%) in all the practical. **Students are assessed on the abilities to:** a) represent analog signals in their digital format; (b) apply digital signal processing techniques to the analysis of signals and systems; (c) design FIR and IIR digital filters for extracting and modifying signals; (d) employ the DFT and window techniques for spectrum estimation; (e) design and implement a variety of DSP algorithms in Matlab; or other related application programs

					Systems Discrete-Time Signals, discrete-Time Systems , analysis of Discrete-Time Linear Time-Invariant systems , discrete-Time Systems Described by Difference Equations And Implementation of Discrete-Time Systems **Discrete Fourier Transform and Signal Spectrum** Discrete Spectrum and Power Spectrum , amplitude Spectrum and Power Spectrum , spectral Estimation Using Window Functions and application to Speech Spectral Estimation **The z-Transform** Definition , properties of the z-Transform R,ational z-Transforms and Inversion of the z-Transform **Frequency Analysis Of Signals And Systems** frequency Analysis of Continuous-Time Signals, frequency Analysis of Discrete-Time Signals, frequency-Domain and Time-Domain Signal Properties and Properties of the Fourier Transform for Discrete-Time Signals	

					Frequency Domain Analysis Of Lti Systems Frequency-Domain Characteristics of Linear Time-Invariant Systems , Frequency Response of LTI Systems , Correlation Functions and Spectra at the Output of LTI Systems and linear Time-Invariant Systems as Frequency-Selective Filters **The Discrete Fourier Transform: Its Properties And Applications** Frequency Domain Sampling: The Discrete Fourier Transform ,Properties of the DFT **Design Of Digital Filers** General Considerations and design of FIR Filters	

Power Electronics	8	14	Power electronics is an essential in many everyday consumer devices and industrial applications. This technology ranges from switched-mode power supplies in consumer electronics on the low-power end, to converters in industrial drives on the high-power end. This course is intended to introduce the student to advanced power	• To analyse advanced power electronics circuits • Apply power electronics circuits knowledge in the design of power electronic converter circuits for AC-DC, DC-DC and DC-AC power conversion.	• Semiconductor Physics, Power Switching Devices • Motor control general concepts, drive components selection criteria • DC Motor drives, DC Motor Operating Modes, Braking Control Modes (Power Control, Regenerative Brake Control, Rheostatic Brake Control, Combine Brake Control) • Controlled Rectifiers Review, Half Wave Converter Drives, Semi-Converter Drives, Full Wave Converter Drive	• Demonstrate knowledge and understanding of Semiconductor devices, Drives Introduction, DC Drives • Demonstrate knowledge, understanding and design of Single Phase and 3 Phase Drives • Demonstrate knowledge, understanding and design of Regulators • Demonstrate knowledge, understanding and design of Convertors

			electronics circuits, with more emphasis given on design. The course will be introduce to the design of power electronic converter circuits for AC-DC, DC-DC and DC-AC power conversion.		• Buck Regulator, Boost Regulator, Buck-Boost Regulator • Flyback Convertors, Forward Convertors, Push-Pull Convertors, Half Bridge Convertors, Full Bridge Convertors	

NETWORKS	8	14	The purpose of this module is to provide students with current knowledge required in the fielding of networking communication systems. This module will enable students to understand gain a true understanding of the role of networks, starting from the basic concepts like IP addressing, to advanced concepts like network security.	• To evaluate the greater role of networks as they operate presently and in the future. • To analyse the roles and relationships among legacy networks, contemporary networks and futuristic networks.	• Review of Networking Fundamentals • Modern IP Addressing • Fundamentals of Internet-of-Things (IoT) Networks • Overview of Network Management • Network Management Protocols • Introduction to Network Security and Cryptography • Introduction to Blockchain Networks and Technology	• To critically evaluate the greater role of networks as they operate presently and in the future. • To demonstrate a wide understanding of the roles and relationships among legacy networks, contemporary networks and futuristic networks.

MECHATRONICS	8	14	In this course, the student will be exposed to facets of Automation and Control. This industry involves many different elements, and this module aims to expose the student to one of many widely used PLC programming languages which is Ladder Logic. Additionally, the students will do work in mechanical designs and movement using Laplace theories. The student will learn what Ladder Logic is and complete a series of projects of Unitronic PLC stands. The student will also be able to derive movement equations which can then be	• Formulate and solve movement systems using Laplace and Matlab • Understand what Ladder Logic is and be able to use it. • Formulate solutions to vague descriptions of Digital Logic using Ladder Logic • Formulate solutions to vague descriptions of mixing systems using drum sequencer. • Recording and processing of parameters in Ladder Logic using Data tables and SD Cards • Be able to research and report on other HMI as well as Ladder Logic elements not specifically covered in this course • Develop full Ladder Logic solutions using physics and available components in a simulated format.	• PLCs • Ladder Logic introduction • Digital Logic using Ladder Logic • Timers • Linearization • Data tables • SD Card usage • Movement analysis using Laplace and Ladder Logic	• Demonstrate usage of Unitronics PLCs • Development and implementation of Digital Logic in Ladder Logic • Development and implementation of data tables and SD Cards • Development of full Ladder Logic solutions from a vague description using physics • Able to research and report on other Ladder Logic and HMI elements not covered in the course.

			controlled using PLCs through introductory lectures			

ENGINEERING MATHEMATICS AND COMPUTING	8	14	This module will provide an overview of the practical application of advanced engineering mathematical and computing techniques.	• Apply Modelling and optimisation tools to engineering problems	• Markov-analysis • Monte Carlo simulations • Deterministic and Stochastic models • Programming languages such as C / C++/ Java • Software and database design	• Demonstrate the application of Markov-analysis • Apply Monte Carlo simulation • Discuss and evaluate Deterministic and Stochastic models • Implement Programming C / C++/ Java • Demonstrate the application of software and database design
				• Formulate and solve mathematical and programming problems	• Numerical analysis methods • Modeling and Optimization processes • Probability and Statistics	• Illustrate various Numerical analysis methods • Demonstrate Modeling and Optimization processes • Evaluate and apply Probability and Statistics in given case scenarios

ENERGY SYSTEMS	8	14	The purpose of this module is to illustrate the importance of energy in the society and worldwide developments in the energy sector with all requirements towards sustainability and environmental protection. The course covers energy supply and consumption, discusses resources of fossil and renewable energies, and describes technologies of fuel exploration and the variety of energy conversion technologies in large, medium and small scale.	• Analyse energy systems in relation to development of urban and rural areas.	• Conventional Electric Power Generation Technologies • Efficiency and impacts of fuel resources • Alternative Generation Technologies • Energy systems management • Innovative and Sustainable Energy Engineering	• Correctly illustrate Conventional Electric Power Generation Technologies, • Critically evaluate the efficiency and impacts of fuel resources • Critically evaluate the emergence of Alternative Generation Technologies • Demonstrate a thorough understanding of Energy systems management and its integration • Critically reflect on Innovative and Sustainable Energy Engineering

GENERALISED THEORY OF ELECTRIC MACHINES	8	14	The purpose of this module is to give the student a practical and advanced working knowledge of electric machines: -their steady state and transient characteristics, performance, and applications. It further equips the student with fundamental knowledge in design and modelling of electric machines for various applications such as: -Electric and Hybrid Electric Vehicles, Generators for fossil and renewable energies etc. It also enables the student to be in the state of readiness for either master's research or course work in the field of electric Machines.	• Interpret and analyse Electric Machines steady-state and transient characteristics. • Design and Model Electric Machines for performance analysis under different operational conditions. • Effectively use computational approach to design and model electric machines for Morden applications.	• Transformers • Brush-Commutator Machines • Induction Machines • Synchronous Machines and Brushless AC Machines • Introduction to design synthesis and optimization	• Application of well-established standard to design electric machines from first principles • Effective use of modern engineering tools to design and model electric machines for steady-state and transient operation • Effective interpretation of results through analysis, and adequate written report.

MODULE NAME	**NOF level**	**CREDITS**	**MODULE PURPOSE**	**MODULE CONTENT List in bullet form**	**MODULE OUTCOME (Refer to Blooms and SAQA Level Descriptors) Pitch outcome at correct level of competence (1 or 2 outcomes per module)**	**MODULE ASSESSMENT CRITERIA What evidence will there be to prove competence of outcome? i.e. What specific aspect will be tested? (2X per outcome)**
Research Methodology	8	14	The purpose of the module is to provide students with tools and techniques for conducting research and producing technical reports within a given time frame.	• Development of research proposals • Literature review • Research projects structuring and planning • Research and project reporting • Citation, referencing and plagiarism • Design of Experiments • Data Analysis using Statistical techniques such as ANOVA • Research Ethics	On completion of this module the student should be able to: • Write a formal research project proposal • Review technical literature including journals and conference articles and books, and systematically document that review • Identify the research gaps and define the scope and objectives of his/her research • Design and plan experiments • Perform analysis of data and check statistical fitness • Derive conclusion and explain trends/effects • Identify and include ethical aspects related to the research problem/project.	Continuous Assessment will be the method to assess this module. • Assignments which may include -Review of past work in terms of Literature Review -Oral Presentation based on that Review -Mini Project proposal • Assignment/Test based on Design of Experiments and Data Analysis Problems Final mark weighting = Semester mark (100%)
Engineering Management	8	14	To introduce students to principles of management and leadership in a technical	• Introduction to Engineering Management • Leadership and Organizational Behaviour	On completion of this module students should be able to: • Differentiate the different roles of	Continuous Assessment will be used for this module. Students will be assessed through: • Tests • Projects

			environment.	• Project Management • Maintenance Management • Management Information Systems • Logistics, Supply Chain Management and Inventory Management • Quality Management • Occupation Health and Safety	management in an engineering environment • Evaluate the financial and human resource performance of an organisation	• Assignments Final mark weighting = Semester mark (50%) + Exam mark (50%) Final mark weighting = Semester mark (100%)
Solid Mechanics	8	14	To provide advanced knowledge in dynamic analysis of the behaviour of materials in engineering.	• Energy Methods • Thin Plates and Shells • Fracture Mechanics and Crack Propagation • Phase Field Models • Introduction to plasticity theory • Contact mechanics and tribology • Stress Analysis • Plastic Bending	On completion of this module students should be competent in: • Analysis and characterisation of complex stressed systems • Evaluation performance of materials under dynamic loading • Evaluation of complex structural systems	Continuous Assessment will be used for this module. Students will be assessed through: • Tests • Projects Assignments Final mark weighting = Semester mark (100%)
Engineering Mathematics and Computing	8	14	This module will provide an overview of the practical application of advanced engineering mathematical and computing techniques.	• Numerical analysis methods • Modeling and Optimization • Probability and Statistics • Scientific Programming and Applications	On completion of this module students should be able to: • Formulate and solve mathematical programming problems • Modelling and optimization of engineering problems • Implement various algorithms on a computing platform	Continuous Assessment will be used for this module. Students will be assessed through: • Tests • Projects • Assignments and • Computer labs Final mark weighting = Semester mark (100%) Compulsory module
Energy Physics	8	14	This module will focus on conceptual understanding of the conversion, storage, and transmission of energy in its various forms.	• Photovoltaics • Solar Concentrators • Wind Energy • Nuclear Energy • Principles of Fuel Cells • Power Plants • Hydroelectric Generation • Geothermal Energy • Bio-fuels • Fossil fuels • Transmission and Distribution of Electricity	On completion of this module students should be able to: Distinguish the different ways of energy generation, application, transmission and distribution.	Continuous Assessment will be used for this module. Students will be assessed through: • Tests • Projects • Assignments Final mark weighting = Semester mark (50%) + Exam mark (50%)
Thermofluids	8	14	The course focuses on the introductory aspects of computational Thermodynamics, Heat and Mass transfer, as well as Fluid Mechanics. The purpose is to provide students with knowledge and tools to model and solve	• Energy, energy transfer, and general energy analysis • Conservation of mass—the continuity equation • The stream function • Conservation of linear momentum—Cauchy's equation • The Navier–Stokes Equation	Upon completion of the module, the students are able to: • Understand the rationale behind the use of differential analysis of thermo-fluid problems • Discretize the control volume of interest into computational domains • Apply the governing differential	Continuous Assessment will be used for this module. Students will be assessed through: • Tests • Projects Assignments Final mark weighting = Semester mark (100%)

			complex problems in thermo-fluid-dynamic processes and energy systems. The course will concentrate on the application of differential forms of thermo-fluids equations in solving for velocity, temperature, pressure fields computationally.		equations in the computational domain • Understand the importance of a high-quality, good resolution grid/mesh • Apply appropriate boundary conditions to computational domains • Understand how to apply CFD (Finite Element / Finite Volume / Finite Difference Method) to basic engineering problems and how to determine whether the output is physically meaningful.	
Engineering and Society	8	14	This module will prepare students for the working environment and the understanding of the code of practice in the engineering profession	• Role of engineering in society • Contracts and law • Codes of practice • Environmental impacts and social responsibility	On completion of this module students should be able to: Understand the roles and responsibilities of an engineer Relate engineering activities to environmental, social and economic impacts	Continuous Assessment will be used for this module. Students will be assessed through: • Projects • Case Study Assignments Final mark weighting = Semester mark (100%)
Research and Design Project	8	42	A research and design project must comprise substantial individual work identifying, formulating, analyzing, and solving a complex engineering problem and completing an appropriate engineering design. Students must demonstrate achievement of specified graduate attributes through oral presentations and written reports.	Advanced research topics in mechanical engineering as proposed by staff members in the department from year to year.	After completing this module, the student should be able to complete an engineering research project as typically experienced in practice. This will require that the student: • Professionally executes an investigation within a pre-defined budget and time limit; • Applies the knowledge he/she has acquired thus far during his/her studies in order to solve the problem that is presented to him/her; • Acquires, by his/her own effort and initiative, new theoretical or empirical knowledge required to master the task; • Communicates the outcome of the Research Project to engineering audiences and to the community in general.	Continuous Assessment will be used for this module. Students will be assessed through: • Progress report assessment • A publishable manuscript • Oral presentation of the manuscript in a symposium Final mark weighting = Semester mark (100%) •