

The NWU Postgraduate School of

NUCLEAR SCIENCE AND ENGINEERING

Leading the way in nuclear science and technology

Postgraduate Diploma in Nuclear Science and Technology

NWU has experienced mounting interest in its Masters in Nuclear Engineering from prospective students holding BSc or BTech degrees.

To facilitate access to the Masters programme, NWU has designed a Postgraduate Diploma in Nuclear Science and Technology.

The Postgraduate Diploma qualification not only serves as an articulation route to Masters level studies in Nuclear Science and Engineering but it also provides an excellent career development qualification for the graduate holding either a BSc or a BTech degree who wants to pursue a career in the nuclear industry.

The individual modules of the Postgraduate Diploma have all been approved by the NWU Senate as short courses and will also be offered as such from the beginning of 2010.

Be part of the solution for the growing energy demand!

1. Introduction

This programme will provide 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.*

Furthermore, the Postgraduate Diploma in Nuclear Science and Technology pursues knowledge and innovation in the field of nuclear power generation and will develop and empower graduates to think laterally and critically and to serve the country specifically within the fields of power generation.

2. Entry requirements

- *The entry requirements for the programme are a three year B.Sc degree (with Maths or Physics to at least the second year) or*
- *B.Tech (Engineering)*

3. Method of presentation

The modules are presented by a distance-contact model developed by North-West University in collaboration with overseas institutions. The e-learning platform e-Fundi, with an interactive site for each module and enables students to participate in well structured self-study learning activities prior to attending the contact lecture session. e-Fundi supports a flexible teaching environment to facilitate collaboration between geographically dispersed students, facilitators and lecturers.

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

4. Structure

The Post-graduate Diploma in Nuclear Science and Technology will be structured as set out in Table 1:

Table 1: Structure of the Post-graduate Diploma in Nuclear Engineering.

Components	Credits	Composition
<i>Project Report (compulsory)</i>	16	Core
<i>Fundamental and core modules courses (compulsory)</i>	7 x 16	3 x Fundamental 4 x Core
TOTAL CREDITS	128	

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

5. Modules offered

Code	Course	Credits
NUCI 511	<i>Nuclear Engineering I</i>	16
NUCI 521	<i>Thermal-Fluid Sciences</i>	16
NUCI 571	<i>Mathematics for Nuclear Engineers</i>	16
NUCI 575	<i>Nuclear Physics</i>	16
NUCI 572	<i>Nuclear Reactor Technology</i>	16
NUCI 576	<i>Radiation and the environment</i>	16
NUCI 574	<i>Nuclear Engineering Project</i>	16
NUCI 573	<i>Nuclear Reactor Safety</i>	16
Total credits		128

6. Application and registration

Applications should be submitted before 31 January 2010.

Obtain the formal NWU application form from Naomi Fourie, e-mail:Naomi.Fourie@nwu.ac.za, tel: 018 299 2642. Follow instructions on the application form.

Application process

- *Post the completed documentation by registered mail to:
Attention: Admissions – Naomi Fourie
North-West University Potchefstroom Campus
Private Bag X6001
2520 POTCHEFSTROOM, RSA*
- *Include the application fee of R150-00 or the deposit slip (proof of payment with your Surname as reference)*
- *After your application has been evaluated and approved, you will receive a letter of confirmation that your application has been successful.*

Registration process (Dalene janse van Rensburg, tel: 018 299 2633)

- *A registration document will be posted to your postal address. On this document you should also indicate the modules you want to register for. The original registration document must be submitted to the university. Registration must take place before attending any classes.*
- *Registration involves: The completed registration document (original) together with the payment of your registration fee and 35% of the programme fee (Fees for 2010 will be confirmed and the mentioned fees are only a figure).*
- ***If you are a bursary holder, the responsible company** should submit a letter, confirming that they will be responsible for all your fees. If the university does not receive either the amount for registration or the letter, you cannot be registered and thus, not take part in lectures or write the exams.*

7. Tuition fees

Application fee is R150 and the registration fee is R910.

The tuition fee for the complete programme will be available in January 2010.

The tuition fee excludes text books, travel and accommodation.

8. Postgraduate bursaries/ scholarship

Different bursary options are available for postgraduate students. When a student is approved to enter into the Masters programme in Nuclear Engineering, he/ she may apply for a PUK-bursary. To be considered for this bursary, the student should have obtained a final grade of 60% for his/ her B.Eng or B.Sc Hons. The contact person is:

Susan van der Westhuisen +27 18 299-2188

The following institutions also offer bursaries for students entering into postgraduate studies in Nuclear Engineering (The contact persons name is also included for convenience):

PBMR: Ilze Taylor +27 12 641 1000

NECSA: Selebale Monageng +27 12 305 5404

ESKOM: Mike Brown +27 51 404 2706

9. Short description of each modules

NUCI 511 NUCLEAR ENGINEERING I

Atomic and nuclear physics, interaction of radiation with matter, nuclear reactors and nuclear power, neutron diffusion and moderation, nuclear reactor theory, the time dependent reactor, heat removal from nuclear reactors, radiation protection, radiation shielding, reactor licensing, safety and the environment.

NUCI 521 THERMAL-FLUID SCIENCES

Thermodynamics: properties of pure substances, work and heat, First Law of Thermodynamics, Second Law of Thermodynamics, power cycles; Fluid mechanics: fluid static's, flow analysis, conservation laws for control volumes, differential forms of basic laws, dimensional analysis, incompressible viscous flow through pipes, one-dimensional compressible flow; Turbo machinery: basic laws, compressors, turbines; Heat transfer: conduction, convection and radiation heat transfer, heat exchangers.

NUCI 572 NUCLEAR REACTOR TECHNOLOGY

The purpose of this module is to introduce students from a non- engineering discipline (B.Sc or B.Tech) to nuclear power reactor technology. The module will give a broad overview of the different types of nuclear power reactors, LWR (PWR and BWR), HWR and GCR (AGR and HTR). The module will also cover the main technological elements of each type of reactor (fuel elements and core, main components, etc.). Aspects of reactor operation, reactor control and stability, will be covered, including elementary concepts of reactor fuel and core design, core loading, spent fuel and radioactive waste management.

NUCI 573 NUCLEAR REACTOR SAFETY

The main purpose of this module is to impart to the student sound knowledge, training and skills in nuclear reactor safety. The main objective is to familiarise the student with the essential principles of nuclear power plant safety, reactor siting, reactor licensing, and radiation doses from nuclear power plants, reactor accidents and accident risk analysis, as well as environmental radiation protection requirements. The main areas of nuclear reactor safety cover multiple barrier reactor design to prevent the escape of radioactivity into the environment. This involves the safe design of the fuel, cladding material, the closed coolant system, the reactor vessel and the containment. Reactor control and reactor emergency shutdown systems are presented in the course. The three levels of safety, including suitable site location and essential evacuation procedures in case of an accident, are all an integral part of the course.

NUCI 574 NUCLEAR ENGINEERING PROJECT

Learners will demonstrate their ability to execute a project in the field of nuclear engineering independently by publishing a concise scientific report on it.

NUCI 575 NUCLEAR PHYSICS

*Learners will be introduced to the principles of radioactivity and the interaction of different types of **radiation** with matter. The content of the module will include; 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 RADIATIONS AND THE ENVIRONMENT

Learners will get 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. To provide the students 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 based on nuclear techniques. The content will include: 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.

10. Enquiries

Me Bessie Danilatos or Lilian van Wyk

Post-graduate School of Nuclear Science and Engineering

Tel: 0(27)18 299 1355 or 4363

Fax: 0(27)18 299 4369

E-mail: nuclear@nwu.ac.za

Website: http://www.puk.ac.za/fakulteite/ing/nuclear/index_e.html

***The NWU Postgraduate School of
NUCLEAR SCIENCE
AND ENGINEERING
Invites you to rise-up and make a difference in
the energy sector.***

“God gave enough uranium and thorium, clever engineers and an understanding of how uranium releases energy when it fissions. We have everything to provide energy for ourselves and our descendants without harming the environment.”

Dr. D. Richard Anderson & President Bush

