VFD ACS 5000 ABB Training Course

Professional Development Training Course Outline

Category	Engineering	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

The ABB ACS 5000 Variable Frequency Drive stands as a benchmark in high-power motor control, utilizing advanced multi-level topology and Active Neutral Point Clamped technology to deliver superior performance for large-scale industrial applications. VFD ACS 5000 ABB Training Course provides a deep dive into the drive’s sophisticated architecture, focusing on the integration of Direct Torque Control and harmonic mitigation strategies. Participants will explore the drive’s ability to manage high-inertia loads in sectors such as mining, water management, and oil and gas, ensuring minimized Total Cost of Ownership and enhanced grid stability through advanced power quality management.

As industries pivot toward Industry 4.0 and decarbonization, mastering the ACS 5000’s digital interface and predictive maintenance capabilities becomes essential. This training program bridges the gap between theoretical power electronics and practical field execution. By focusing on Condition-Based Monitoring and the latest cybersecurity protocols for industrial control systems, the course empowers personnel to optimize system reliability and implement Net-Zero energy strategies. Learners will engage with real-world troubleshooting scenarios, mastering the Drive Compose toolset to ensure seamless commissioning and rapid fault resolution in mission-critical operations.

Programme Curriculum

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10 days

Course Objectives

- Identify and understand the function of ANPC inverter modules, DC link capacitors, and phase modules.
- Configure and tune DTC parameters for high-dynamic performance and motor protection.
- Analyze and optimize 18-pulse or 36-pulse transformer configurations to meet IEEE 519 standards.
- Utilize fault log analysis and diagnostic tools to reduce Mean Time to Repair
- Leverage virtual models for safe testing of control logic and load-sharing scenarios.
- Apply variable speed control strategies to achieve significant carbon footprint reduction.
- Configure IoT-enabled sensors for real-time thermal and vibration monitoring.
- Implement SIL-rated Safe Torque Off and mechanical key interlocking sequences.
- Manage Reactive Power Compensation and Low Voltage Ride Through capabilities.
- Perform full system start-ups, from cold-start sequences to full-load testing.
- Secure drive communication interfaces against unauthorized access in IIoT environments.
- Optimize water-cooling or air-cooling circuits to prevent thermal derating.
- Evaluate and execute migration paths from legacy systems to the ACS 5000 platform.

Target Audience

- Electrical Engineers.
- Maintenance Technicians
- Plant Managers.
- Commissioning Engineers.
- System Integrators.
- Reliability Engineers.
- Service Partners.
- Safety Officers.

Course Modules

Module 1: ACS 5000 Fundamentals & ANPC Topology

- Physics of 5-level Active Neutral Point Clamped (ANPC) inverters.
- Comparison between 2-level, 3-level, and 5-level voltage source inverters (Pal et al., 2022).
- Advantages of **low dv/dt** stress on motor insulation.
- Power flow: From MV input transformer to the motor shaft.
- **Case Study:** Analysis of motor life extension in a 20-year-old pumping station after ACS 5000 retrofit.

Module 2: Control Logic & Direct Torque Control (DTC)

- Principles of DTC vs. traditional PWM modulation.
- Speed and torque loop tuning for high-inertia loads.
- Flux braking and high-speed motor control.
- Integration with ABB **AC 800PEC** high-performance controllers.
- **Case Study:** Optimizing a conveyor system in a copper mine to handle 150% peak starting torque.

Module 3: Hardware Components & Power Modules

- In-depth inspection of IGBTs, IGCTs, and diode bridges.
- Maintenance of DC link capacitors and charging resistors.
- Optical fiber communication between control boards and power modules.
- Phase module replacement procedures and torque specifications.
- **Case Study:** Component failure analysis at a desalination plant due to coastal corrosion.

Module 4: Transformer & Input Protection

- Multi-pulse (18, 24, 36) transformer configurations for harmonic reduction.
- Transformer protection relays and temperature monitoring.
- Primary side vacuum circuit breaker (VCB) interlocking.
- Pre-magnetization sequences to prevent inrush current.
- **Case Study:** Meeting stringent utility grid requirements for a 10MW compressor in an urban area.

Module 5: Cooling Systems (Air & Water)

- Closed-loop deionized water cooling circuit maintenance.
- Heat exchanger efficiency and fan control logic.
- Conductivity monitoring and ion exchange resin replacement.
- Leak detection and pressure protection settings.
- **Case Study:** Cooling system failure prevention during a 45°C summer peak in a Middle Eastern refinery.

Module 6: Parameterization & Software Tools

- Expert use of **DriveCompose** and **DriveWindow** software.
- Backup and restore procedures for drive firmware and parameters.
- Customizing User Defined Macros for specific applications.
- Real-time data logging and trend analysis.
- **Case Study:** Remote parameter optimization of a fan drive located on an offshore platform.

Module 7: Fault Diagnostics & Troubleshooting

- Interpreting fault and alarm codes from the CDP 312 control panel.
- Using the **data logger** to capture pre-fault waveforms.
- Testing power semiconductors using multi-meter and pulse tests.
- Systematic approach to "Drive Not Starting" scenarios.
- **Case Study:** Troubleshooting intermittent "DC Link Overvoltage" in a regenerative crane application.

Module 8: Protective Functions & Safety

- Configuration of Safe Torque Off (STO) and Safe Stop 1 (SS1).
- Motor protection: Thermal models, stall protection, and underload.

- Ground fault detection and earth switch interlocking.
- Arc-guard system integration for personnel safety.
- **Case Study:** Emergency shutdown sequence validation for a chemical processing reactor.

Module 9: Communication & Industrial IoT

- Configuring Modbus, Profibus, and Ethernet/IP adapters.
- Integrating drive data into SCADA and **ABB Ability™** cloud platforms.
- OPC UA connectivity for cross-platform data exchange.
- Cybersecurity: Disabling unused ports and setting access levels.
- **Case Study:** Implementing fleet-wide monitoring for 50 VFDs in a global paper mill network.

Module 10: Commissioning & Start-up Procedures

- Pre-energization checklists and insulation resistance (IR) testing.
- First-power-on sequence and firmware verification.
- Motor identification run (ID-Run) procedures.
- Load-sharing configuration for multi-drive systems.
- **Case Study:** Reducing commissioning time by 30% using standardized digital checklists.

Module 11: Application Specific: Fans & Pumps

- Quadratic load torque characteristics and energy saving calculations.
- Multi-pump control (Lead/Lag) and pipe fill functions.
- Resonance frequency avoidance (Critical Speeds).
- Flying start capabilities for spinning loads (Tolbert, 2026).
- **Case Study:** Energy audit of a municipal water plant showing 40% savings post-VFD installation.

Module 12: Application Specific: Extruders & Mixers

- Constant torque load challenges and low-speed performance.
- Managing high-breakaway torque requirements.
- External brake control and mechanical integration.
- Precise speed regulation for product quality.
- **Case Study:** Solving vibration issues in a high-capacity rubber mixer using ACS 5000.

Module 13: Power Quality & Grid Compliance

- Active Front End (AFE) and Diode Front End (DFE) impacts.
- Harmonic distortion (THDi) measurements and reporting.
- Power factor correction using the drive’s reactive power capability.
- Compliance with global standards (IEC 61000, IEEE 519).
- **Case Study:** Mitigating voltage dips in a remote grid for a large-scale mining operation.

Module 14: Maintenance & Life Cycle Management

- Annual, 3-year, and 6-year preventative maintenance schedules.
- Managing the **ABB Life Cycle** phases: Active, Classic, Limited, Obsolete.
- Spare parts management and critical inventory planning.
- Upgrading control boards to latest hardware revisions.
- **Case Study:** Planning a seamless "Classic to Active" upgrade for a critical LNG compressor.

Module 15: Future Trends: AI & Decarbonization

- AI-driven anomaly detection for early bearing failure.
- Carbon footprint reporting via automated drive telemetry.
- Integration with hydrogen fuel cell propulsion systems (Wei, 2026).
- Virtual Reality (VR) for remote maintenance assistance.
- **Case Study:** Future-proofing a maritime propulsion system for 2030 emission standards.

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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