



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

Advanced Polymer Composite Manufacturing Techniques Training

Manufacturing, Engineering and Technology / Manufacturing and Assembly

Unit Standard 110280 · NQF Level 3 · 28 Credits · 25 Days

COURSE OVERVIEW

This course equips learners with advanced skills in polymer composite manufacturing techniques, focusing on process optimization, quality assurance, and application of industry standards. It prepares participants to manage composite production processes efficiently while adhering to safety and environmental regulations.

Category	Manufacturing, Engineering and Technology
Subfield	Manufacturing and Assembly
Unit Standard	110280
Accreditation	SAQA Accredited · NQF Level 3 · 28 Credits
Duration	25 days
Training Method	Online, On-Campus, In-House
Certificate	Issued via AATICD LMS – verifiable online

LEARNING OUTCOMES

- Apply advanced polymer composite manufacturing techniques to optimize production processes.
- Analyze composite material properties and select appropriate manufacturing methods.
- Evaluate quality control procedures to ensure compliance with industry standards.
- Design manufacturing workflows that integrate safety and environmental best practices.
- Implement troubleshooting strategies for common composite manufacturing defects.
- Demonstrate proficiency in using specialized equipment for composite lay-up and curing.

WHO SHOULD ATTEND

- This course is designed for manufacturing engineers, production supervisors, and technical managers involved in the production of polymer composite materials.
- It is also suitable for technicians seeking to upgrade their skills in advanced composite manufacturing.

COURSE OUTLINE

Day 1: Introduction to Polymer Composites

- Overview of composite materials
- Matrix and reinforcement roles
- Types of polymer matrices (thermoset vs thermoplastic)
- Reinforcement forms (fibers, fabrics, mats)
- Property enhancement mechanisms
- Industry applications (aerospace, automotive, marine)
- Environmental and sustainability considerations

Day 2: Materials Science for Composites

- Thermoset resin chemistry and curing
- Thermoplastic matrix characteristics
- Glass fiber types and properties
- Carbon fiber types and properties
- Aramid and specialty fibers
- Fiber surface treatments and sizing
- Material selection criteria
- Health and safety handling of raw materials

Day 3: Preforming and Layup Techniques

- Preforming techniques (cutting, stacking, stitching)
- Manual hand layup process
- Spray-up method
- Fiber orientation and laminate stacking sequence
- Common layup defects (wrinkles, voids, misalignment)
- Quality checks during layup
- Tooling and mold preparation

Day 4: Vacuum Bagging and Curing

- Vacuum bagging components (bag, sealant tape, breather, release film)
- Bagging procedure step-by-step
- Vacuum pressure and leak detection
- Cure cycles (room temperature vs elevated temperature)
- Oven and autoclave curing
- Post-cure processes
- Troubleshooting bagging defects

Day 5: Resin Infusion Processes

- Introduction to liquid composite molding
- VARTM process overview
- Resin infusion setup (inlet, outlet, distribution media)
- Resin flow dynamics and permeability
- Process parameters (vacuum level, resin viscosity, temperature)
- Infusion defects (dry spots, race tracking)
- Materials for infusion (resins, flow media, peel ply)

Day 6: Prepreg Technology

- Prepreg manufacturing process
- Types of prepregs (unidirectional, woven)
- Storage requirements (cold storage, out-time limits)
- Cutting and kitting prepregs
- Automated layup (AFP/ATL) introduction
- Hand layup of prepregs
- Autoclave curing cycle
- Quality control for prepreg parts

Day 7: Compression Molding and BMC/SMC

- Compression molding machine components
- BMC and SMC material forms
- Mold design and heating systems
- Process parameters (temperature, pressure, dwell time)
- Flow behavior in the mold
- Defects (short shots, porosity, warpage)
- Applications in automotive and electrical industries

Day 8: Filament Winding

- Filament winding machine types
- Winding patterns (helical, hoop, polar)
- Fiber tension control
- Resin bath and impregnation
- Mandrel materials and design
- Curing and mandrel removal
- Applications (pipes, pressure vessels, tanks)

Day 9: Pultrusion and Pullforming

- Pultrusion line components (creel, resin bath, die, puller)
- Die design and heating zones
- Reinforcement forms (rovings, mats, veils)
- Resin systems for pultrusion
- Process parameters (pull speed, temperature, curing)
- Defects (voids, surface defects, fiber breakage)
- Applications (profiles, beams, gratings)

Day 10: Additive Manufacturing of Composites

- Overview of additive manufacturing
- FFF with continuous fiber reinforcement
- Short fiber reinforced filaments
- Stereolithography with ceramic composites
- Design for additive manufacturing (DFAM)
- Post-processing (curing, surface finishing)
- Applications (prototyping, tooling, end-use parts)

Day 11: Joining and Assembly Techniques

- Adhesive types (epoxy, acrylic, polyurethane)

- Joint design (lap, scarf, butt)
- Surface preparation methods (abrasion, plasma, chemical)
- Mechanical fastening (bolts, rivets, inserts)
- Hybrid joining
- Ultrasonic and induction welding
- Quality assurance of joints

Day 12: Quality Control and NDT

- Defect types (delamination, porosity, foreign inclusions)
- Visual inspection and tap testing
- Ultrasonic testing (A-scan, C-scan)
- Radiography (X-ray, CT)
- Thermography and shearography
- Destructive testing (microscopy, mechanical tests)
- Statistical process control basics
- Documentation and traceability

Day 13: Repair and Reconditioning

- Damage assessment (impact, delamination, moisture)
- Repair design principles
- Scarf repair procedure
- Patch repair (precured, wet layup)
- Bonded vs bolted repairs
- Curing of repairs (heat blankets, lamps)
- Repair validation and testing
- Regulatory and certification aspects

Day 14: Design for Manufacturing (DFM)

- Design for manufacturing principles
- Laminate design (orientation, thickness, ply drops)
- CAD software for composites (CATIA, FiberSIM)
- Ply book generation
- Draft angles and radii
- Tooling considerations
- Cost estimation
- Design review and iteration

Day 15: Process Simulation and Modeling

- Introduction to composite process simulation
- Resin flow modeling (Darcy's law, permeability)
- Cure kinetics and heat transfer
- Stress and deformation during curing
- Software tools (PAM-RTM, COMPRO, Abaqus)
- Validation of simulations
- Optimization of process parameters

Day 16: Automation and Industry 4.0

- Automated fiber placement (AFP)

- Automated tape laying (ATL)
- Robotic pick-and-place for preforms
- In-process monitoring (cure sensors, flow sensors)
- Data acquisition and statistical process control
- Digital twin concept
- Smart factories and IoT
- Case studies of automated lines

Day 17: Tooling and Mold Design

- Tooling materials (steel, aluminum, invar, composite)
- Mold design for RTM, infusion, compression molding
- Thermal management (heating channels, insulation)
- Coefficient of thermal expansion (CTE) considerations
- Surface preparation and mold release
- Vacuum integrity and sealing
- Tooling cost and durability

Day 18: Health, Safety, and Environmental Management

- Chemical hazards (resins, hardeners, solvents)
- Personal protective equipment (PPE)
- Ventilation and containment
- Fire safety and storage of flammable materials
- Waste management (resin waste, scrap fibers)
- Recycling of composites (mechanical, thermal, chemical)
- South African OHS Act and regulations
- Environmental management systems (ISO 14001)

Day 19: Advanced Topics and Emerging Technologies

- Nanocomposites (CNT, graphene reinforcement)
- Bio-based resins and natural fibers
- Self-healing composites
- Smart composites with embedded sensors
- 3D woven and braided preforms
- Hybrid manufacturing (additive + subtractive)
- Recycling technologies for composites
- Industry trends and research directions

Day 20: Capstone Project and Course Review

- Capstone project brief
- Part selection and material choice
- Process selection and tooling design
- Quality plan and cost estimate
- Team presentations and peer review
- Instructor feedback
- Course review and key takeaways
- Final assessment 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 **28 NQF credits** at **NQF Level 3**.

PRICING (PER DELEGATE, EX-VAT)

Delegates	Training Method	Price per Delegate	Total
1	Online	R 74,200.00	R 74,200.00
1	In-House	R 96,500.00	R 96,500.00
1	On-Campus (Pretoria)	R 111,300.00	R 111,300.00

UPCOMING SESSIONS

Start	End	Method	Venue
31 Jul 2026	03 Sep 2026	On-Campus	Mauritius
03 Aug 2026	04 Sep 2026	On-Campus	Dubai, UAE
04 Aug 2026	07 Sep 2026	On-Campus	Pretoria, South Africa
04 Aug 2026	07 Sep 2026	On-Campus	Lagos, Nigeria
05 Aug 2026	08 Sep 2026	On-Campus	Johannesburg, South Africa
06 Aug 2026	09 Sep 2026	On-Campus	Mauritius
07 Aug 2026	10 Sep 2026	On-Campus	Cape Town, South Africa
10 Aug 2026	11 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 110280) 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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