



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

Demonstrate Knowledge Of Electronic Emission Theory Training

Law, Military Science and Security / Sovereignty of the State

Unit Standard 120057 · NQF Level 5 · 12 Credits · 9 Days

COURSE OVERVIEW

This course provides participants with a foundational understanding of electronic emission theory, including the principles of electron movement, emission types, and their applications in electronic devices. It equips learners with the knowledge to analyze and apply electronic emission concepts in practical scenarios within the electronics and telecommunications industries.

Category	Law, Military Science and Security
Subfield	Sovereignty of the State
Unit Standard	120057
Accreditation	SAQA Accredited · NQF Level 5 · 12 Credits
Duration	9 days
Training Method	Online, On-Campus, In-House
Certificate	Issued via AATICD LMS – verifiable online

LEARNING OUTCOMES

- Explain the fundamental principles of electronic emission, including thermionic, photoelectric, and field emission.
- Analyze the factors affecting electron emission efficiency in various electronic components.
- Apply electronic emission theory to interpret the operation of vacuum tubes, cathode ray tubes, and semiconductor devices.
- Evaluate the impact of material properties and environmental conditions on emission characteristics.
- Demonstrate the ability to measure and calculate emission parameters using standard techniques.
- Implement safety procedures when working with high-voltage or emission-based equipment.

WHO SHOULD ATTEND

- This course is designed for technicians, engineers, and students in electronics, telecommunications, or related fields who need to understand the theoretical underpinnings of electronic emission for equipment operation, maintenance, or design.

COURSE OUTLINE

Day 1: Introduction to Electronic Emission and Atomic Theory

- Atomic structure: protons, neutrons, electrons.
- Energy levels and electron orbits.
- What is electronic emission?
- Overview of thermionic, photoelectric, secondary, and field emission.
- Historical context and applications.
- Basic safety precautions when working with emission devices.

Day 2: Thermionic Emission and Vacuum Tube Technology

- Thermionic emission: heating cathodes to release electrons.
- Work function and its influence.
- Richardson's law and the Richardson-Dushman equation.
- Vacuum tube components: cathode, anode, grid.
- Types of cathodes: directly and indirectly heated.
- Practical examples: diodes, triodes.

Day 3: Photoelectric Emission and Light-Matter Interaction

- Photoelectric effect: photon energy and electron release.
- Einstein's photoelectric equation: $E = hf - \phi$.
- Threshold frequency and work function.
- Photoemissive materials and their properties.
- Phototubes, photomultipliers, and solar panels.
- Practical demonstrations and calculations.

Day 4: Secondary Emission and Electron Multiplication

- Secondary emission: primary electrons ejecting secondary electrons.
- Secondary emission ratio (δ) vs. primary energy.
- Dynodes and electron multipliers.
- Photomultiplier tubes (PMTs) and their operation.
- Applications in detectors and imaging.
- Comparison with thermionic and photoelectric emission.

Day 5: Field Emission and Quantum Tunneling

- Field emission: strong electric fields extracting electrons.
- Quantum tunneling and potential barriers.
- Fowler-Nordheim tunneling equation.
- Field emission tips and arrays.
- Scanning electron microscopes (SEM) and field emission displays.
- Reliability and vacuum requirements.

Day 6: Cathode Ray Tubes and Display Technology

- CRT components: electron gun, deflection plates/yokes, screen.
- Electron beam focusing and scanning.
- Phosphor types and persistence.
- Monochrome vs. colour CRTs.
- Applications: oscilloscopes, televisions, monitors.

- Limitations and obsolescence.

Day 7: Microwave Tubes and High-Power Devices

- Magnetron: cavity resonators and crossed fields.
- Klystron: velocity modulation and bunching.
- Travelling wave tube (TWT): slow-wave structures.
- Applications: radar, satellite communication, microwave ovens.
- Efficiency and power handling.
- Comparison with solid-state devices.

Day 8: Gas-Filled Tubes and Specialized Emission Devices

- Gas discharge: ionization and plasma formation.
- Thyatron: grid-controlled gas tube.
- Ignitron: mercury-arc rectifier.
- Cold cathode tubes and neon indicators.
- Applications: high-power switching, voltage regulation.
- Obsolescence and replacement by solid-state devices.

Day 9: Integration, Maintenance, and Future Trends

- Comparative summary of emission methods.
- Troubleshooting common faults in vacuum tubes and CRTs.
- Safety practices: high voltage, X-ray emission, implosion hazards.
- Emerging trends: carbon nanotube field emitters, MEMS.
- Integration with solid-state devices.
- Course review and assessment.

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 **12 NQF credits** at **NQF Level 5**.

PRICING (PER DELEGATE, EX-VAT)

Delegates	Training Method	Price per Delegate	Total
1	Online	R 35,000.00	R 35,000.00
1	In-House	R 45,500.00	R 45,500.00
1	On-Campus (Pretoria)	R 52,500.00	R 52,500.00

UPCOMING SESSIONS

Start	End	Method	Venue
10 Aug 2026	20 Aug 2026	On-Campus	Abu Dhabi, UAE
11 Aug 2026	21 Aug 2026	On-Campus	Durban, South Africa
11 Aug 2026	21 Aug 2026	On-Campus	Mauritius
12 Aug 2026	24 Aug 2026	On-Campus	Cape Town, South Africa
13 Aug 2026	25 Aug 2026	On-Campus	Dubai, UAE
14 Aug 2026	26 Aug 2026	On-Campus	Pretoria, South Africa
17 Aug 2026	27 Aug 2026	On-Campus	Durban, South Africa
18 Aug 2026	28 Aug 2026	On-Campus	Shenzhen, China

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 120057) 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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