Training at the Namibian Uranium Institute

Schedule and Course Overview for 2019

Radiation Safety and
Occupational Medicine
Education and Training Services

“We scientists recognize our inescapable responsibility to carry to our fellow citizens an understanding of the simple facts of atomic energy and its implications for society.”
(by Albert Einstein)

Thank you for your interest in our training facilities. Whether you want to develop your own understanding, train your workforce, or simply ensure you comply with the latest Namibian legislation, the Namibian Uranium Institute (NUI) can help you achieve your goals.

Our portfolio of courses is delivered throughout the year at our training centre in Swakopmund, enabling you to learn about health and all aspects of radiation safety. The NUI’s education and training programs have been created to equip you with the skills needed to make informed decisions regarding radiation safety in the workplace.
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1. Radiation Safety Training

Why do I need Radiation Safety Training?

The answer is simple. Training is a legal requirement for any radiation worker. Attending an appropriate radiation safety course may assist participants meet their licensing or registration requirements with their relevant regulatory authorities. The courses are also highly valuable to those wanting to improve their knowledge on radiation protection principles and practices. Please read the course outlines below for details and costs.

All Radiation Safety Courses were developed by VO Consulting:

VO Consulting – independent Namibian energy, environment and radiation consultants

VO CONSULTING
P.O. Box 8168
Swakopmund
Namibia

Phone/Fax:
+264 (64) 402 966

Email:
voconsulting@afol.com.na

Internet:
www.voconsulting.net
## NUI – RAD 1: Radiation Safety Officer (Part I)

— Course Outline of a 6-Day Course —

### Introduction to Ionising Radiation

- atomic structure
- isotopes
- radioactivity
- uranium and fission
- nuclear stability
- radiation
- types of radiation
- half-life
- decay chains

- activity
- units
- secular equilibrium
- interaction of radiation with matter
- sources of radiation in the mining environment
- biological effects of radiation
- typical radiation doses, and associated effects
- exercises

### Radiation exposure

- natural sources of radiation
- man-made sources of radiation
- occupational sources of radiation
- radiation detection devices
- personal dosimetry: devices used
- exposure pathways

- external radiation: time, distance, shielding, scattering
- sources of radiation in mining
- internal radiation: sources, types, mechanisms of contamination
- long-lived alphas, short-lived alphas
- exercises

### Contamination

- internal contamination
- exposure pathways and dose calculation
- contamination and contamination control

- radwaste
- transport
- exercises

### Statistics

- scientific notation
- precision and accuracy
- how many digits?
- significance
- error

- normal distribution and standard deviation
- probability
- limit of detection
- statistical tests
Health Effects

- principles of safety, occupational medicine and occupational hygiene
- basic anatomy, physiology and biochemistry
- radiobiology
- epidemiology
- the concept of risk
- health risk assessment
- national health profile
- occupational cancer in the uranium exploration and mining sector
- exercises

Legal Framework

- Atomic Energy and Radiation Protection Act
- National Radiation Protection Authority
- The Radiation Management Plan
- Exercises

Instrumentation & Practical Radiation Dosimetry

- conceptualization
- occupational dosimetry
- public/environmental monitoring

- instrumentation
- monitoring
- analysis
- exercises

Costs: N$ 11 890.- (minimum of 7 candidates)
NUI – RAD 2: Radiation Safety Officer (Part II)

– Course Outline of a 5-Day Course –

Monitoring radon – theoretical background

- Historical background
- properties
- short--lived progeny
- equilibrium factor
- units and unit conversions
- dose calculations

Taking grab samples of radon progeny (Kusnetz method)

Radon progeny and LLRD sampling (DoseManPro & MyRIAM)

Monitoring long---lived radioactive dust (LLRD)

- taking grab samples of LLRD
- taking and counting out wipe tests
- contamination monitoring

Urine Bioassay

Gamma area monitoring

Introduction to the following instruments:

- Electra
- FH 40 G
- Automess
- TLD
- EPD
- RadEye PRD
- HandECount
- smear filters
- Gilair pumps
- DoseManPro
- DoseMan
- MyRIAM
- AlphaGuard & AlphaPM (if available)

Practical at a uranium mine site

- Radon area sampling
- Surface contamination measurements
- Surface smears
- LLRD sampling
- Area gamma monitoring
- Drum scanning
- Container scanning
- Data analysis (training room with computers required for this, software to be installed)

Costs: N$ 10 780.- (minimum of 6 candidates)
NUI – RAD 3: Radiation Safety Officer (Part III)

– Course Outline of a 3-Day Course –

Atomic Energy and Radiation Protection Act

- Overview
- Step-by-step introduction
- Atomic Energy Board
- Authorisations, licensing and registrations
- National Radiation Protection Authority
- Overview of general provisions
- Exercises

Radiation Protection and Waste Disposal Regulations

- Overview
- Step-by-step introduction
- Applicability and exemptions
- Radiation protection performance requirements
- Management requirements
- Verification of protection and safety
- Occupational exposure protection
- Public exposure protection
- Requirements for the safety and security of sources
- Transport requirements
- Requirements for emergency intervention
- Disposal of waste
- Exercises

Radiation Management Plan: Planning, Content, Implementation

- Introduction
- Background
- Pre-Operational Safety Assessment
- Organisational Arrangements
- Occupational Radiation Protection Program
- Medical Exposure Control
- Public Exposure Monitoring Program
- Waste Management Program
- Emergency Preparedness and Response Plan
- Transport Plan
- Safety and Security of Radiation Sources
- Exercises

Reporting

- Statutory requirements
- Exercises

Costs: N$ 7 895.- (minimum of 5 candidates)
NUI – RAD 4: Radiation Technician Course (Assistant Radiation Safety Officer)

(Same as RSO 1 course)

– Course Outline of a 6-Day Course –

Introduction to Ionising Radiation

- atomic structure
- isotopes
- radioactivity
- uranium and fission
- nuclear stability
- radiation
- types of radiation
- half-life
- decay chains
- activity
- units
- secular equilibrium
- interaction of radiation with matter
- sources of radiation in the mining environment
- biological effects of radiation
- typical radiation doses, and associated effects
- exercises

Health Effects

- principles of safety, occupational medicine and occupational hygiene
- radiobiology
- concept of risk
- health risk assessment
- exercises

Radiation exposure and control

- natural sources of radiation
- man-made sources of radiation
- occupational sources of radiation
- radiation detection devices
- personal dosimetry: devices used
- exposure pathways
- external radiation: time, distance,
  shielding, scattering
- sources of radiation in mining
- internal radiation: sources, types,
  mechanisms of contamination
- long-lived alphas, short-lived alphas
- exercises

Contamination

- internal and external contamination
- exposure pathways and dose calculations
- contamination and contamination control
- hierarchy of controls
- radioactive waste
- transport of radioactive materials
- exercises
Statistics

- scientific notation
- precision and accuracy
- significant digits
- probability
- normal distribution and standard deviation
- limit of detection
- percentiles
- exercises

Instrumentation and practical radiation dosimetry

- occupational dosimetry
- public/environmental monitoring
- instrumentation
- dose assessments
- elementary analysis
- exercises

Costs: N$ 11 890.- (minimum of 7 candidates)
NUI – RAD 5: Radiation Safety for Managers

– Course Outline of a half day course –

**Introduction to Radiation**

- What is radiation and radioactivity?
- What are ionising radiation, radiation dose, pathways and units?
- Uranium

- Half-life
- Background radiation
- Introducing radiation control

**Biological Effects and Risks of Radiation**

- How much radiation is too much?
- Biological effects
- Linear No Threshold Hypothesis
- Health Risks from cancer
- Sequence of events from ionising radiation

- Types of biological effect
- Cellular sensitivity to radiation
- Effects of cellular damage
- Whole body sensitivity factors
- Typical doses and effects

**Radiation Safety**

- Radiation Management Plan
- Occupational exposure
- System of Radiological Protection
- Standards
- Radiation Control
- Sources of radiation
- Personal monitoring

- Area monitoring and contamination monitoring
- Transport
- Shipment
- Emergency Procedures
- The RMP as an active Management Tool

Costs: N$ 1 495.- (minimum of 6 candidates)
NUI – RAD 6: Introduction to Radiation Safety in Emergency Situations

– Course Outline of a half day course –

Emergency Scenarios

- purpose of the course
- incidents and accidents
- legal obligations
- outline

Introduction to Radiation

- radiation – a fact of life
- low energy radiation
- high energy radiation
- the structure of matter – the atom
- radioactivity
- ionising radiation
- types of radiation
- exposure pathways
- uranium
- measuring radiation
- natural background radiation
- background radiation in the Erongo Region
- man-made sources of radiation
- international and local radiation dose limits
- exposure doses – low and high levels of radiation

Emergency Response

- roles and responsibilities
- from notification to action
- on-site arrival, clean-up, finalisation
- reporting

Health/Medical Response

- first things first
- medical evaluation
- laboratory tests
- follow up management

Instrumentation PRD & Electra

- RadEye PRD/Electra
- uses of the RadEye PRD/Electra
- handling the RadEye PRD/Electra
- limitations of the RadEye PRD/Electra
- practical do’s and don’ts.

Costs: N$ 1 495.- (minimum of 6 candidates)
NUI – RAD 7: Introduction to Radiation and uranium for members of the public

– Course Outline of a half day course –

Introduction to Radiation

- radiation – a fact of life
- overview of the different types of radiation
- history of the discovery of radioactivity
- structure of matter
- atomic structure
- forces in the atom
- radiation from the nucleus
  - alpha radiation
  - beta radiation
  - gamma radiation
- ionising and non-ionising radiation
- electromagnetic radiation
  - exposure pathways
  - uranium
  - decay chains
  - half-life
  - measuring radiation
  - measuring the effects of radiation
  - natural background radiation
  - background radiation in the Erongo Region
  - man-made sources of radiation
  - exposure doses
  - relative and absolute risks of exposure to ionising radiation

Biological Effects and Risks

- living tissue
- biological effects to radiation (general)
- effectiveness of radiation damage
- biological responses to radiation
- estimating biological effects
- cellular and organ sensitivity to radiation
- direct and indirect effects

Costs: free of charge
NUI – RAD 8: Radiation Safety for Transporters of Radioactive Materials

– Course Outline of a one day course –

Introduction to Radiation & Radioactivity
- Radiation – a fact of life
- Low & high energy radiation
- Radioactivity
- Types of radiation
- Ionising radiation
- Sources of radiation

Emergency Management
- Incidents and accidents
- Roles and responsibilities in an emergency
- From notification to action
- First things first – urgent and important actions
- On-site arrival
- Clean-up
- Finalization of an emergency
- Reporting

Exposure to radiation & Exposure Doses
- Exposure pathways
- Exposure doses – low and high levels of radiation
- International and Namibian radiation dose limits radiation control
- Natural background radiation
- Exposure doses – low and high levels
- Measuring exposure doses

Radiation Safety
- Introduction to radiation safety
- Key concepts of radiation safety
- The concept of ALARA
- Radiation safety when handling radioactive materials

Transporting Radioactive Materials
- Introduction to transport requirements for radioactive materials
- Namibian Law
- International Atomic Energy Agency’s Transport Regulations
- Classifying radioactive materials for transport
- Labeling, placarding and packaging radioactive materials for transport
- Radiation safety in transport

Radiation Monitoring & Using Radiation Monitoring Instruments
- RadEye PRD/Electra
- Uses of the RadEye PRD/Electra
- Handling the RadEye PRD/Electra
- Limitation of the RadEye PRD/Electra
- Practical do’s and don’ts RadEye PRD/Electra
- PRD’s finder mode and locating radioactive materials

Multiple Choice Test (30 minutes)

Costs: N$ 1 995.- (minimum of 7 candidates)
NUI – RAD 9: Radiation Safety for Sealed Sources

– Course Outline of a one day course –

The basic course curriculum includes the following 7 parts:

1. Part I – Introduction to Radiation Sources
2. Part II – Radiation Exposure & Exposure Doses
3. Part III – Radiation Safety Basics
4. Part IV – Radiation Monitoring & Dosimetry
5. Part V – Legal Framework & Requirements
6. Part VI – Transporting, Storing & Safety
7. Part VII – Emergencies & Emergency Procedures

If required, the course can be adapted to meet specific requirements, for example to include training on monitoring instruments or radiation safety procedures.

Costs: N$ 1 995.- (minimum of 7 candidates)
2. Medical Training

Spirometry Training Course

1.0 BASIC ANATOMY AND PHYSIOLOGY OF THE RESPIRATORY SYSTEM
1.1 Structure and function
1.2 Upper respiratory tract
1.3 Lower respiratory tract
1.4 The mechanism of respiration
1.5 Defence mechanisms

2.0 INTRODUCTION TO SPIROMETRY
2.1 Indication for doing spirometry
2.2 Lung volume and sub divisions
2.3 Lung capacities
2.4 Definitions of variables
2.5 Flow volume loop
2.6 Volume time curve
3.0 SETTING UP A SPIROMETRY TEST FACILITY

3.1 The office

3.2 Testing area

3.3 Equipment

3.4 Consumables

4.0 FLOW SENSING SPIROMETER

4.1 Spirometer measured information

4.2 Choose the right spirometer

5.0 CALIBRATION

5.1 Definition of calibration and calibration check

5.2 Accuracy

5.3 Precision

5.4 Calibrated 3 litre syringe

5.5 Calibration quality control

5.6 Calibration check

5.7 Daily volume calibration

5.8 Weekly linearity check

5.9 Quarterly range calibration

5.10 When to calibrate

5.11 Ambient conditions

5.12 Calibration procedure

5.13 Wrong perception

5.14 Quality control check

5.15 Common problems

5.16 Quality control in the workplace

5.17 Gas laws

5.18 ATPS to BTPS correction factor

5.19 Temperature correction table

6.0 INFECTION CONTROL

6.1 Testing room

6.2 Consumables

6.3 Medical waste

6.4 Spirometer

6.5 Sterilizing equipment

7.0 REQUIREMENTS FOR SPIROMETRY MANOEUVRE

7.1 Competent operator using the spirometer

7.2 Contraindications to spirometry testing

7.3 Medical history

7.4 Spirometer preparation

7.5 Patient demographic data

7.6 Reference values

7.7 Patient information data on report

8.0 SPIROMETRY TEST MANOEUVRE

8.1 Operator’s role

8.2 Patient instructions before to test procedure

8.3 Patient preparation

8.4 Test instructions

9.0 CHARACTERISTICS OF ACCEPTABLE FLOW VOLUME LOOP

9.1 Characteristics of acceptable volume-time curve

9.2 Characteristics of unacceptable flow volume loop

9.3 Evaluation of spirograms

9.4 Repeatability criteria

9.5 Best test criteria

9.6 Usability criteria

9.7 Summary of ATS/ERS 2005 spirometry standard

9.8 Reporting spirometry results
10.0 INTERPRETING SPIROMETRY RESULTS

10.1 Characteristics of spirometry test
10.2 Algorithm for interpreting spirometry results
10.3 Follow algorithm sequence
10.4 Bronchodilator
10.5 Reversibility
10.6 Obstructive pattern
10.7 Non-Obstructive pattern
10.8 Spirometry abnormal indices
10.9 Interpretation guidelines
10.10 Guideline to grade occupational endurance
10.11 Misinterpretation

11.0 EXAMPLE OF CASE STUDIES

11.1 Quality spirometry in the workplace
11.2 Conclusion
11.3 Quality assessment of spirometry results

12.0 APPENDIX 1 Checklist to purchase a spirometer
APPENDIX 2 Infection control
APPENDIX 3 Spirometry unit standard

Costs: N$4 950.- (minimum of 7 candidates)

Spirometry Refresher Course

2.0 ATS/ERS 2005 SPIROMETRY GUIDELINE

2.0 KEY CHANGES TO EQUIPMENT AND TEST PROCEDURE
2.1 Spirometer
2.2 Accuracy

3.0 CALIBRATION and CALIBRATION CHECK

3.1 Definition of calibration
3.2 Definition of calibration
3.3 Calibrated 3 litre syringe
3.4 Calibration quality control
3.5 Calibration check
3.6 Daily volume calibration
3.7 Weekly linearity check
3.8 Quarterly range calibration
3.9 When to calibrate
3.10 Ambient conditions
3.11 Calibration procedure

4.0 QUALITY CONTROL

4.1 Record keeping
4.2 Patient demographic data
4.3 Variable definitions of the Flow volume
4.4 Flow Volume loop
4.5 Volume –time curve
5.0 TEST PROCEDURE

5.1 Patient instructions prior to the test
5.2 Patient preparation prior to the test
5.3 Operator’s role
5.4 Test instructions
5.5 Test manoeuvre

6.0 QUALITY ASSURANCE OF SPiroGRAMS

6.1 Summary of ATS/ERS 2005
6.2 Characteristics of acceptable flow volume loop
6.3 Acceptability errors
6.4 Plan of action
6.5 Communication
6.6 Characteristics of repeatability criteria
6.7 Characteristics of usability criteria
6.8 Characteristics of best test
6.9 Reporting results

7.0 INTERPRETING SPIROMETRY RESULTS

7.1 Characteristics of spirograms
7.2 Algorithm for interpreting spirometry results
7.3 Follow sequence
7.4 Bronchodilator
7.5 Reversibility
7.6 Obstructive pattern
7.7 Non-Obstructive pattern

8.0 GUIDELINES FOR GRADING SPIROMETRY RESULTS

8.1 SATS guideline to grade severity
8.2 Compilation of a Mandatory Code of Practice
8.3 Guidance not for Occupational Practitioners
8.4 Occupational Diseases in Mine and Works

9.0 INFECTION CONTROL

9.1 Testing room
9.2 Consumables
9.3 Medical waste
9.4 Spirometer
9.5 Sterilizing equipment

10.0 EXAMPLE OF CASE STUDIES

11.0 QUALITY ASSURANCE IN THE WORKPLACE

11.1 Spirometry Training Courses
11.2 Motivated operator
11.3 Operator without skills
11.4 Conclusion

12.0 APPENDIX 1 Checklist to purchase a spirometer
APPENDIX 2 Infection control

Costs: N$1 890.- (minimum of 10 candidates)
Audiometry Training Course

The comprehensive 3 day Audiometry certificate course seeks to address particular needs in industry related to hearing health. The course will enable participants to work within the scope of practice of audiometricians: “the determination and evaluation of the range, nature and degree of a person’s hearing by means of electro acoustic instrumentation and observation methods and within the framework of a hearing health (conservation) team in industry. The outcome of this course is to generate acceptable and repeatable audiograms according to the SANS10083:2004 guidelines.

The course will be accredited by the HPCNA for CPD points. Successful candidates will receive a Certificate.

Costs: t.b.a.

Audiometry Refresher Course

The 1 day Audiometry Refresher Course is for successful students who have completed a comprehensive Audiometry course. Students who provide a copy of their Audiometry competency certificate dated 1 January 2005 or later may register for the Refresher course.

Students must bring 3 samples of audiometry tests from their onsite workplace audiometer to be assessed for quality. Please ensure that subject confidentiality is adhered to on submission of these sample tests.

The course will be accredited by the HPCNA for CPD points. Successful candidates will receive a Certificate.

Costs: t.b.a.
NUI TRAINING REGISTRATION FORM

Kindly complete ALL sections – no booking will be made without the all required information and payment.

Registration forms are to be returned to:

- Email: info@namibianuranium.org
- Fax: 064 – 402 394 (Tel: 064 – 402 393)

STUDENT’S PERSONAL DETAILS

<table>
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<th>Name:</th>
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<td>Sex:</td>
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<td>Occupation:</td>
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COURSE DETAILS - Strictly ONE registration form per course

| Course Name:             |                         |
| Course Date/s:           |                         |
| Price per candidate:     |                         |

- The Namibian Uranium Institute reserves the right to reschedule any course.
- We will confirm COURSE DATE & TIME.
- TERMS AND CONDITIONS apply.

CANDIDATES: Please be aware of the important requirements as outlined in the TERMS AND CONDITIONS.

If you are making the booking on behalf of any candidates, please ensure that you make them aware of the requirements.

ALWAYS LEARNING, ALWAYS IMPROVING THE WAY WE WORK
PERSON RESPONSIBLE FOR PAYMENT

Please note; the following is only to be completed if a company is responsible for payment.

<table>
<thead>
<tr>
<th>Name:</th>
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<tr>
<td>Postal address:</td>
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<tr>
<td>Physical Address</td>
</tr>
<tr>
<td>Telephone No.:</td>
</tr>
<tr>
<td>CONTACT PERSON:</td>
</tr>
<tr>
<td>Email Address:</td>
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</tbody>
</table>

*Method of Payment (cash deposit/EFT/order number):
Please note that you have to provide proof of payment for all payments made.

<table>
<thead>
<tr>
<th>BANKING DETAILS</th>
<th>Account Name: The Namibian Uranium Association</th>
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<tbody>
<tr>
<td>Bank :</td>
<td>Bank Windhoek</td>
</tr>
<tr>
<td>Branch Code:</td>
<td>481772</td>
</tr>
<tr>
<td>Account No.:</td>
<td>8003770837</td>
</tr>
</tbody>
</table>

*REFERENCE when making payment: surname, initials/invoice number.

TERMS AND CONDITIONS
1. Candidates agree to adhere to the rules and always be on time for classes.
2. On the first day of the course, the candidates must bring:
   - A file (preferably ring bind files)
   - An examination pad to take notes
   - A CALCULATOR
   - And pens and pencils (and everything else you might need)
   - 1 x copy of ID/PASSPORT
3. No booking confirmations will be forwarded to the candidate without the order number or proof of full payment.
4. Full course fee paid at least 1 week prior to course
5. Should any candidate not attend, the full fee shall be payable if not cancelled within 10 working days of the starting date of the course. All cancellations must be in writing.
6. Refreshments and lunch are provided on the Namibian Uranium Institute premises. If any dietary requirements are to be met, please add them onto the registration form.
7. We are not legible for any damage or loss of property.
8. Certificates will be issued upon:
   - Passing the course
   - Submission of documentation as per 2. above

By signing this registration form you subjecting yourself to all the terms and conditions.

<table>
<thead>
<tr>
<th>Authorizing Signature:</th>
<th>Date:</th>
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</table>

ALWAYS LEARNING, ALWAYS IMPROVING THE WAY WE WORK