POTCHEFSTROOM CAMPUS

ENGINEERING

POSTGRADUATE PROGRAMMES

Address all correspondence to:

The Registrar
North-West University
Potchefstroom Campus
Private Bag X6001
Potchefstroom
2520

Tel: (018) 299 1111/2222
Fax: (018) 299 2799
Web page: http://www.nwu.ac.za

PLEASE MENTION YOUR UNIVERSITY NUMBER IN ALL CORRESPONDENCE.

The General Academic Rules of the University, which all students subject to and which apply to all the qualifications offered by the University, appear in a separate publication and are available on the web page at: http://www.nwu.ac.za/postgrad/how-to-apply.

Please note: Although the information in this Calendar has been compiled with the utmost care and accuracy, the Council and the Senate of the University accept no responsibility whatsoever for errors that may occur. Before students make a final decision on their selection of modules, they must consult the class timetable. If a clash occurs in the planned selection of a student, the relevant module combination is not permitted.

2017_V1

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Office Bearers

Dean

Prof LJ Grobler – PrEng, CEM, CMVP, PhD (*University of Pretoria*).

Directors of Schools / Research Units

Unit for Energy and Technology Systems

Prof L van Dyk – PrEng, SAIIE, PhD (*US*), MEng (*UP*), MSc (*Worwick*), BEng (*UP*).

School of Chemical and Minerals Engineering

Prof FB Waanders – PrEng, PrSciNat, PhD (*PU for CHE*).

School of Electrical, Electronic and Computer Engineering

Prof G van Schoor – PrEng, DEng (*RAU*).

School of Mechanical and Nuclear Engineering

Prof JH Wichers – PrEng, SAIMechE, PhD, MENG, BEng (*PU for CHE*).

Centre for Research and Continued Engineering Development (CRCED)

CRCED Pretoria

Prof EH Mathews (Manager) – PrEng, PhD (*PU for CHE*).

Postgraduate Programme Managers

School of Chemical and Minerals Engineering

Prof S Marx

School of Electrical, Electronic and Computer Engineering

Dr L Grobler

School of Mechanical and Nuclear Engineering

Dr J Kruger

Administrative Manager

Ms L Viljoen

Ms D Zietsman

Faculty Council

Chairperson

Prof LJ Grobler (*Dean)*

School Directors / Programme Managers and Academic personnel

School of Chemical and Minerals Engineering

Prof FB Waanders (*Director*)

Prof M le Roux (*Undergraduate Programme Manager: Mineral Engineering*)

Prof S Marx (*Undergraduate Programme Manager: Chemical Engineering*)

Prof S Marx (*Postgraduate Programme Manager*)

School of Electrical, Electronic and Computer Engineering

Prof G van Schoor (*Director*)

Dr H Marais (*Undergraduate Programme Manager: Computer and Electronic Engineering*)

Dr A Grobler (*Undergraduate Programme Manager: Electrical and Electronic Engineering*)

Mr W Kukard (*Undergraduate Programme Manager: Electromechanical Engineering*)

Dr L Grobler (*Postgraduate Programme Manager*)

School of Mechanical and Nuclear Engineering

Prof JH Wichers (*Director*)

Dr JJ Janse van Rensburg (*Undergraduate Programme Manager: Mechanical Engineering*)

Prof L van Dyk (*Undergraduate Programme Manager: Industrial Engineering*)

Dr J Kruger (*Postgraduate Programme Manager*)

Academic representative from the Faculty of Natural Sciences

Prof HCM Vosloo

Teaching-Learning and Quality affairs

Prof M le Roux (*Chairman: Teaching and Learning Committee*)

Ms V Pretorius (*Senior Administrative Assistant*)

Innovation Support Office

Mr AG Hattingh (*Project Manager*)

Unit for Energy and Technology Systems

Prof L van Dyk (*Director*)

Centre for Research and Continued Engineering Development (*Pretoria*)

Prof EH Mathews (*Manager*)

Recruitment, Selection, Bursaries and Student Affairs

Ms EC Hattingh (*Manager*)

Undergraduate Teaching-Learning

Mrs MCJ Potgieter (*Administrative Manager, Secretariat*)

Postgraduate Administration

Ms L Viljoen (*Administrative Manager*)

Student Representative

ESA-Chairperson (*Engineering Student Association*)

Research

Research in the Faculty is managed in the following research subgroups.

Research Chairs

DTI Chair in Nuclear Engineering

Prof CG du Toit

E-mail: Jat.DuToit@nwu.ac.za

SARChI Chair in Coal Research

Prof JR Bunt

E-mail: John.Bunt@nwu.ac.za

NRF Research Chair in Biofuels

Prof S Marx

E-mail: Sanette.Marx@nwu.ac.za

Chair in Smart Grids

Prof APJ Rens

E-mail: Johan.Rens@nwu.ac.za

BBE Energy Chair for Energy Innovation

Prof JA de Kock

E-mail: Jan.deKock@nwu.ac.za

Subgroups

Visit the website for more information on each subgroup: http://www.nwu.ac.za/p-fe/research-groups.html

Aerodynamic Design and Aircraft Development Group

Dr AS Jonker

E-mail: Attie.Jonker@nwu.ac.za

Bio-Energy Research Group

Prof S Marx

E-mail: Sanette.Marx@nwu.ac.za

Centre for Advanced Additive Manufacturing

Mr DB Vorster

E-mail: Danie.Vorster@nwu.ac.za

Coal Research Group

Prof JR Bunt

E-mail: John.Bunt@nwu.ac.za

DST-HySA (Hydrogen South Africa) Infrastructure Centre of Competence

Dr D Bessarabov

E-mail: Dmitri.Bessarabov@nwu.ac.za

Energy Research Group (ERG)

Prof R Gouws

E-mail: Rupert.Gouws@nwu.ac.za

Engineering Management

Prof JH Wichers

E-mail: Harry.Wichers@nwu.ac.za

Industrial Engineering

Prof L van Dyk

E-mail: Liezl.vanDyk@nwu.ac.za

Intelligent Systems

Prof AJ Hoffman

E-mail: Alwyn.Hoffman@nwu.ac.za

Materials, Vibration Analysis and Manufacturing

Prof J Markgraaff

E-mail: Johan.Markgraaff@nwu.ac.za

McTronX

Prof G van Schoor

E-mail: George.vanSchoor@nwu.ac.za

Water Research Group

Prof FB Waanders

E-mail: Frans.Waanders@nwu.ac.za

Nuclear Engineering and Neutronics

Dr AC Cilliers

E-mail: Anthonie.Cilliers@nwu.ac.za

Telenet Research Group

Prof AS Helberg

E-mail: Albert.Helberg@nwu.ac.za

Thermal and Dynamic System Process Optimization Group

Prof CP Storm

E-mail: Chris.Storm@nwu.ac.za

Thermal-Fluid Systems Group

Prof M van Eldik

E-mail: Martin.vanEldik@nwu.ac.za

Contact Details

Applications and Enquiries – Postgraduate Studies

Postgraduate Administrative Manager

Ms D Zietsman

E-mail: EngineerPostgrad-info@nwu.ac.za

Enquiries regarding research opportunities within different subgroups

Research Administrative Manager

Mrs L Gertenbach

E-mail: Louise.Gertenbach@nwu.ac.za

Postgraduate Programme Managers

School of Chemical and Minerals Engineering

Prof S Marx

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E-mail: Sanette.Marx@nwu.ac.za

School of Electrical, Electronic and Computer Engineering

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E-mail: Leenta.Grobler@nwu.ac.za

School of Mechanical and Nuclear Engineering

Dr J Kruger

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E-mail: JanHendrik.Kruger@nwu.ac.za

Centre for Research and Continued Engineering Development (CRCED Pretoria)

Tel: (012) 809 0412

Fax: (086) 231 0366

Physical Address:

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Office Park

13 Pony Street

Tyger Valley

PRETORIA

Postal Address:

P.O. Box 112211

Silver Lakes

0054

I.1 FACULTY RULES

I.1.1 AUTHORITY OF THE GENERAL RULES

The Faculty Rules valid for the different qualifications, programmes and curricula of this Faculty and contained in this Faculty calendar are subject to the General Rules of the University, as determined from time to time by the Council of the University on the recommendation of the Senate. The Faculty Rules should therefore be read in conjunction with the General Rules.

The General ACADEMIC RULES can be found on the University's website at http://www.nwu.ac.za/postgrad/how-to-apply or, alternatively, the Higher Degree Administration department of the University can be consulted.

Further guidelines and rules regarding postgraduate study are given in the **Manual for Postgraduate Studies**. All students are required to consult this manual in detail. A version of this manual is available on the University's web site (http://www.nwu.ac.za/postgrad/how-to-apply).

I.1.2 FACULTY-SPECIFIC RULES

Additional requirements and/or faculty-specific rules with regard to different programmes are reflected at a specific programme.

I.1.2.1 Admission

The admission and registration requirements are set out in Academic Rules A.4.2. and A.4.3 (*Masters*); A5.2. and A5.3. (*PhD*).

Prospective students apply for admission to the North-West University – forms and information available from Higher Degree Administration – Postgraduate Admissions – telephone (018) 299 4274 / e-mail: PostGrad-EnquiriesPotch@nwu.ac.za. .

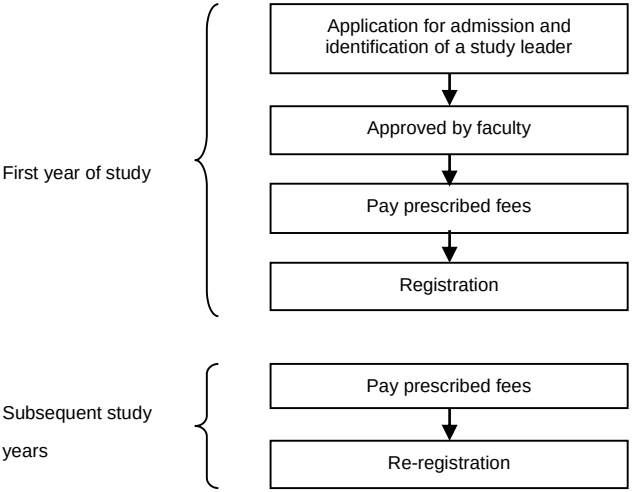
Prospective students must consult the Faculty postgraduate website to help them identify a study leader (www.nwu.ac.za/p-fe/stl). The study leader will then sign a study leader acceptance form, which must accompany the application form. Students will not be allowed to register unless a study leader has been confirmed. Further information can be requested from the Postgraduate Administrative Officer – e-mail: EngineerPostgrad-info@nwu.ac.za or on the website: www.nwu.ac.za/p-fe/prospective.

Please note: Applications have a consideration period of approximately four (4) weeks, after being received by the Faculty for evaluation. This turnaround time is additional to the time required by the Higher Degree Administration department to finalize the admission process.

After a student has been admitted, registration forms are issued, which must be signed by the Faculty Postgraduate Administration Officer before the student will be allowed to register. The prescribed fees must also be paid BEFORE registration.

Students must re-register every year according to the prescribed procedure on or before the date set by the University.

The process can be illustrated as follows:



Note: No student will be allowed to attend the lectures of a particular module unless the prescribed registration fee has been payed.

Foreign qualifications

Students holding a foreign qualification (*i.e. not obtained at a South African University*), are required to have the qualification evaluated by SAQA (*South African Qualifications Authority*) and a certificate of evaluation must be submitted with the application form. For more information, contact SAQA at www.saqa.org.za.

For further information regarding foreign students, please visit the University's International Office on the following website: http://www.nwu.ac.za/nwu/students/int.html.

Recognition of Prior Learning (RPL)

The Faculty's policy with regard to Recognition of Prior Learning applies. Students must consult the NWU RPL Policy on the website: http://www.nwu.ac.za/content/policy_rules and the Faculty Standard for RPL Portfolio for the correct processes and procedures to be followed. The Standard for RPL Portfolio is available from the Postgraduate Administrative Officer – e-mail: EngineerPostgrad-info@nwu.ac.za.

I.1.2.2 Selection

The Faculty reserves the right to select students before admission to specific programmes and not to admit applicants to the relevant qualification programmes if they do not meet the selection criteria, even where such applicants do meet the minimum admission requirements. Where, in such a case, a student number is allocated to an applicant, it is done solely for administrative purposes, and does not constitute or create right to admission.

Selection processes are approved by faculty structures and are revised annually.

I.1.2.3 Registration

A student who has been admitted to the University registers for a specific qualification programme per annum for the duration of the study at the time determined in the annual calendar for that purpose, by paying the prescribed registration fee, completing a registration form either on paper or electronically and acquiring the required approval from the study leader concerned. Thereafter the student must have the registration form signed by the Faculty Postgraduate Administration Officer before submitting the form to the office concerned, upon which proof of registration is issued to the student. The aforementioned is also applicable to the re-registration of existing students. If a provisional postgraduate student fails to register during the determined registration cycle of the specific academic year, he/she must re-apply for admission to the University (I.1.2.10).

An existing postgraduate student who fails to re-register for any academic year, must apply for re-admission and continuation. Such student will be responsible for paying outstanding tuition fees of preceding year(s) as well (I.1.2.10).

I.1.2.4 Duration of registration

A postgraduate student who is admitted to the University and officially registered remains a student of the University for as long as the registration is valid, or until such time the registration is cancelled by the student or by the faculty due to inadequate progress.

I.1.2.5 Amendment or cancellation of registration

A postgraduate student's registration many only be amended or cancelled on application in the prescribed manner. The Faculty may cancel a student's registration for a particular module if such registration was done contrary to Faculty rules.

A student whose registration is cancelled and who received bursaries from the University are liable to make arrangements for reimbursement.

I.1.2.6 Erroneous registration

The University reserves the right to cancel any erroneous registration and to withdraw any qualification that was awarded erroneously after the conclusion of a disciplinary process or the completion of a thorough administrative enquiry.

I.1.2.7 Exemption from registration

A postgraduate student who still needs to write a paper or make improvements to an examined dissertation or thesis and who can still attain the qualification at the autumn graduation ceremony, does not register for a new year, provided that the examination is successfully completed by the end of January of the new year or the dissertation or thesis is satisfactorily improved by the end of January of that new year.

I.1.2.8 Simultaneous registration at more than one institution

A postgraduate student may not be registered simultaneously at the University and at another higher education institution without written permission granted by the Dean and with the concurrence of the other institution.

I.1.2.9 Simultaneous registration for more than one qualification

A postgraduate student may not be registered simultaneously for more than one qualification at the University without prior written permission granted by the Dean(s) concerned.

I.1.2.10 Re-admission after failure to register

Interruption of master's and doctoral studies is not allowed. A student's studies will be terminated by the Postgraduate Faculty Administration if he/she fails to re-register for an academic year.

A student whose registration is terminated and who received bursaries from the University are liable to make arrangements for reimbursement.

Where a postgraduate student's studies were terminated because of failure to re-register, such a student must apply anew for admission by completing the relevant forms. Refer to I.1.2.1.

A student is only allowed to apply twice towards the same qualification. Upon re-application, the student must identify a new study leader and research topic. A student intending to continue previous unfinished studies must re-apply for admission by completing the relevant forms (I.1.2.1). After which, all outstanding fees applicable to the preceding years of study must be paid in full, together with the minimum registration fee applicable for registration, before registration will take place.

I.1.2.11 Extension of study period

A student who does not expect to complete the curriculum within the maximum study period must apply (*on the prescribed form*) for an extension of the study period for one academic year before the end of the maximum allowed period of study (*in accordance with Academic Rule A.4.4.10 and A.5.4.10).*

The study leader makes a recommendation to the School Director with regard to extension of the study period. Please consult the Faculty postgraduate portal for the necessary procedures to follow and forms to be completed – website: www.engineeringpostgrad.co.za/uets.

I.1.2.12 Registration for additional modules

A postgraduate student may upon request, but subject to Faculty Rules, be allowed in any study year to register for additional modules not required for the curriculum concerned. Additional fees will be applicable. Please consult the Faculty postgraduate portal for the necessary procedures to follow and forms to be completed – website: www.engineeringpostgrad.co.za/uets.

I.1.2.13 Recognition of and exemption from modules

According to the Academic Rules, a student who joins the University after having completed only a portion of or a full qualification at another institution of higher learning may, with a view to further study at this University, apply in writing for recognition of modules, provided that exemption shall not be granted for more than half the number of modules required for the curriculum. The student may repeat modules from which he/she cannot be exempted.

Any registered student of this University who wishes to change a curriculum during the course of his/her study period may, with a view to further study at this University, apply in writing to the appropriate faculty for recognition of any modules that he/she has already passed and which forms part of the curriculum to which the student wishes to change. Please consult the Faculty

postgraduate portal for the necessary procedures to follow and forms to be completed – website: www.engineeringpostgrad.co.za/uets.

I.1.2.14 Research proposal and title registration for master's and doctoral degrees

Master's and doctoral students must after registration (*and in consultation with a study leader*) present a research proposal and title registration for approval to a body determined by Faculty Rules. If a student fails to present a research proposal for approval in time after due notification, the study may be terminated.

If, in any year, a student fails to re-register as student at the time determined in the annual calendar, the Faculty Board concerned may assign the topic of the dissertation or thesis, if already registered, to another student in the same research entity.

I.1.2.15 Classification of dissertations and theses

Where a dissertation or thesis is classified in terms of Senate Policy, effect is given in the examination process to the rules laid down by Senate for the purpose.

The postgraduate student and study leader(s) concerned are responsible for applying for classification in a timeous manner by completing the required forms. Please consult the postgraduate e-Fundi portal for the necessary procedures to follow and forms to complete – website: http://efundi.nwu.ac.za/portal/.

I.1.2.16 Upgrade of master's degree study to doctoral study

Academic Rule A.4.4.9. stipulates that a student who is registered for a master's degree and who, in the unanimous opinion of the study leader concerned, the Research Director or research entity leader concerned, or where applicable, the School Director concerned, has achieved outcomes of quality and extent acceptable for a doctoral degree, may apply to the Faculty Board concerned to convert the registration for a master's degree to that of a doctoral degree.

A candidate to whom such concession is made, must, where applicable, successfully complete the paper component of the master's degree examination before the thesis may be submitted and must comply with all the rules and requirements set by the University regarding a doctoral degree. The student only receives the doctoral degree after the number of credits for the master's degree papers, where applicable, has been attained and the minimum period required for the registration of the doctoral degree has expired.

I.1.2.17 Termination of study

In accordance to Academic Rule A.4.4.11 and A.5.4.11, the Campus Rector concerned may, in terms of the Faculty Rules and on recommendation of the Research Director or the research entity leader concerned, or where applicable, to the School Director concerned, terminate a student's study if the student fails to comply with all the requirements of Senate or the Faculty; or fails to re-register; or exceeds the maximum duration of the study period as determined by Faculty Rules; or after being granted an extended study period, still fails to complete the study.

In the event of an application for re-admission by a student whose study has been terminated, the Dean concerned has the discretionary authority to set

reasonable conditions for such re-admission and must report such conditions to the Vice-Rector.

I.1.2.18 Examination

Postgraduate Diploma

The examination of the Postgraduate Diploma in Nuclear Science and Technology is conducted in accordance with the requirements of Academic Rule A.4.4.

Master's Degrees

The examination of the master's degree is conducted in accordance with the requirements of Academic Rule A.4.4. The taught course modules should preferably be completed in the first year of study.

Doctoral Degrees

The examination of the doctoral degree is conducted in accordance with the requirements of Academic Rule A.5.4.

I.1.2.19 Submission of dissertation or thesis for examination

According to Academic Rule A.4.4.2. a dissertation for a master's degree must be submitted for examination before or on the date determined annually by the Senate. The same applies to a thesis for a doctoral degree in terms of Academic Rule A.5.4.2.

In the case where a resubmission result was obtained during the first examination submission, a student must resubmit their dissertation or thesis within 12 months (*1 year*) of the first submission.

Certain prescribed forms have to be completed before and at submission. Please consult the Faculty postgraduate portal for the necessary procedures to follow and forms to be completed – website: www.engineeringpostgrad.co.za/uets.

I.1.3 LANGUAGE POLICY

The University strives towards being internationally relevant by utilizing English as teaching medium, with all postgraduate correspondence and documentation made available to students in English.

I.1.4 WARNING AGAINST PLAGIARISM

Assignments are individual tasks and not group activities (*unless explicitly indicated as group activities*). The focus of a University is scholarship, the practice of scientific disciplines. Science is discovered/researched, taught, learnt and made useful to satisfy legitimate needs.

Scientific knowledge is constantly disseminated by those who teach and are taught, those who learn and those who render research results. Scientific communication is therefore at the root of the activities of the University.

A distinction between what is scientific and pre-scientific is situated in the way in which scientific information is communicated, regardless of whether this is in the context of learning, teaching, research or application of knowledge. Scientific communication must pass the test of correctness, defensibility and (*especially in the case of research*) originality. The scientific practice of students and scientists is adjudicated and evaluated on an ongoing basis. For

that reason, integrity and therefore honesty, apart from obvious moral considerations, is an essential factor in the practice of science and scholarship.

It is therefore expected of anybody engaged in scientific work that the relevant individual should assume sole responsibility for the content of his or her scientific communication. To present at any level as one's own work the knowledge, insights, wording of formulation of anybody else within the context of teaching, learning, research activities or the application of knowledge without acknowledgement is unacceptable and the blameworthiness is comparable with crimes such as theft and fraud.

Dishonest academic conduct constitutes serious misconduct, whether it occurs orally, by conduct, or in writing, during examinations or in the context of other forms of assessment such as assignments, dissertations, theses, as well as in reports and publications.

Therefore it is the policy of the North-West University that no form of academic dishonesty shall be tolerated, and if any of such conduct is reported or detected, the perpetrator, upon being found guilty, shall be punishable in terms of the University's disciplinary policies, rules and procedures. The University has the responsibility to inculcate integrity and its corollary of academic honesty in all students and staff, especially those in academic positions.

For further details see: www.nwu.ac.za/content/policy_rules

I.1.5 CAPACITY STIPULATION

Please take cognizance of the fact that, owing to specific capacity constraints, the University reserves the right to select candidates for admission to certain fields of study. This means that prospective students who comply with the minimum requirements may not necessarily be admitted to the relevant courses.

I.1.6 SCHOOLS OF THE FACULTY

Postgraduate academic programmes are presented within the Faculty of Engineering's four Schools and one off-campus centre. The Schools are responsible for the undergraduate and postgraduate academic training of students.

The Centre for Research and Continued Engineering Development (CRCED) exist off-campus to cater for needs of postgraduate students in the Gauteng area.

The master's taught course modules are presented and managed by the four Schools. CRCED Pretoria offers supervision for master's students in some of the disciplines offered by the Faculty. In the coordination and presentation of postgraduate training programmes, the Directors of the Schools are assisted by Postgraduate Programme Managers and by the Postgraduate Administrative Manager.

Schools
School of Chemical and Minerals Engineering
School of Electrical, Electronic and Computer Engineering
School of Industrial Engineering
School of Mechanical and Nuclear Engineering
Centre of Research and Continued Engineering Development (Pretoria)

I.1.7 QUALIFICATIONS, PROGRAMMES AND CURRICULA

DIPLOMAS				
Qualification	**Qualification and Qualification Code**	**Curriculum and Curriculum Code**	**Method of delivery**	**NQF level**
Postgraduate Diploma in Nuclear Science and Technology	**705 100**	**I501P**	Full-time Part-time	8

MASTER'S DEGREES *Option A*				
Qualification	**Qualification and Qualification Code**	**Curriculum Code**	**Method of delivery**	**NQF level**
Master of Engineering with (***MEng***)	Chemical Engineering **7CE N01**	**I801P**	Full-time Part-time	9
	Computer and Electronic Engineering **7CD N01**	**I801P**	Full-time Part-time	9
	Development and Management Engineering **7CF N01**	**I801P**	Full-time Part-time	9
	Electrical and Electronic Engineering **7CC N01**	**I801P**	Full-time Part-time	9
	Mechanical Engineering **7CB N01**	**I801P**	Full-time Part-time	9
Master of Science in Engineering Sciences with (***MSc***) ***Engineering Sciences***	Chemical Engineering **7CE N01**	**I801P**	Full-time Part-time	9
	Computer and Electronic Engineering **7CD N01**	**I801P**	Full-time Part-time	9
	Electrical and Electronic Engineering **7CC N01**	**I801P**	Full-time Part-time	9
	Mechanical Engineering **7CB N01**	**I801P**	Full-time Part-time	9

**** Note:*** *New 2017 enrolments for Option A will be registered on the new aligned qualification- and curriculum codes, with old qualification- and curriculum codes being phased out.*

MASTER'S DEGREES *Option B*				
Qualification	**Qualification and Qualification Code**	**Curriculum Code**	**Method of delivery**	**NQF level**
Master of Engineering (***MEng***)	Chemical Engineering **702 110**	**I872P**	Full-time Part-time	9
	Computer and Electronic Engineering **702 109**	**I887P**	Full-time Part-time	9
	Development and Management Engineering **702 111**	**I892P**	Full-time Part-time	9
	Electrical and Electronic Engineering **702 108**	**I884P**	Full-time Part-time	9
	Mechanical Engineering **702 107**	**I881P**	Full-time Part-time	9
	Nuclear Engineering **702 104**	(**I803P**	Full-time Part-time	9
Master of Science in Engineering Sciences (***MSc***)	Chemical Engineering **203 152**	**I891P**	Full-time Part-time	9
	Computer and Electronic Engineering **203 154**	**I897P**	Full-time Part-time	9
	Electrical and Electronic Engineering **203 153**	**I894P**	Full-time Part-time	9
	Mechanical Engineering **203 151**	**I888P**	Full-time Part-time	9
	Nuclear Engineering **203 200**	**I803P**	Full-time Part-time	9

DOCTORATES				
Qualification	**Qualification and Qualification Code**	**Curriculum Code**	**Method of delivery**	**NQF level**
Philosophiae Doctor with (***PhD***)	Chemical Engineering **7CA R01**	**I901P**	Full-time Part-time	10
	Computer Engineering **7CA R03**	**I901P**	Full-time Part-time	10
	Computer and Electronic Engineering **7CA R02**	**I901P**	Full-time Part-time	10
	Development and Management Engineering **7CA R04**	**I901P**	Full-time Part-time	10
	Electrical Engineering **7CA R06**	**I901P**	Full-time Part-time	10
	Electronic Engineering **7CA R07**	**I901P**	Full-time Part-time	10
	Electrical and Electronic Engineering **7CA R05**	**I901P**	Full-time Part-time	10
	Industrial Engineering **7CA R11**	**I901P**	Full-time Part-time	10
	Mechanical Engineering **7CA R09**	**I901P**	Full-time Part-time	10
	Nuclear Engineering **7CA R10**	**I901P**	Full-time Part-time	10

**** Note:*** *New 2017 enrolments will be registered on the new aligned qualification- and curriculum codes, with old qualification- and curriculum codes being phased out.*

I.1.8 PROGRAMME OUTCOMES

PHILOSOPHIAE DOCTOR (*PhD*)	MASTER OF ENGINEERING (*MEng*)	MASTER OF SCIENCE IN ENGINEERING SCIENCES (*MSc*)
The programme outcomes have been achieved if the student has made an original contribution to knowledge in the chosen field as evidenced by a thesis with proper structure, style, and language that includes: • Identification and formulation of an original engineering research problem; • Critically engage with existing knowledge to compile a comprehensive and relevant exposition thereof, which also reveals the originality of the envisaged contribution; • Develop and execute appropriate and advanced research procedures to solve research problem and verify solution; • Assess, validate and conclude research results and solutions; and • Communicate and defend the research problem, research process, research results and the originality of the contribution.	**The programme outcomes have been achieved if the student demonstrates competence in applying research methodology as evidenced by a dissertation with proper structure, style, and language that includes:** • Identify and formulate an engineering research problem; • Critically engage with existing knowledge to compile a relevant literature survey; • Develop and execute appropriate research procedures to solve research problem and verify (*Option A and Option B*) solution; • Assess, validate (*Option A*) and conclude research results and solutions; and • Communicate the research problem, research process and research results.	**The programme outcomes have been achieved if the student demonstrates competence in applying research methodology as evidenced by a dissertation with proper structure, style, and language that includes:** • Identify and formulate a research problem within the context of engineering science; • Critically engage with existing knowledge to compile a relevant literature survey; • Develop and execute appropriate research procedures to solve research problem and verify (*Option A and Option B*) solution; • Assess, validate (*Option A*) and conclude research results and solutions; and • Communicate the research problem, research process and research results.

I.1.9 PROGRAMME ASSESSMENT CRITERIA

PHILOSOPHIAE DOCTOR (*PhD*)	MASTER OF ENGINEERING (*MEng*)	MASTER OF SCIENCE IN ENGINEERING SCIENCES (*MSc*)
Question existing knowledge boundaries and practices in the field related to research problem. Formulate complex, unfamiliar problems in the field of Engineering. Deal with complexity, lacunae and contradictions in the knowledge base of the field of Engineering to identify and formulate an original research problem.	Identify knowledge boundaries and practices in the field related to research problem. Within this context, formulate a research problem in the field of Engineering.	Identify knowledge boundaries and practices in the field related to research problem. Within this context, formulate a research problem in the field of Engineering science.
Demonstrate in depth and critical knowledge and high levels of theoretical understanding in a complex and specialised area within the field of Engineering and/or across specialised or applied areas and expand or redefine existing knowledge in the field of Engineering. Show mastery of the literature and state of research in area related to the research problem.	Demonstrate knowledge and theoretical understanding in a specialised area within the field of Engineering. Synthesize existing knowledge in the field of Engineering. Show mastery of the literature and state of research area related to the research problem.	Demonstrate knowledge and theoretical understanding in a specialised area within the field of Engineering and/or across specialised or applied areas and expand or redefine existing knowledge in the field of Engineering. Show mastery of the literature and state of research in area related to the research problem.
Use intellectual independence and advanced research skills through the ability to apply sophisticated knowledge and research methodologies to the solve of the research problem and to verify the solution.	Use appropriate research skills to apply appropriate knowledge and research methodologies to the solve of the research problem and to verify solution.	Use appropriate research skills to apply appropriate knowledge and research methodologies to the solve of the research problem and to verify solution.

Execute autonomous independent judgements about information and concepts at highly abstract levels and make evaluations of research results on the basis of independently generated criteria and confirm that the proposed solution solves the research problem.	Execute judgements and make evaluations to confirm that the proposed solution solves the research problem. Apply theoretical insights and research findings beyond the context of research process.	Execute judgements and make evaluations to confirm that the proposed solution solves the research problem. Apply theoretical insights and research findings beyond the context of research process.
Compile an appropriately structured and coherent written thesis to communicate and defend the research problem, research process, research results and originality of the contribution and to demonstrate accomplishments of all other outcomes. This may be presented in traditional monograph format, or as a thesis based on a series of journal articles authored by the candidate. Disseminate some research results by means of academic journals and/or conferences.	Compile an appropriately structured and coherent written dissertation to communicate the research problem, research process and research results and to demonstrate accomplishment of all the other outcomes.	Compile an appropriately structured and coherent written dissertation to communicate the research problem, research process and research results and to demonstrate accomplishment of all the other outcomes.

I.1.10 RULES FOR THE POSTGRADUATE DIPLOMA

I.1.10.1 Duration (*minimum and maximum duration)*

The minimum term of study is **one year** and the maximum term of study is **two years**.

I.1.10.2 Admission requirements for the qualification

- Three-year BSc degree (*with Mathematics or Physics to at least the second year*);
- BTech (*Engineering*).

Enquiries with regard to these curricula should be directed to the School of Mechanical and Nuclear Engineering at telephone (018) 299 4369.

I.1.10.3 Method of presentation

The modules are presented by means of a distance-contact method. The e-learning platform e-Fundi, with an interactive site for each module, enables students to participate in well-structured self-study learning activities prior to attending the contact lecture session.

Six to eight weeks, of which one week is a contact session, are scheduled for each module. Students cannot register for more than two modules being presented simultaneously, except the Nuclear Engineering Project.

All lectures of a specific module are given during one week. The other weeks are used for self-study, assignments and assessment. During this period students have access to a facilitator who will provide support as required.

I.1.10.4 Postgraduate Diploma in Nuclear Science and Technology Qualification Code: 705 100

This programme provides learners with:

- a wider and deeper knowledge of nuclear science;
- advanced training in the field of nuclear science and technology;
- problem-solving ability;
- integration of knowledge across fields;
- the ability to execute a project in the field of nuclear science and technology.

I.1.10.4.1 List of modules

Module code	Descriptive name	Prerequisites	Credits
NUCI 511	Nuclear Engineering I	-	16
NUCI 521	Introduction to Thermal-Fluid Sciences	-	16
NUCI 571	Mathematics for Nuclear Engineers	-	16
NUCI 572	Nuclear Reactor Technology	-	16
NUCI 573	Nuclear Reactor Safety	-	16
NUCI 574	Nuclear Engineering Project	-	16
NUCI 575	Nuclear Physics	-	16
NUCI 576	Radiation and the Environment	-	16

** The School reserves the right not to offer certain modules during a certain year.*

I.1.10.5 Curriculum: I501P

I.1.10.5.1 Curriculum outcomes

The Postgraduate Diploma in Nuclear Science and Technology pursues knowledge and innovation in the field of nuclear power generation and develops and empowers graduates to think laterally and critically and to serve the country specifically within the fields of power generation.

I.1.10.5.2 Compilation of curriculum

The curriculum is constituted of 4 core modules, 3 fundamental modules and a project report. Each of these modules and the report counts 16 credits for a total of 128 credits for the diploma.

One credit represents 10 notional study hours, so a prospective student should expect to spend at least 1280 study hours on the programme.

Information regarding the course schedule, lecture venue, structure of the courses, etc. can be obtained from the School of Mechanical and Nuclear Engineering, at telephone (018) 299 4369.

Components	Composition	Credits
Project Report	Core (Compulsory)	16
4 Modules	Core (Compulsory)	16 ea.
3 Modules	Fundamental (Compulsory)	16 ea.
Total credits for the curriculum		**128**

I.1.11 RULES FOR THE DEGREE MASTER OF ENGINEERING

I.1.11.1 Duration (*minimum and maximum duration*)

The minimum **full-time** term of study is **one (1) year** and the maximum is **two (2) years**.

For **part-time** study the minimum term is **one (1) year** and the maximum term is **three (3) years**, calculated from the beginning of the first year of registration for the relevant programme.

I.1.11.2 Admission requirements for the qualification

- The student holds an applicable four (4) year bachelor degree (*ECSA-accredited*) in engineering or has been allowed to that status.

The School Director may, with notification to the Faculty Management Committee (*postgraduate*), request students who do not comply with the abovementioned requirements to be provisionally registered for the MEng-degree on the grounds of knowledge and experience gained through prior learning, pending the Recognition of Prior Learning outcome (*to be concluded within 6 months*). Refer to I.1.2.1. for the RPL-process to be followed for consideration of non-provisional registration.

Programme-specific assumptions are, where applicable, indicated at each programme description.

I.1.11.3 Composition of the programme

The master's degree programme allows for two options. These options allow different combinations of coursework and/or research that are based on an engineering problem leading to a synthesized solution based on engineering methods and designs.

The two options can be summarized as follows:

Description	Credits	Description	Credits	Description	Credits
Dissertation (*full*)	180	Dissertation	100	Dissertation	100
		5x elective modules	16 ea.	3x compulsory modules	16 ea.
				2x elective modules	16 ea.
Total	**180**	**Total**	**180**	**Total**	**180**

**** Note:** At least three (3) of the five (5) 16-credit taught course modules must be engineering technology modules within the chosen curriculum.*

I.1.11.3.1 Outcomes and assessment criteria

The programme outcomes have been achieved if the student demonstrates competence in applying research methodology as evidenced by a dissertation with proper structure, style and language. For full breakdown refer to I.1.8. and I.1.9.

I.1.11.4 Requirements for a dissertation

Regarding technical requirements, a dissertation must comply with all requirements and outcomes laid down by the Faculty. Also see the Manual for Postgraduate Studies and the applicable Academic Rules in this regard.

For presenting a dissertation in the form of a published research article(s) or (an) unpublished manuscript(s) in article format, see Academic Rule A.4.4.2.9. and the Manual for Postgraduate Studies (*Section 6.9*).

I.1.11.5 Faculty-specific requirements

The title of the dissertation, the research proposal and the appointment of external examiners must be reviewed by the Faculty Management Committee (*postgraduate*). Further information regarding rules and procedures are contained in the Faculty-specific rules I.1.2.14., Academic Rules A.4.3.1. and A.4.4., and in the Manual for Postgraduate Study.

In addition to attaining the abovementioned outcomes, students are also required to:

- take part in at least two formal colloquia and/or technical conferences where aspects of their work are presented to an audience of peers;
- have at least one full-length research paper on aspects of the dissertation submitted for review/publication in an accredited scientific journal before being allowed to submit the dissertation for examination (*A.4.4.2.8. and section 3.1.1.3.*).

Official prescribed forms used in the postgraduate study process are available on the postgraduate e-Fundi portal – website: http://efundi.nwu.ac.za/portal/ and www.engineeringpostgrad.co.za/uets.

Refer to the programme-specific information in this Calendar for information regarding the Faculty-specific requirements.

I.1.11.6 Articulation possibilities

- After the successful completion of the MEng programme, graduates who have performed adequately may be allowed to continue with a doctoral programme in the core module/programme in which the qualification has been awarded.
- Credit will be given to modules passed at other faculties or institutes of higher education, with final approval from the Faculty Management Committee (*postgraduate*), provided the student fully complies with the outcome and total credit requirements for this qualification/programme.
- The expertise that the graduate acquires with this qualification in one of the engineering disciplines will empower him/her to continue with further learning and research in various other specialized fields at a variety of institutions.

I.1.11.7 List of modules

Although the research and research modules are managed by the Unit for Energy and Technology Systems, the taught course modules are managed by the respective Schools. Curricula are listed under the Schools or Units in which they are presented for easy reference.

Note: CRCED Pretoria offers supervision in a variety of the available study areas

The total number of credits needed to obtain an MEng in Engineering degree is 180 credits. Each credit represents a nominal of 10 hours of study. Students

choose one curriculum with certain taught course modules to be completed in order to obtain the relevant degree. The taught course modules approved as part of the master's degree curricula in the Faculty of Engineering are listed below.

UNIT FOR ENERGY AND TECHNOLOGY SYSTEMS		
Module code	**Descriptive name**	**Credits**
CEMI 871	Dissertation (*full*)	180
CEMI 872	Dissertation	100
EERI 871	Dissertation (*full*)	180
ELEI 872	Dissertation	100
REEI 872	Dissertation	100
MEGI 871	Dissertation (*full*)	180
MEGI 872	Dissertation	100
NUCI 872	Dissertation	100
IIOB 871	Dissertation (*full*)	180
IIOB 872	Dissertation	100
SCHOOL OF CHEMICAL AND MINERALS ENGINEERING		
Module code	**Descriptive name**	**Credits**
CEMI 875	Fluid-phase Equilibrium	16
CEMI 876	Separation Processes	16
CEMI 877	Coal Technology I	16
CEMI 878	Coal Technology II	16
CEMI 879	Bioreactors and Bioprocess Technology	16
CEMI 881	Bio-ethanol Process Technology	16
CEMI 882	STS and Renewable Energy	16
CEMI 883	Introduction to Renewable and Sustainable Energy	16
CEMI 884	Biodiesel Process Technology	16
SCHOOL OF ELECTRICAL, ELECTRONIC AND COMPUTER ENGINEERING		
Module code	**Descriptive name**	**Credits**
EEII 881	Data Mining and Knowledge Extraction	16
EEII 882	Electrical Power Quality	16
EEII 883	Advanced Protection Systems	16
EEII 884	Advanced Signal Processing	16
EEII 885	Information Systems for e-trade and e-logistics	16
EEII 886	Information Security: Strategies and Techniques	16
EEII 887	Kalman Filters	16
EEII 888	Power System Dynamics	16
EEII 889	Compensation of Distortion in Power Systems	16
EEII 891	Advanced Electronic Development and Design	16
EEII 892	Advanced Power Electronics	16
EEII 893	Advanced Electrical Machines	16
EERI 877	Digital Control Systems	16
ERIE 874	Neural Networks	16
ERIE 875	Fuzzy Logic Systems	16
ERIE 876	Process Modelling and Identification	16
SCHOOL OF MECHANICAL AND NUCLEAR ENGINEERING		
Module code	**Descriptive name**	**Credits**
MEGI 874	Computational Fluid Dynamics I	16
MEGI 875	Computational Fluid Dynamics II	16

MEGI 876	Finite Element Methods	16
MEGI 877	Finite Element Methods for Flow	16
MEGI 878	Energy Management	16
MEGI 879	Advanced Engineering Thermodynamics	16
MEGI 884	Advanced Strength of Materials	16
MEGI 889	Materials Selection for Design	16
MEGI 894	Composite Materials	16
MGII 885	Thermal-Fluid Systems Modelling I	16
MGII 886	Thermal-Fluid Systems Modelling II	16
MGII 887	Gas Turbine Theory and Performance	16
NUCI 621	Introduction to Thermal-Fluid Sciences	16
NUCI 671	Mathematics for Nuclear Engineers	16
NUCI 811	Nuclear Engineering I	16
NUCI 874	Advanced Reactor Analysis I	16
NUCI 876	High Temperature Gas-Cooled Reactor Thermal-Fluid Analysis	16
NUCI 877	High Temperature Reactor Fuels and Materials	16
NUCI 878	High Temperature Reactor Technology	16
NUCI 879	Nuclear Project Management	16
NUCI 882	Light Water Reactor Thermal-Hydraulics	16
NUCI 883	Nuclear Engineering II	16
NUCI 886	Pebble Bed Reactor Design	16
NUCI 887	Reactor Analysis	16
NUCI 888	Reactor Safety	16
NUCI 889	Pressurized Water Reactor Technology	16
IIOB 881	Project Management	16
IIOB 882	Maintenance Management	16
IIOB 883	Corporate Career Skills	16
IIOB 884	Production Optimization Management	16
IIOB 885	Entrepreneurial Career Skills	16
IIOB 886	System Engineering	16
IIOB 887	Quality Management in Engineering Projects	16

I.1.11.8 Course modules from other MEng and/or other curricula

Any postgraduate taught course module in any School in the Faculty of Engineering or complementary modules offered by any other Faculty may be chosen after consultation with the appropriate Programme Manager and his/her supervisor, provided that:

- more than 50% of taught course modules are within the chosen curriculum;
- the complimentary taught course modules, as chosen from other master's curricula, are relevant to the proposed research project, pre-approved by the study leader, on a NQF level 9, with the appropriate credits; and
- the supervisor has given permission in writing for the choice of other taught course modules to be taken.

I.1.11.9 MEng with Chemical Engineering
Qualification Code: 7CE N01

I.1.11.9.1 Admission requirements for the programme

Refer to the qualification (I.1.9.2) and Faculty-specific information (I.1.2.) in this Calendar for information regarding admission requirements.

Enquiries with regard to these curricula to be directed to the School of Chemical and Minerals Engineering at telephone (018) 299 1995.

I.1.11.9.2 Curriculum Code: I801P

Module code	Descriptive name	Cr
Compulsory		
CEMI 871	Dissertation (*full*)	180
Total credits for the curriculum		**180**

I.1.11.10 MEng in Chemical Engineering
Qualification Code: 702 110

I.1.11.10.1 Curriculum Code: I872P

Module code	Descriptive name	Prerequisites	Cr
Core (Compulsory)			
CEMI 872	Dissertation	-	100
Electives (Choose five – compulsory)			
CEMI 875	Fluid-phase Equilibrium	-	16
CEMI 876	Separation Processes	-	16
CEMI 877	Coal Technology I	-	16
CEMI 878	Coal Technology II	-	16
CEMI 879	Bioreactors and Bioprocess Technology	-	16
CEMI 881	Bio-ethanol Process Technology	-	16
CEMI 882	STS and Renewable Energy	-	16
CEMI 883	Introduction to Renewable and Sustainable Energy	-	16
CEMI 884	Biodiesel Process Technology	-	16
Total credits for the curriculum			**180**

** The School reserves the right not to offer certain modules during a certain year.*

I.1.11.11 MEng with Computer and Electronic Engineering
Qualification Code: 7CD N01

I.1.11.11.1 Admission requirements for the programme

Refer to the qualification (I.1.9.2) and Faculty-specific information (I.1.2.) in this Calendar for information regarding admission requirements.

Enquiries with regard to these curricula should be directed to the School of Electrical, Electronic and Computer Engineering at telephone (018) 299 4058.

I.1.11.11.2 Curriculum Code: I801P

Module code	Descriptive name	Cr
Compulsory		
EERI 871	Dissertation (*full*)	180
Total credits for the curriculum		**180**

I.1.11.12 MEng in Computer and Electronic Engineering
Qualification Code: 702 109

I.1.11.12.1 Curriculum Code: I887P

Module code	Descriptive name	Prerequisites	Cr
Core (Compulsory)			
REEI 872	Dissertation	-	100
Electives (Choose five – compulsory)			
EEII 881	Data Mining and Knowledge Extraction	-	16
EEII 884	Advanced Signal Processing	-	16
EEII 885	Information Systems for e-trade and e-logistics	-	16
EEII 886	Information Security: Strategies and Techniques	-	16
EEII 887	Kalman Filters	-	16
EEII 891	Advanced Electronic Development and Design	-	16
EERI 877	Digital Control Systems	-	16
ERIE 874	Neural Networks	-	16
ERIE 875	Fuzzy Logic Systems	-	16
ERIE 876	Process Modelling and Identification	-	16
Total credits for the curriculum			**180**

** The School reserves the right not to offer certain modules during a certain year.*

I.1.11.13 MEng with Electrical and Electronic Engineering
Qualification Code: 7CC N01

I.1.11.13.1 Admission requirements for the programme

Refer to the qualification (I.1.9.2) and Faculty-specific information (I.1.2.) in this Calendar for information regarding admission requirements.

Enquiries with regard to these curricula should be directed to the School of Electrical, Electronic and Computer Engineering at telephone (018) 299 4058.

I.1.11.13.2 Curriculum Code: I801P

Module code	Descriptive name	Cr
Compulsory		
EERI 871	Dissertation (*full*)	180
Total credits for the curriculum		**180**

I.1.11.14 MEng in Electrical and Electronic Engineering
Qualification Code: 702 108

I.1.11.14.1 Curriculum Code: I884P

Module code	Descriptive name	Prerequisites	Cr
Core (Compulsory)			
ELEI 872	Dissertation	-	100
Electives (Choose five – compulsory)			
EEII 882	Electrical Power Quality	-	16
EEII 883	Advanced Protection Systems	-	16
EEII 884	Advanced Signal Processing	-	16
EEII 887	Kalman Filters	-	16
EEII 888	Power System Dynamics	-	16
EEII 889	Compensation of Distortion in Power Systems	-	16
EEII 891	Advanced Electronic Development and Design	-	16
EEII 892	Advanced Power Electronics	-	16
EEII 893	Advanced Electrical Machines	-	16
EERI 877	Digital Control Systems	-	16
ERIE 874	Neural Networks	-	16
ERIE 875	Fuzzy Logic Systems	-	16
ERIE 876	Process Modelling and Identification	-	16
Total credits for the curriculum			**180**

** The School reserves the right not to offer certain modules during a certain year.*

I.1.11.15 MEng with Mechanical Engineering
Qualification Code: 7CB N01

I.1.11.15.1 Admission requirements for the programme

Refer to the qualification (I.1.9.2) and Faculty-specific information (I.1.2.) in this Calendar for information regarding admission requirements.

Enquiries with regard to these curricula should be directed to the School of Mechanical and Nuclear Engineering at telephone (018) 299 4496.

I.1.11.15.2 Curriculum Code: I801P

Module code	Descriptive name	Cr
Compulsory		
MEGI 871	Dissertation (*full*)	180
Total credits for the curriculum		**180**

I.1.11.16 MEng in Mechanical Engineering
Qualification Code: 702 107

I.1.11.16.1 Curriculum Code: I881P

Module code	Descriptive name	Prerequisites	Cr
Core (Compulsory)			
MEGI 872	Dissertation	-	100
Electives (Choose five – compulsory)			
MEGI 874	Computational Fluid Dynamics I	-	16
MEGI 875	Computational Fluid Dynamics II	MEGI 874	16
MEGI 876	Finite Element Methods	-	16
MEGI 877	Finite Element Methods for Flow	-	16
MEGI 878	Energy Management	-	16
MEGI 879	Advanced Engineering Thermodynamics	-	16
MEGI 884	Advanced Strength of Materials	-	16
MEGI 889	Materials Selection for Design	-	16
MEGI 894	Composite Materials	-	16
MGII 885	Thermal-Fluid Systems Modelling I	-	16
MGII 886	Thermal-Fluid Systems Modelling II	MGII 885	16
MGII 887	Gas Turbine Theory and Performance	-	16
Total credits for the curriculum			**180**

** The School reserves the right not to offer certain modules during a certain year.*

I.1.11.17 MEng in Nuclear Engineering
Qualification Code: 702 104

I.1.11.17.1 Admission requirements for the programme

Refer to the qualification (I.1.9.2) and Faculty-specific information (I.1.2.) in this Calendar for more information regarding admission requirements.

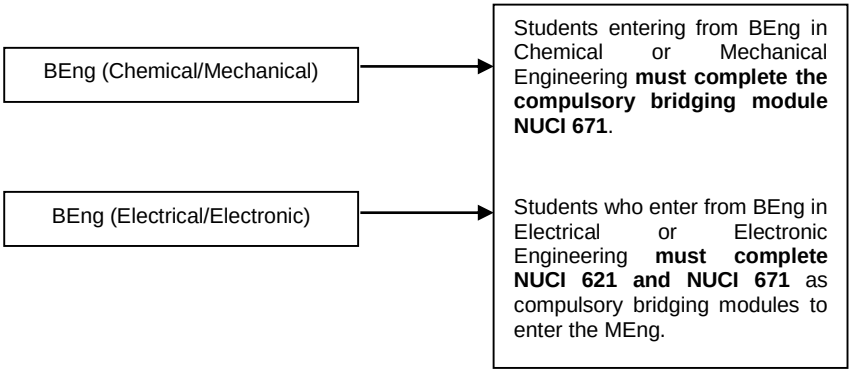
Nuclear Engineering modules are presented on a focused contact basis. Instruction is provided as a series of continuous contact sessions, followed by assignments and examinations. This requires students to attend lectures for a number of consecutive days as specified per module.

Enquiries with regard to these curricula should be directed to the School of Mechanical and Nuclear Engineering at telephone (018) 299 4496.

I.1.11.17.2 Faculty-specific requirements

- Students in possession of either a **BEng** (***Mechanical***) or **BEng** (***Chemical***) degree must register for Mathematics for Nuclear Engineers (**NUCI 671**), which is a **bridging module**.
- Students in possession of a **BEng** (***Electrical/Electronic***) must register for Mathematics for Nuclear Engineers (**NUCI 671**) and Introduction to Thermal-Fluid Sciences (**NUCI 621**), which are **bridging modules**.

** The credits for the two bridging modules do not count towards the 180 credits for the master's degree.*



I.1.11.17.3 Curriculum Code: I803P

Module code	Descriptive name	Prerequisites	Cr
Core (Compulsory)			
NUCI 872	Dissertation	-	100
NUCI 811	Nuclear Engineering I	-	16
NUCI 883	Nuclear Engineering II	NUCI 811 NUCI 621* NUCI 671*	16
NUCI 887	Reactor Analysis	NUCI 883	16
Electives (Choose two – compulsory)			
NUCI 882	Light Water Reactor Thermal-Hydraulics	NUCI 883 MGII 885	16
NUCI 886	Pebble Bed Reactor Design	NUCI 883 NUCI 874	16
NUCI 888	Reactor Safety	NUCI 883 NUCI 887	16
NUCI 889	Pressurized Water Reactor Technology	NUCI 883 NUCI 887	16
NUCI 874	Advanced Reactor Analysis I	NUCI 887	16
NUCI 876	High Temperature Gas-Cooled Reactor Thermal-Fluid Analysis	NUCI 883 MEGI 874	16
NUCI 877	High Temperature Reactor Fuels and Materials	NUCI 883 NUCI 887	16
NUCI 878	High Temperature Reactor Technology	NUCI 883 NUCI 887	16
NUCI 879	Nuclear Project Management	-	16
MEGI 874	Computational Fluid Dynamics I	MGII 885	16
MGII 885	Thermal-Fluid Systems Modelling I	NUCI 621	16
MGII 886	Thermal-Fluid Systems Modelling II	MGII 885	16
IIOB 886	System Engineering	-	16
Total credits for the curriculum			**180**

** Refer to I.1.9.13.2*

*** The School reserves the right not to offer certain modules during a certain year.*

I.1.11.18 MEng with Development and Management Engineering
Qualification Code: 7CF N01

I.1.11.18.1 Admission requirements for the programme

Refer to the qualification (I.1.9.2) and Faculty-specific information (I.1.2.) in this Calendar for information regarding admission requirements.

Enquiries with regard to these curricula should be directed to the School of Mechanical and Nuclear Engineering at telephone (018) 299 1663.

I.1.11.18.2 Curriculum Code: I801P

Module code	Descriptive name	Cr
Compulsory		
IIOB 871	Dissertation (*full*)	180
Total credits for the curriculum		**180**

I.1.11.19 MEng in Development and Management Engineering
Qualification Code: 702 111

Module code	Descriptive name	Prerequisites	Cr
Core (Compulsory)			
IIOB 872	Dissertation	-	100
Electives (Choose five – compulsory)			
IIOB 881	Project Management	-	16
IIOB 882	Maintenance Management	-	16
IIOB 883	Corporate Career Skills	-	16
IIOB 884	Production Optimization Management	-	16
IIOB 885	Entrepreneurial Career Skills	-	16
IIOB 886	System Engineering	-	16
IIOB 887	Quality Management in Engineering Projects	-	16
Total credits for the curriculum			**180**

** The School reserves the right not to offer certain modules during a certain year.*

I.1.12 RULES FOR THE DEGREE MASTER OF SCIENCE IN ENGINEERING SCIENCES

I.1.12.1 Duration (*minimum and maximum duration*)

The minimum **full-time** term of study is **one (1) year** and the maximum is **two (2) years.**

For **part-time** study the minimum term is **one (1) year** and the maximum term is **three (3) years**, calculated from the beginning of the first year of registration for the relevant programme.

I.1.12.2 Admission requirements for the qualification

The MSc-degree in Engineering Science may follow on a

- BSc (*Hons*) degree;
- applicable four (4) year bachelor degree (*ECSA-accredited*) in engineering or the student has been allowed to that status;
- another recognized qualification that allows the student to attain equivalent status and which has approved by the Postgraduate Research Quality Assurance Committee.

The School Director may, with notification to the Faculty Management Committee (*postgraduate*), request students who do not comply with the abovementioned requirements to be provisionally registered for the MSc-degree on the grounds of knowledge and experience gained through prior learning, pending the Recognition of Prior Learning outcome (*to be concluded within 6 months*). Refer to I.1.2.1. for the RPL-process to be followed for consideration of non-provisional registration.

Programme-specific assumptions are, where applicable, indicated at each programme description.

I.1.12.3 Composition of the programme

The master's degree programme allows for two options. These options allow different combinations of coursework and/or research that are based on an engineering problem leading to a synthesized solution based on engineering methods and designs.

The two options can be summarized as follows:

Option A		**Option B**		**Option B (Nuclear)**	
Description	**Credits**	**Description**	**Credits**	**Description**	**Credits**
Dissertation (*full*)	180	Dissertation	100	Dissertation	100
		5x elective modules	16 ea.	3x compulsory modules	16 ea.
				2x elective modules	16 ea.
Total	**180**	**Total**	**180**	**Total**	**180**

**** Note:** At least three (3) of the five (5) 16-credit taught course modules must be engineering technology modules within the chosen curriculum.*

I.1.12.3.1 Outcomes and assessment criteria

The programme outcomes have been achieved if the student demonstrates competence in applying research methodology as evidenced by a dissertation with proper structure, style and language. For full breakdown refer to I.1.8. and I.1.9.

I.1.12.4 Requirements for a dissertation

Regarding technical requirements, a dissertation must comply with all requirements and outcomes laid down by the Faculty. Also see the Manual for Postgraduate Studies and the applicable Academic Rules in this regard.

For presenting a dissertation in the form of a published research article(s) or (an) unpublished manuscript(s) in article format, see Academic Rule A.4.4.2.9. and the Manual for Postgraduate Studies (*Section 6.9*).

I.1.12.5 Faculty-specific requirements

The title of the dissertation, the research proposal and the appointment of external examiners must be reviewed by the Faculty Management Committee (*postgraduate*). Further information regarding rules and procedures are contained in the Faculty-specific rules I.1.2.14., Academic Rules A.4.3.1. and A.4.4., and in the Manual for Postgraduate Study.

In addition to attaining the abovementioned outcomes, students are also required to:

- take part in at least two formal colloquia and/or technical conferences where aspects of their work are presented to an audience of peers;
- have at least one full-length research paper on aspects of the dissertation submitted for review/publication in an accredited scientific journal before being allowed to submit the dissertation for examination (*A.4.4.2.8. and section 3.1.1.3*.).

Official prescribed forms used in the postgraduate study process are available on the postgraduate e-Fundi portal – website: http://efundi.nwu.ac.za/portal/ and www.engineeringpostgrad.co.za/uets.

Refer to the programme-specific information in this Calendar for information regarding the Faculty-specific requirements.

I.1.12.6 Articulation possibilities

- After the successful completion of the MSc programme, graduates who have performed adequately may be allowed to continue with a doctoral programme in the core module/programme in which the qualification has been awarded.
- Credit will be given for modules passed at other faculties or institutes of higher education, with final approval from the Faculty Management Committee (*postgraduate*), provided the outcome and total credit requirements for this qualification/programme have been fully complied with.
- The expertise that the graduate acquires with this qualification in one of the engineering disciplines will empower him/her to continue with further learning and research in various other specialized fields at a variety of institutions.

I.1.12.7 List of modules

Although the research and research modules are managed by the Unit for Energy and Technology Systems, the taught course modules are managed by the respective Schools. Curricula are listed under the Schools or Units in which they are presented for easy reference.

Note: CRCED Pretoria offers supervision in a variety of the available study areas

The total number of credits needed to obtain an MSc in Engineering Sciences degree is 180 credits. Each credit represents a nominal of 10 hours of study. Students choose one curriculum with certain taught course modules to be completed in order to obtain the relevant degree. The taught course modules approved as part of the master's degree curricula in the Faculty of Engineering are listed below.

UNIT FOR ENERGY AND TECHNOLOGY SYSTEMS		
Module code	**Descriptive name**	**Credits**
CEMI 871	Dissertation (*full*)	180
CEMI 872	Dissertation	100
EERI 871	Dissertation (*full*)	180
ELEI 872	Dissertation	100
REEI 872	Dissertation	100
MEGI 871	Dissertation (*full*)	180
MEGI 872	Dissertation	100
NUCI 872	Dissertation	100
SCHOOL OF CHEMICAL AND MINERALS ENGINEERING		
Module code	**Descriptive name**	**Credits**
CEMI 875	Fluid-phase Equilibrium	16
CEMI 876	Separation Processes	16
CEMI 877	Coal Technology I	16
CEMI 878	Coal Technology II	16
CEMI 879	Bioreactors and Bioprocess Technology	16
CEMI 881	Bio-ethanol Process Technology	16
CEMI 882	STS and Renewable Energy	16
CEMI 883	Introduction to Renewable and Sustainable Energy	16
CEMI 884	Biodiesel Process Technology	16
SCHOOL OF ELECTRICAL, ELECTRONIC AND COMPUTER ENGINEERING		
Module code	**Descriptive name**	**Credits**
EEII 881	Data Mining and Knowledge Extraction	16
EEII 882	Electrical Power Quality	16
EEII 883	Advanced Protection Systems	16
EEII 884	Advanced Signal Processing	16
EEII 885	Information Systems for e-trade and e-logistics	16
EEII 886	Information Security: Strategies and Techniques	16
EEII 887	Kalman Filters	16
EEII 888	Power System Dynamics	16
EEII 889	Compensation of Distortion in Power Systems	16
EEII 891	Advanced Electronic Development and Design	16
EEII 892	Advanced Power Electronics	16
EEII 893	Advanced Electrical Machines	16
EERI 877	Digital Control Systems	16
ERIE 874	Neural Networks	16

ERIE 875	Fuzzy Logic Systems	16
ERIE 876	Process Modelling and Identification	16
SCHOOL OF MECHANICAL AND NUCLEAR ENGINEERING		
Module code	**Descriptive name**	**Credits**
MEGI 874	Computational Fluid Dynamics I	16
MEGI 875	Computational Fluid Dynamics II	16
MEGI 876	Finite Element Methods	16
MEGI 877	Finite Element Methods for Flow	16
MEGI 878	Energy Management	16
MEGI 879	Advanced Engineering Thermodynamics	16
MEGI 884	Advanced Strength of Materials	16
MEGI 889	Materials Selection for Design	16
MEGI 894	Composite Materials	16
MGII 885	Thermal-Fluid Systems Modelling I	16
MGII 886	Thermal-Fluid Systems Modelling II	16
MGII 887	Gas Turbine Theory and Performance	16
NUCI 621	Introduction to Thermal-Fluid Sciences	16
NUCI 671	Mathematics for Nuclear Engineers	16
NUCI 811	Nuclear Engineering I	16
NUCI 874	Advanced Reactor Analysis I	16
NUCI 876	High Temperature Gas-Cooled Reactor Thermal-Fluid Analysis	16
NUCI 877	High Temperature Reactor Fuels and Materials	16
NUCI 878	High Temperature Reactor Technology	16
NUCI 879	Nuclear Project Management	16
NUCI 882	Light Water Reactor Thermal-Hydraulics	16
NUCI 883	Nuclear Engineering II	16
NUCI 886	Pebble Bed Reactor Design	16
NUCI 887	Reactor Analysis	16
NUCI 888	Reactor Safety	16
NUCI 889	Pressurized Water Reactor Technology	16

I.1.12.8 Course modules from other MSc and/or other curricula

Any postgraduate taught course module in any School in the Faculty of Engineering or complementary modules offered by any other Faculty may be chosen after consultation with the appropriate Programme Manager and his/her supervisor, provided that:

- more than 50% of taught course modules are within the chosen curriculum;
- the complimentary taught course modules, as chosen from other master's curricula, are relevant to the proposed research project, pre-approved by the study leader, on a NQF level 9, with the appropriate credits; and
- the supervisor has given permission in writing for the choice of other taught course modules to be taken.

I.1.12.9 MSc (Engineering) with Chemical Engineering
Qualification Code: 7CM N02

I.1.12.9.1 Admission requirements for the programme

Refer to the qualification (I.1.10.2) and Faculty-specific information (I.1.2.) in this Calendar for information regarding admission requirements.

Enquiries with regard to these curricula should be directed to the School of Chemical and Minerals Engineering at telephone (018) 299 1995.

I.1.12.9.2 Curriculum Code: I801P

Module code	Descriptive name	Cr
Compulsory		
CEMI 871	Dissertation (*full*)	180
Total credits for the curriculum		**180**

I.1.12.10 MSc in Chemical Engineering
Qualification Code: 203 152

I.1.12.10.1 Curriculum Code: I891P

Module code	Descriptive name	Prerequisites	Cr
Core (Compulsory)			
CEMI 872	Dissertation	-	100
Electives (Choose five – compulsory)			
CEMI 875	Fluid-phase Equilibrium	-	16
CEMI 876	Separation Processes	-	16
CEMI 877	Coal Technology I	-	16
CEMI 878	Coal Technology II	-	16
CEMI 879	Bioreactors and Bioprocess Technology	-	16
CEMI 881	Bio-ethanol Process Technology	-	16
CEMI 882	STS and Renewable Energy	-	16
CEMI 883	Introduction to Renewable and Sustainable Energy	-	16
CEMI 884	Biodiesel Process Technology	-	16
Total credits for the curriculum			**180**

** The School reserves the right not to offer certain modules during a certain year.*

I.1.12.11 MSc (Engineering) with Computer and Electronic Engineering
Qualification Code: 7CM N04

I.1.12.11.1 Admission requirements for the programme

Refer to the qualification (I.1.10.2) and Faculty-specific information (I.1.2.) in this Calendar for information regarding admission requirements.

Enquiries with regard to these curricula should be directed to the School of Electrical, Electronic and Computer Engineering at telephone (018) 299 4058.

I.1.12.11.2 Curriculum Code: I801P

Module code	Descriptive name	Cr
Compulsory		
EERI 871	Dissertation (*full*)	180
Total credits for the curriculum		**180**

I.1.12.12 MSc in Computer and Electronic Engineering
Qualification Code: 203 154

I.1.12.12.1 Curriculum Code: I897P

Module code	Descriptive name	Prerequisites	Cr
Core (Compulsory)			
REEI 872	Dissertation	-	100
Electives (Choose five – compulsory)			
EEII 881	Data Mining and Knowledge Extraction	-	16
EEII 884	Advanced Signal Processing	-	16
EEII 885	Information Systems for e-trade and e-logistics	-	16
EEII 886	Information Security: Strategies and Techniques	-	16
EEII 887	Kalman Filters	-	16
EEII 891	Advanced Electronic Development and Design	-	16
EERI 877	Digital Control Systems	-	16
ERIE 874	Neural Networks	-	16
ERIE 875	Fuzzy Logic Systems	-	16
ERIE 876	Process Modelling and Identification	-	16
Total credits for the curriculum			**180**

** The School reserves the right not to offer certain modules during a certain year.*

I.1.12.13 MSc (Engineering) with Electrical and Electronic Engineering
Qualification Code: 7CM N03

I.1.12.13.1 Admission requirements for the programme

Refer to the qualification (I.1.10.2) and Faculty-specific information (I.1.2.) in this Calendar for information regarding admission requirements.

Enquiries with regard to these curricula should be directed to the School of Electrical, Electronic and Computer Engineering at telephone (018) 299 4058.

I.1.12.13.2 Curriculum Code: I801P

Module code	Descriptive name	Cr
Compulsory		
EERI 871	Dissertation (*full*)	180
Total credits for the curriculum		**180**

I.1.12.14 MSc in Electrical and Electronic Engineering
Qualification Code: 203 153

I.1.12.14.1 Curriculum Code: I894P

Module code	Descriptive name	Prerequisites	Cr
Core (Compulsory)			
ELEI 872	Dissertation	-	100
Electives (Choose five – compulsory)			
EEII 882	Electrical Power Quality	-	16
EEII 883	Advanced Protection Systems	-	16
EEII 884	Advanced Signal Processing	-	16
EEII 887	Kalman Filters	-	16
EEII 888	Power System Dynamics	-	16
EEII 889	Compensation of Distortion in Power Systems	-	16
EEII 891	Advanced Electronic Development and Design	-	16
EEII 892	Advanced Power Electronics	-	16
EEII 893	Advanced Electrical Machines	-	16
EERI 877	Digital Control Systems	-	16
ERIE 874	Neural Networks	-	16
ERIE 875	Fuzzy Logic Systems	-	16
ERIE 876	Process Modelling and Identification	-	16
Total credits for the curriculum			**180**

** The School reserves the right not to offer certain modules during a certain year.*

I.1.12.15 MSc (Engineering) with Mechanical Engineering
Qualification Code: 7CM N01

I.1.12.15.1 Admission requirements for the programme

Refer to the qualification (I.1.10.2) and Faculty-specific information (I.1.2.) in this Calendar for information regarding admission requirements.

Enquiries with regard to these curricula to be should be directed to the School of Mechanical and Nuclear Engineering at telephone (018) 299 4496.

I.1.12.15.2 Curriculum Code: I801P

Module code	Descriptive name	Cr
Compulsory		
MEGI 871	Dissertation (*full*)	180
Total credits for the curriculum		**180**

I.1.12.16 MSc in Mechanical Engineering
Qualification Code: 203 151

I.1.12.16.1 Curriculum Code: I888P

Module code	Descriptive name	Prerequisites	Cr
Core (Compulsory)			
MEGI 872	Dissertation	-	100
Electives (Choose five – compulsory)			
MEGI 874	Computational Fluid Dynamics I	-	16
MEGI 875	Computational Fluid Dynamics II	MEGI 874	16
MEGI 876	Finite Element Methods	-	16
MEGI 877	Finite Element Methods for Flow	-	16
MEGI 878	Energy Management	-	16
MEGI 879	Advanced Engineering Thermodynamics	-	16
MEGI 884	Advanced Strength of Materials	-	16
MEGI 889	Materials Selection for Design	-	16
MEGI 894	Composite Materials	-	16
MGII 885	Thermal-Fluid Systems Modelling I	-	16
MGII 886	Thermal-Fluid Systems Modelling II	MGII 885	16
MGII 887	Gas Turbine Theory and Performance	-	16
Total credits for the curriculum			**180**

** The School reserves the right not to offer certain modules during a certain year.*

I.1.12.17 MSc in Nuclear Engineering
Qualification Code: 203 200

I.1.12.17.1 Admission requirements for the programme

Refer to the qualification (I.1.10.2), Faculty-specific information (I.1.2.), and admission requirements (I.1.10.13.1) in this Calendar for more information regarding admission requirements.

- BSc-degree with Mathematics, Applied Mathematics or Physics to at least third year level ***plus*** a BSc Honours degree in Physics or Mathematics; or
- BTech-degree in Engineering (*Mechanical, Chemical or Electrical*) ***plus*** a BSc Honours degree in Physics or Mathematics; or
- Postgraduate Diploma in Nuclear Science and Technology, with a pass average of 65%.

Nuclear Engineering modules are presented on a focused contact basis. Instruction is provided as a series of continuous contact sessions, followed by assignments and examinations. This requires students to attend lectures for a number of consecutive days as specified per module.

Enquiries with regard to these curricula should be directed to the School of Mechanical and Nuclear Engineering at telephone (018) 299 4496.

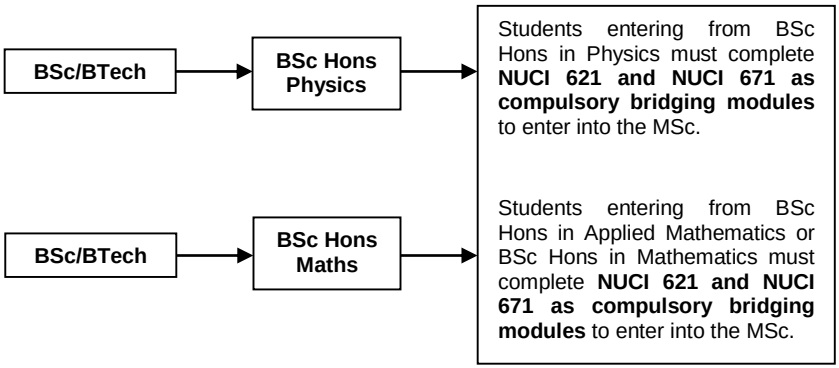
I.1.12.17.2 Faculty-specific requirements

All MSc students must register for the two bridging modules, namely:

- **NUCI 621** – Introduction to Thermal-Fluid Sciences; and
- **NUCI 671** – Mathematics for Nuclear Engineers.

** This includes students entering via the Postgraduate Diploma route.*

*** The credits for the two bridging modules do not count towards the 180 credits for the master's degree.*



I.1.12.17.3 Curriculum Code: I803P

Module code	Descriptive name	Prerequisites	Cr
Core (Compulsory)			
NUCI 872	Dissertation	-	100
NUCI 811	Nuclear Engineering I	-	16
NUCI 883	Nuclear Engineering II	NUCI 811 NUCI 621* NUCI 671*	16
NUCI 887	Reactor Analysis	NUCI 883	16
Electives (Choose two – compulsory)			
NUCI 882	Light Water Reactor Thermal-Hydraulics	NUCI 883 MGII 885	16
NUCI 886	Pebble Bed Reactor Design	NUCI 883 NUCI 874	16
NUCI 888	Reactor Safety	NUCI 883 NUCI 887	16
NUCI 889	Pressurized Water Reactor Technology	NUCI 883 NUCI 887	16
NUCI 874	Advanced Reactor Analysis I	NUCI 887	16
NUCI 876	High Temperature Gas-Cooled Reactor Thermal-Fluid Analysis	NUCI 883 MEGI 874	16
NUCI 877	High Temperature Reactor Fuels and Materials	NUCI 883 NUCI 887	16
NUCI 878	High Temperature Reactor Technology	NUCI 883 NUCI 887	16
NUCI 879	Nuclear Project Management	-	16
MEGI 874	Computational Fluid Dynamics I	MGII 885	16
MGII 885	Thermal-Fluid Systems Modelling I	NUCI 621	16
MGII 886	Thermal-Fluid Systems Modelling II	MGII 885	16
IIOB 886	System Engineering	-	16
Total credits for the curriculum			**180**

** Refer to I.1.10.13.2*

*** The School reserves the right not to offer certain modules during a certain year.*

I.1.13 RULES FOR THE DEGREE OF PHILOSOPHIAE DOCTOR

The purpose of this programme is to provide opportunity for original research by either uncovering new knowledge and/or by independent and critical analysis of existing information.

I.1.13.1 Duration (*minimum and maximum duration*)

The minimum **full-time** term of study is **two (2) years** and the maximum is **four (4) years.**

For **part-time** study the minimum term is **two (2) years** and the maximum term is **six (6) years**, calculated from the beginning of the first year of registration for the relevant programme.

Academic Rule A.4.4.9. is applicable to students whose master's registration had been converted to PhD registration.

I.1.13.2 Admission requirements for the qualification

- Master's degree in Engineering;
- MSc in Engineering Sciences; or
- Another recognized qualification that allows the student to attain equivalent status and which is approved by the Postgraduate Research Quality Assurance Committee.

The School Director may, with notification to the Faculty Management Committee (*postgraduate*), request students who do not comply with the abovementioned requirements to be provisionally registered for the PhD-degree on the grounds of knowledge and experience gained through prior learning, pending the Recognition of Prior Learning outcome (*to be concluded within 6 months*). Refer to I.1.2.1. for the RPL-process to be followed for consideration of non-provisional registration.

I.1.13.3 Faculty-specific requirements

The title of the thesis, the research proposal and the appointment of external examiners must be reviewed by the Faculty Management Committee (*postgraduate*). Further information regarding rules and procedures are contained in the Faculty-specific rules I.1.2.14., Academic Rules A.5.3.1. and A.5.4., and in the Manual for Postgraduate Study.

In addition to attaining the abovementioned outcomes, students are also required to:

- take part in at least two formal colloquia and/or technical conferences where aspects of their work are presented to an audience of established researchers and peers;
- have at least one full-length research paper on aspects of the thesis submitted for review in an accredited scientific journal before being allowed to submit the thesis for examination (*A.5.4.2.6. and section 3.1.1.3.*).; **OR**
- have two papers in accredited peer reviewed conference proceedings on aspects of the thesis before being allowed to submit the thesis for examination.

Official prescribed forms used in the postgraduate study process are available on the postgraduate portal – website: http://efundi.nwu.ac.za/portal/ and www.engineeringpostgrad.co.za/uets.

I.1.13.4 Requirements for a thesis

Regarding technical requirements, a thesis must comply with all requirements and outcomes laid down by the Faculty. Also see the Manual for Postgraduate Studies and the applicable Academic Rules in this regard.

For presenting a thesis in the form of a published research article(s) or (an) unpublished manuscript(s) in article format, see Academic Rule A.5.4.2.7. and the Manual for Postgraduate Studies (*Section 6.9*).

I.1.13.4.1 Outcomes and assessment criteria

The programme outcomes have been achieved if the student has made an original contribution to knowledge in a chosen field as evidenced by a thesis with proper structure, style and language. For full breakdown refer to I.1.8. and I.1.9.

I.1.13.5 Articulation possibilities

With the basic and applied expertise and the research skills that the graduate acquires with this qualification in one of the engineering disciplines, the graduate will be empowered, with further learning and research, to pursue other specialized fields at a variety of institutions, both nationally and internationally.

I.1.13.6 Programme

DOCTORATES				
Qualification	**Qualification and Qualification Code**	**Curriculum Code**	**Method of delivery**	**NQF level**
Philosophiae Doctor with (***PhD***)	Chemical Engineering **7CA R01**	**I901P**	Full-time Part-time	10
	Computer Engineering **7CA R03**	**I901P**	Full-time Part-time	10
	Computer and Electronic Engineering **7CA R02**	**I901P**	Full-time Part-time	10
	Development and Management Engineering **7CA R04**	**I901P**	Full-time Part-time	10
	Electrical Engineering **7CA R06**	**I901P**	Full-time Part-time	10
	Electronic Engineering **7CA R07**	**I901P**	Full-time Part-time	10
	Electrical and Electronic Engineering **7CA R05**	**I901P**	Full-time Part-time	10
	Industrial Engineering **7CA R11**	**I901P**	Full-time Part-time	10
	Mechanical Engineering **7CA R09**	**I901P**	Full-time Part-time	10
	Nuclear Engineering **7CA R10**	**I901P**	Full-time Part-time	10

** Note: CRCED Pretoria offers supervision in a variety of the above study areas. Please consult the CRCED personnel at (012) 809 0412.*

I.2 MODULE OUTCOMES

CEMI 875	NQF level: 9
Title: Fluid-Phase Equilibrium	
Module outcomes: After completion of this module, the student should be able to: • use statistical thermodynamics theory for the determination of thermodynamic characteristics of fluids; • establish the thermodynamic equilibrium by means of molecular modelling methods; and • use advanced thermodynamic theory for the development of separation processes such as membrane separation, supercritical extraction and relative distillation.	
Method of delivery: The module is presented as follows: • Approximately 40 hours contact time with the lecturer in the form of formal lectures, tutorials and discussion classes; and • Approximately120 hours of self-study and preparation of assignments.	

NUCI 574	NQF level: 8
Title: Nuclear Engineering Project	
Module outcomes: Learners are required demonstrate their ability to execute a project in the field of nuclear engineering independently by publishing a concise scientific report on it.	

NUCI 575	NQF level: 8
Title: Nuclear Physics	
Module outcomes: Learners are introduced to the principles of radioactivity and the interaction of different types of radiation with matter. The content of the module includes: • Properties of the nucleus; • Basic features of radioactivity and the radioactive decay process; • The radiations emitted by radioactive substances and their interaction with matter; • Comparison of atomic decays; and • Nuclear reactions.	

NUCI 576	NQF level: 8
Title: Radiation and the Environment	
Module outcomes: Learners should develop a sound understanding of the characteristics of ionizing radiation and radio-nuclides, interactions of radiation with matter, biological effects, protection of persons and the environments against harmful effects of radiation and detection and measurement of radiation. The module provides the student with baseline knowledge of the use of radiation and radio-nuclides in various branches of science, technology and medicine, with special emphasis on the monitoring of the environmental pollution on nuclear techniques. The content includes: • Characteristics of ionizing radiation;	

- Properties of radio-nuclides and other sources of radiation;
- Basic processes involved in interactions of radiation with matter;
- Main radiation quantities and units;
- Physical, chemical and biological effects of radiation;
- Protection of people and the environment against harmful effects of radiation;
- Radiation detection; measurement and spectrometry;
- Monitoring of environmental radioactivity;
- Applications of radiation and radio-nuclides in science, industry and medicine; and
- The use of nuclear techniques in assessing various pollutants in the environment.

NUCI 621	**NQF level: 8**

Title:
Introduction to Thermal-Fluid Sciences

Module outcomes:
On the completion of this module the student should be able to:

- demonstrate a thorough understanding of thermodynamics, fluid mechanics, heat transfer and turbo machines by analysing and solving simple and complex industry related problems;
- demonstrate an understanding of how the different constituent parts of an integrated system interact and influence each other by describing the interaction and calculating the effect of changing certain variables; and
- evaluate the performance of simple and complex systems and propose actions to improve their performance.

NUCI 671	**NQF level: 8**

Title:
Mathematics for Nuclear Engineers

Module outcomes:
On completion of this module the student should be able to solve mathematical problems related to nuclear engineering. With this knowledge they should be able to:

- use different methods to solve partial and differential equations analytically;
- solve partial and differential equations numerically;
- study special functions and their application in solving differential equations;
- use this basic knowledge to solve more complex problems;
- use the methods learnt here in other nuclear engineering modules.

NUCI 811	**NQF level: 9**

Title:
Nuclear Engineering I

Module outcomes:
The module provides students with a broad overview of nuclear engineering to provide them with the basic knowledge they need to function in the nuclear reactor industry. The student should be able to demonstrate specialist knowledge to enable engagement with criticism of current nuclear research and nuclear practices. The student's problem solving skill should be developed to demonstrate the ability to use a wide range of specialist skills in identifying, conceptualizing, designing and implementing methods to address complex practical and theoretical nuclear problems. The student should also demonstrate an understanding of the consequences of any nuclear solution.

Therefore, the following topics in nuclear engineering are covered:

- The history of nuclear engineering;
- Basics of anatomic and nuclear physics for engineers;
- Interaction of neutrons and nuclear radiation with matter;
- Basic types of nuclear power plants, neutron diffusion and moderation;

- Nuclear reactor theory;
- Time dependent behaviour and effects;
- Heat generation in nuclear cores;
- Radiation protection;
- Radiation shielding; and
- Reactor safety and licencing.

NUCI 874	NQF level: 9
Title: Advanced Reactor Analysis I	
Module outcomes: The following topics in nuclear engineering are covered: • Neutron transport theory (Sn, Pn derivation); • Neutron diffusion theory (FD, codes); • Neutron energy distribution; • Neutron thermalization; • Reactivity changes (bum up, point kinetics); and • Introduction to Monte Carlo methods (basic equations, approaches, cross-sections, statistics).	

NUCI 876	NQF level: 9
Title: High Temperature Gas-Cooled Reactor Thermal-Fluid Analysis	
Module outcomes: Upon completion of this module, students should possess a comprehensive and systematic knowledge base and skills in the following: • Physical properties of fluids and solid materials used in HTR's; • Pressure drop relationships for flow through a pebble bed reactor; • Heat generation in HTR's; • Heat transfer mechanisms in pebble be HTR's; • Conservation equations governing heat transfer and fluid flow in HTR's; • Numerical solution techniques of the governing equations; and • HTR design bases.	

NUCI 877	NQF level: 9
Title: High Temperature Reactor Fuels and Materials	
Module outcomes: On completion of this module, the students are expected to: • Understand the reasoning for selecting proper materials for HTR's; • Demonstrate knowledge of basic steps of design and fabrication of high temperature reactor fuel; • Calculate main operational parameters such as fuel temperature, burn-up, CO production, etc.; • Discuss main problems and ways of improvements for HTR fuel and structural materials; and • Relate reactor physics, thermal hydraulics and reactor design aspects with reactor fuel and materials.	

NUCI 878	NQF level: 9
Title: High Temperature Reactor Technology	
Module outcomes: On completion of this module, the student will have obtained a basic knowledge in the field of HTR technology, safety aspects and applications of HTR. The students receive additional information on different processes of electricity production and several of the future important processes of nuclear heat application and on estimation of production costs. The student should be able to analyse physical, technical and safety relevant questions, not only valid for HTR-plants, but for other concepts too.	

NUCI 879	NQF level: 9
Title: Nuclear Project Management	
Module outcomes: After successful completion of the Nuclear Project Management (NPM) module the student should demonstrate mastery of basic knowledge and skills pertaining to the theory, concepts, processes, tools and techniques of project management. He/she will have applied it to a typical nuclear industry project.	

NUCI 882	NQF level: 9
Title: Light Water Reactor Thermal-Hydraulics	
Module outcomes: LWR Thermal-Hydraulics examines detailed thermal hydraulic analysis with an emphasis on those TH phenomena important to Light Water Reactor (LWR) design and operation. Specifically, analysis of the transport equations for single and two-phase flow is presented with an added emphasis on two-phase flow dynamics and heat transfer. Analysis methods for LWR power stations are introduced via the formulation of reactor thermal hydraulic design problems. Particularly, steady state and transient analysis of single, heated channels are covered.	

NUCI 883	NQF level: 9
Title: Nuclear Engineering II	
Module outcomes: On completion of this module, the student will have obtained the basic knowledge in understanding how nuclear power plants are designed and operated. With the knowledge the student have obtained from the module, he/she should be able to solve basic thermal-hydraulic problems related to nuclear reactor engineering and communicate with the engineering community about these problems. The student's knowledge in the thermal-hydraulic analysis of nuclear reactors, as well as knowledge of nuclear fuel and reactor operations, will enable him/her to work in the nuclear industry.	

NUCI 886	NQF level: 9
Title: Pebble Bed Reactor Design	
Module outcomes: Upon completion of this module, learners should possess a comprehensive and systematic knowledge base and skills in the following: • Understanding the difference between typical reactors and pebble bed reactors.	

Special attention shall be given to:

- The fuel design;
- Reactor design; and
- The reactor operation.

The various physical characteristics encountered inside the reactor and how it is simulated by calculation are explained. These properties include aspects of:

- Neutron moderation;
- Double heterogeneity;
- Spectrum calculations;
- Flux distribution;
- Power generation;
- Bum-up characteristics;
- Pebble movement in the reactor under gravity;
- Temperature feedback;
- Decay heat production; and
- How the characteristics mentioned above and combinations thereof are simulated by the VSOP-A suite of codes.

Learners should also be able to independently perform simulations of the design baselines for HTR's using existing codes and interpret the results.

NUCI 887	**NQF level: 9**

Title:
Reactor Analysis

Module outcomes:
Upon successful completion of the module, the student should have acquired basic knowledge of nuclear reactor analysis, which includes the following topics:

- Physics of neutron-nuclear interactions and fission chain reaction;
- Neutron transport model and diffusion theory;
- Neutron energy distribution, including slowing down, resonance absorption and group energy method;
- Nuclear reactor dynamics; and
- Fuel burn-up.

This level of knowledge would enable the student to understand physical principles and apply computational methods for reactor design and analysis such as the calculation of neutron flux distribution in space and energy for simple homogenous geometrics and heterogeneous lattices.

NUCI 888	**NQF level: 9**

Title:
Reactor Safety

Module outcomes:
On completion of this module the student should have developed a basic knowledge in the field of reactor safety. With this knowledge he/she should be able to:

- understand accidental situations and the student should have learned the necessary methods to evaluate them;
- the student should be able to communicate with the engineering community about these problems;
- the student should furthermore be able to carry out estimations for important accidents in nuclear plants;
- use the basic knowledge to go deeper and to use complex programmes for safety analysis; and
- use the knowledge to work in the nuclear industry or in safety organizations for

supervision of nuclear power plants.

The methods used in nuclear safety analysis are helpful in other fields of technology.

NUCI 889	NQF level: 9
Title: Pressurized Water Reactor Technology	
Module outcomes: On completion of this module the student should: • have basic knowledge to understand how Pressurized Water Reactors (PWR's) are designed and operated; • understand the functions of various PWR systems; • understand how improvements have made this form of power plant the choice for the advanced PWR's now being ordered; • have knowledge of the PWR systems that will help foster an understanding of the various design requirements; and • understand how the various systems interact to provide a reliable and safe source of electricity.	