



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

Steel Structures Strength Of Materials Fundamentals Training

Physical Planning and Construction / Civil Engineering Construction

Unit Standard 114198 · NQF Level 5 · 20 Credits · 17 Days

COURSE OVERVIEW

This course provides foundational knowledge of strength of materials principles as applied to steel structures. Learners will gain the ability to analyze and evaluate structural integrity, ensuring safe and efficient design and maintenance practices in accordance with South African standards.

Category	Physical Planning and Construction
Subfield	Civil Engineering Construction
Unit Standard	114198
Accreditation	SAQA Accredited · NQF Level 5 · 20 Credits
Duration	17 days
Training Method	Online, On-Campus, In-House
Certificate	Issued via AATICD LMS – verifiable online

LEARNING OUTCOMES

- Apply fundamental principles of strength of materials to analyze steel structural components.
- Analyze stress-strain relationships and calculate key parameters such as tensile strength, yield point, and modulus of elasticity.
- Evaluate the effects of axial, bending, and torsional loads on steel members.
- Implement appropriate safety factors and design criteria for steel structures.
- Demonstrate competence in interpreting material test results and structural drawings.
- Assess the structural integrity of steel components under various loading conditions.

WHO SHOULD ATTEND

- This course is designed for engineers, technicians, and supervisors involved in the design, construction, or inspection of steel structures, particularly those in the manufacturing, mining, and construction sectors.

COURSE OUTLINE

Day 1: Introduction to Strength of Materials

- Overview of strength of materials and its applications
- Fundamental concepts: force, stress, strain
- Mechanical properties of structural steel
- Introduction to relevant standards (SANS, EN)
- Types of loads: dead, live, wind, seismic

Day 2: Stress and Strain Fundamentals

- Normal stress and strain: axial loading
- Shear stress and strain
- Hooke's law and Young's modulus
- Stress-strain diagram for ductile steel
- Factor of safety and allowable stress

Day 3: Axially Loaded Members

- Axial deformation formula
- Statically determinate systems
- Thermal stresses and strains
- Stress concentrations in tension members
- Saint-Venant's principle

Day 4: Torsion of Steel Members

- Torsion of circular shafts: elastic theory
- Angle of twist and shear stress distribution
- Torsion of thin-walled open sections
- Warping torsion in I-beams
- Design considerations for torsional loading

Day 5: Bending: Shear Force and Bending Moment

- Types of beams and supports
- Shear force and bending moment diagrams
- Relationships between load, shear, and moment
- Graphical method for diagram construction
- Superposition principle

Day 6: Bending Stress in Beams

- Flexure formula and assumptions
- Elastic bending stress distribution
- Section modulus and moment of resistance
- Composite beams: transformed section method
- Bending of unsymmetric sections

Day 7: Shear Stress in Beams

- Shear stress formula for beams
- Shear stress distribution in common shapes
- Shear flow in flanged sections
- Shear centre concept

- Design for shear in steel beams

Day 8: Deflection of Beams

- Differential equation of elastic curve
- Double integration method
- Moment-area theorems
- Superposition method
- Allowable deflection criteria

Day 9: Combined Stresses and Mohr's Circle

- Combined loading: axial + bending + torsion
- Plane stress transformation
- Mohr's circle construction
- Principal stresses and maximum shear stress
- Failure theories: von Mises, Tresca

Day 10: Columns and Buckling

- Euler buckling theory
- Effective length factor
- Slenderness ratio
- Johnson's formula for intermediate columns
- Column design in steel codes

Day 11: Connections: Bolted Joints

- Bolted connection types: bearing, friction
- Bolt strength: shear, tension, combined
- Bolt group analysis: eccentric loading
- Prying action
- Design of simple bolted joints

Day 12: Connections: Welded Joints

- Weld types: fillet, groove, plug
- Weld symbols and specifications
- Strength of fillet welds
- Eccentrically loaded weld groups
- Weld quality and inspection methods

Day 13: Plate Girders and Built-Up Sections

- Plate girder components
- Bending and shear design
- Web buckling and stiffeners
- Flange-to-web welds
- Hybrid girder design

Day 14: Fatigue and Fracture Mechanics

- Fatigue failure mechanisms
- S-N curves and endurance limit
- Fatigue design categories for steel
- Fracture mechanics: stress intensity factor
- Fatigue of welded joints

Day 15: Structural Analysis Software Applications

- Introduction to structural analysis software
- Modelling beams, columns, and connections
- Applying loads and boundary conditions
- Interpreting results: diagrams and tables
- Verification of results

Day 16: Design of Steel Structures: Case Studies

- Case study: industrial building frame
- Load take-down and analysis
- Member design: beam, column, brace
- Connection design
- Design documentation

Day 17: Review and Assessment

- Comprehensive review of key topics
- Integrated problem-solving session
- Written assessment (closed book)
- Calculation verification
- 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 **20 NQF credits** at **NQF Level 5**.

PRICING (PER DELEGATE, EX-VAT)

Delegates	Training Method	Price per Delegate	Total
1	Online	R 56,500.00	R 56,500.00
1	In-House	R 73,400.00	R 73,400.00
1	On-Campus (Pretoria)	R 84,700.00	R 84,700.00

UPCOMING SESSIONS

Start	End	Method	Venue
03 Aug 2026	25 Aug 2026	On-Campus	Cape Town, South Africa
04 Aug 2026	26 Aug 2026	On-Campus	Dubai, UAE
05 Aug 2026	27 Aug 2026	On-Campus	Pretoria, South Africa
05 Aug 2026	27 Aug 2026	On-Campus	Lagos, Nigeria
06 Aug 2026	28 Aug 2026	On-Campus	Johannesburg, South Africa
07 Aug 2026	31 Aug 2026	On-Campus	Mauritius
10 Aug 2026	01 Sep 2026	On-Campus	Dubai, UAE
11 Aug 2026	02 Sep 2026	On-Campus	Pretoria, South Africa

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 114198) 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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