



Accredited Africa Training Institute for Capacity Development

Unit FO409, Hatfield Plaza · 1122 Burnett St, Hatfield 0028 · Pretoria, Gauteng · South Africa

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COURSE BROCHURE

Understand Electromagnetic And Particle Radiation Principles And Applications Training

Manufacturing, Engineering and Technology / Engineering and Related Design

Unit Standard 119806 · NQF Level 5 · 10 Credits · 7 Days

COURSE OVERVIEW

This course equips learners with a foundational understanding of electromagnetic and particle radiation principles, enabling them to identify radiation types, assess associated risks, and apply safety measures in occupational settings. It bridges theoretical knowledge with practical applications in industries such as healthcare, mining, and manufacturing.

Category	Manufacturing, Engineering and Technology
Subfield	Engineering and Related Design
Unit Standard	119806
Accreditation	SAQA Accredited · NQF Level 5 · 10 Credits
Duration	7 days
Training Method	Online, On-Campus, In-House
Certificate	Issued via AATICD LMS – verifiable online

LEARNING OUTCOMES

- Distinguish between electromagnetic and particle radiation based on their properties and sources.
- Apply principles of radiation protection, including time, distance, and shielding, to minimize exposure.
- Analyze the biological effects of ionising and non-ionising radiation on human health.
- Evaluate radiation monitoring techniques and interpret measurement results from detection instruments.
- Demonstrate compliance with South African radiation safety regulations and standards.
- Implement appropriate safety protocols for handling and storing radioactive materials.

WHO SHOULD ATTEND

- This course is designed for technicians, safety officers, and professionals working in environments where radiation exposure is a concern, including medical imaging, nuclear facilities, and industrial radiography.

COURSE OUTLINE

Day 1: Introduction to Electromagnetic and Particle Radiation

- Overview of radiation: types and significance.
- The electromagnetic spectrum: from radio waves to gamma rays.
- Wave-particle duality: photons and quanta.
- Properties of electromagnetic waves: speed of light, energy, and intensity.
- Introduction to particle radiation: alpha, beta, neutrons, and cosmic rays.
- Ionising vs non-ionising radiation: definitions and examples.
- Natural and artificial sources of radiation.
- Health and safety implications: basic awareness.

Day 2: Foundational Physics of Radiation

- Atomic structure: nucleus, electrons, isotopes.
- Radioactive decay processes: alpha decay, beta decay, gamma emission.
- Half-life: concept and calculations.
- Decay chains and secular equilibrium.
- Planck's equation: $E = hf$ and relationships.
- Inverse square law: intensity vs distance.
- Attenuation and shielding basics.
- Practical examples: decay of common radionuclides.

Day 3: Interaction of Radiation with Matter

- Photon interactions: photoelectric effect, Compton scattering, pair production.
- Attenuation coefficients and half-value layer.
- Charged particle interactions: ionisation and excitation.
- Bragg peak for heavy charged particles.
- Neutron interactions: moderation and capture.
- LET and relative biological effectiveness (RBE).
- Shielding materials: lead, concrete, water.
- Practical applications: radiation detection principles.

Day 4: Radiation Detection and Measurement

- Gas-filled detectors: ionisation chambers, proportional counters, GM tubes.
- Scintillation detectors: inorganic and organic scintillators.
- Semiconductor detectors: silicon and germanium.
- Dosimeters: TLD, OSL, film badges.
- Units: becquerel, gray, sievert, roentgen.
- Counting statistics: error, standard deviation, confidence intervals.
- Calibration and quality assurance.
- Practical session: using a GM counter and interpreting results.

Day 5: Radiation Safety and Regulatory Framework

- Biological effects: deterministic vs stochastic effects.
- Dose limits for occupational and public exposure.
- ALARA: as low as reasonably achievable.
- Shielding calculation examples.
- South African regulatory bodies: NNR, DMR.

- Licensing and compliance for radiation sources.
- Emergency response: contamination, spill, exposure.
- Personal protective equipment and monitoring.

Day 6: Applications of Electromagnetic and Particle Radiation

- Medical imaging: X-ray, CT, PET, SPECT.
- Radiation therapy: external beam, brachytherapy.
- Nuclear medicine: radiopharmaceuticals.
- Industrial radiography: non-destructive testing.
- Gauging: thickness, density, level measurements.
- Sterilization: gamma and electron beam.
- Nuclear power: fission reactors and fuel cycle.
- Environmental tracing and carbon dating.

Day 7: Practical Integration and Assessment

- Review of key concepts and problem-solving.
- Practical exercise: radiation survey of a simulated area.
- Case study: developing a safety plan for an industrial radiography site.
- Calculation workshop: half-life, shielding, dose rate.
- Written assessment (multiple choice and short answer).
- Practical assessment: use of survey meter and dosimeter.
- Feedback and discussion.
- Course evaluation and certification.

ASSESSMENT & CERTIFICATION

Delegates are assessed through exercises and a final test. A mark of **50% or above** earns an **AATICD Certificate of Completion**, issued digitally with a unique verification code. This course carries **10 NQF credits** at **NQF Level 5**.

PRICING (PER DELEGATE, EX-VAT)

Delegates	Training Method	Price per Delegate	Total
1	Online	R 29,600.00	R 29,600.00
1	In-House	R 38,500.00	R 38,500.00
1	On-Campus (Pretoria)	R 44,400.00	R 44,400.00

UPCOMING SESSIONS

Start	End	Method	Venue
31 Jul 2026	10 Aug 2026	On-Campus	Dar es Salaam, Tanzania
03 Aug 2026	11 Aug 2026	On-Campus	Johannesburg, South Africa
04 Aug 2026	12 Aug 2026	On-Campus	Mauritius
05 Aug 2026	13 Aug 2026	On-Campus	Cape Town, South Africa
06 Aug 2026	14 Aug 2026	On-Campus	Dubai, UAE
07 Aug 2026	17 Aug 2026	On-Campus	Pretoria, South Africa
07 Aug 2026	17 Aug 2026	On-Campus	Lagos, Nigeria
10 Aug 2026	18 Aug 2026	On-Campus	Mauritius

Contact us if no suitable date is listed – on-demand sessions can be arranged for groups.

HOW TO GET A QUOTE OR APPLY

1. **Get an instant quotation online:** visit www.aaticd.co.za, open the page for this course (Unit Standard 119806) and click **Get A Quote / Apply**. Select your training method and number of delegates – your quotation is generated immediately and emailed to you with the course brochure attached.
2. **Apply by email:** send the course title, your preferred training method (Online, In-House or On-Campus Pretoria), the number of delegates and your preferred dates to apply@aaticd.co.za – our team will reply with a formal quotation.
3. **Apply by phone or WhatsApp:** call **+27 12 004 8389** or WhatsApp **+27 65 077 6310** and we will prepare your quotation and reserve your seats.
4. **Confirm your booking:** accept the quotation and settle the invoice. As soon as payment is confirmed your delegates are enrolled and receive their AATICD LMS login details by email, along with joining instructions for their chosen training method.

Group discounts apply automatically – the more delegates you enrol, the lower the price per delegate. No payment is required to request a quotation.

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