COURSE OVERVIEW IE0805
CAT 3500 Electronic Engine Diagnostic

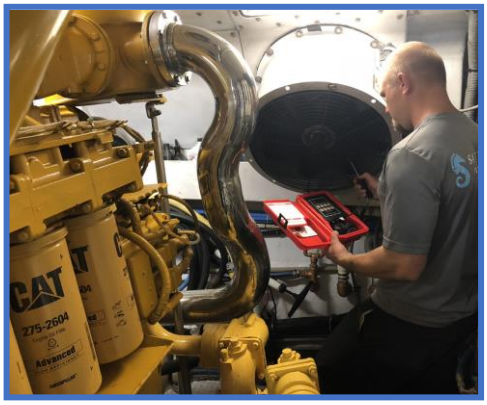
Course Title
CAT 3500 Electronic Engine Diagnostic

Course Date/Venue
February 22-26, 2026/Boardroom 2, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
IE0805

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description



This practical and highly-interactive course includes real-life case studies where participants will be engaged in a series of interactive small groups and class workshops.

This course is designed to provide participants with a detailed and up-to-date overview of CAT 3500 Electronic Engine Diagnostic. It covers the CAT 3500 engine series, basics of electronic engine management and electronic control module (ECM) architecture; the engine sensor, engine actuator and diagnostic tools; the CAT ET installation, configuration, monitoring engine parameters and event and fault code management; and the snapshot, data logging, engine configuration, parameters and troubleshooting workflow.

Further, the course will also discuss the sensor signal theory, testing engine sensors, wiring harness and connector inspection; the electrical schematic interpretation, power supply, ground diagnostics and intermittent fault troubleshooting; the electronic fuel injection system, injector diagnostics, engine timing and speed control; the air and exhaust system interaction, engine protection and derate strategies; the performance complaint diagnostics covering low power troubleshooting, excessive fuel consumption, rough running, misfire, black smoke and exhaust issues.

During this interactive course, participants will learn the advanced ECM diagnostics, communication network diagnostics and cold start and shutdown issues; and the advanced troubleshooting techniques covering root cause analysis, fault replication methods, eliminating multiple fault interactions and documentation of diagnostic findings.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on CAT 3500 electronic engine diagnostic
- Discuss CAT 3500 engine series, basics of electronic engine management and electronic control module (ECM) architecture
- Identify engine sensor, engine actuator and diagnostic tools
- Implement CAT ET installation and configuration, monitoring engine parameters and event and fault code management
- Apply snapshot and data logging, engine configuration and parameters and troubleshooting workflow
- Discuss sensor signal theory and carryout testing engine sensors and wiring harness and connector inspection
- Apply electrical schematic interpretation, power supply and ground diagnostics and intermittent fault troubleshooting
- Recognize electronic fuel injection system, injector diagnostics and engine timing and speed control
- Carryout air and exhaust system interaction and engine protection and derate strategies
- Discuss performance complaint diagnostics covering low power troubleshooting, excessive fuel consumption, rough running and misfire and black smoke and exhaust issues
- Determine advanced ECM diagnostics, communication network diagnostics and cold start and shutdown issues
- Employ advanced troubleshooting techniques covering root cause analysis, fault replication methods, eliminating multiple fault interactions and documentation of diagnostic findings

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of CAT 3500 electronic engine diagnostic for diesel engine technicians and mechanics, maintenance and reliability engineers, workshop supervisors and service managers and operations staff overseeing engine performance.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Haward's certificates are accredited by the following international accreditation organizations:

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Dr. Ahmed El-Sayed, PhD, MSc, BSc, is a **Senior Electromechanical Engineer** with over **30 years** of extensive experience in the **Power**, **Petroleum**, **Petrochemical** and **Utilities**. He specializes in **CAT 3500 Engine Series**, **Electronic Control Module (ECM) Architecture**, **CAT ET Installation & Configuration**, **SIMATIC S7-300 & S7-1500**: Basic PLC Programming & Operation, Maintenance & Troubleshooting for **SIMATIC S7-300/S7-1500** Systems, Process Automation with **SIMATIC S7-1500** & PID Control, **SIMATIC S7-300**: Hardware Configuration & Commissioning, **SIMATIC S7-300** Safety Systems: Fail-Safe Programming, **SIMATIC S7-300** Communication, **SIMATIC S7-1500**: Hardware Configuration, Commissioning & Diagnostics, **HV/LV Equipment**, **High Voltage Electrical Safety**, **LV & HV Electrical System**, **HV Equipments Inspection & Maintenance**, **HV Switchgear Operation & Maintenance**, **LV Distribution Switchgear & Equipment**, **HV Switchgear Maintenance**, **HV/LV Electrical** Authorisation, **Hazardous Area Classification, Power Quality**, **Disturbance Analysis**, **Blackout**, **Power Network**, **Power Distribution**, **Power Systems Control**, **Power Systems Security**, Power **Electronics**, **ETAP**, Electrical **Substations**, Tariff Design & Structure Analysis, **Engineering Drawings, Codes & Standards**, **P&ID Reading, Interpretation & Developing**, **PLC**, **SCADA**, **DCS**, **Process Control**, **Instrumentation**, **Automation**, Power **Generation**, **Process Control Instrumentation**, **SIS**, **SIL**, **ESD**, **Alarm Management Systems**, **Fieldbus Systems** and **Fiber Optics** as well as the service pricing of these. Further, he is also well versed in **Pumps**, **Valves**, **Boilers**, **Pressure Vessels**, **Heat Recovery Steam Generators** (**HRSG**), **Bearings**, **Compressors**, **Motors**, **Turbines**, **Actuators**, **Carbon Footprint**, **Energy Efficiency**, **Power Plant Performance & Efficiency**, **P&ID**, **Engineering Drawing**, **Codes & Standards** and **Hydraulic Systems** He is currently the **Systems Control Manager** of **Siemens** where he is in-charge of Security & Control of Power **Transmission Distribution** & **High Voltage** Systems and he further takes part in the Load Records Evaluation & Transmission Services Pricing.

During his career life, Dr. Ahmed has been actively involved in different Power System Activities including Roles in Power System Planning, Analysis, Engineering, **HV Substation** Design, Electrical Service Pricing, Evaluations & Tariffs, Project Management and also in Teaching and Consulting. His vast industrial experience was honed greatly when he joined many International and National Companies such as **Siemens**, **Electricity Authority** and **ACETO** industries where he focused more on dealing with Technology Transfer, System Integration Process and Improving Localization. He was further greatly involved in manufacturing some of **Power System** and **Control & Instrumentation Components** such as Series of Digital Protection **Relays**, MV **VFD**, **PLC** and **SCADA** System with intelligent features.

Dr. Ahmed is well-versed in different electrical and instrumentation fields like Load Management Concepts, **PLC** Programming, Installation, Operation and Troubleshooting, **AC Drives** Theory, Application and Troubleshooting, Industrial Power Systems Analysis, AC & DC **Motors**, Electric Motor **Protection**, **DCS SCADA**, **Control** and Maintenance Techniques, Industrial Intelligent Control System, **Power Quality** Standards, Power Generators and Voltage Regulators, Circuit Breaker and Switchgear Application and Testing Techniques, **Transformer** and **Switchgear** Application, Grounding for Industrial and Commercial Assets, Power Quality and **Harmonics**, **Protective Relays** (O/C Protection, Line Differential, Bus Bar Protection and **Breaker Failure Relay**) and Project Management Basics (PMB).

Dr. Ahmed has **PhD**, **Master's** & **Bachelor's** degree in **Electrical** and **Instrumentation Engineering** from the **University of Wisconsin Madison**, **USA**. Further, he has numerous papers published internationally in the areas of Power Quality, Superconductive Magnetic Energy Storage, SMES role in Power Systems, Power System **Blackout** Analysis, and Intelligent Load Shedding Techniques for preventing Power System Blackouts, HV **Substation Automation** and Power System Stability.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Fee

US$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Sunday, 22nd of February 2026***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of CAT 3500 Engine Series*** *CAT 3500 Engine Applications (Power Generation, Marine, Industrial) • Engine Configurations (3508, 3512, 3516) • Mechanical versus Electronic Control Evolution • Safety Standards and Service Documentation*
0930 – 0945	*Break*
0945 – 1030	***Basics of Electronic Engine Management*** *Purpose of Electronic Engine Control • Closed-Loop versus Open-Loop Control • Role of Sensors and Actuators • Engine Performance Optimization Principles*
1030 – 1130	***Electronic Control Module (ECM) Architecture*** *ECM Internal Components • Input/Output Signal Processing • Memory Types and Data Storage • Communication with Engine Systems*
1130 – 1215	***Engine Sensor Overview*** *Temperature Sensors (Coolant, Intake Air, Exhaust) • Pressure Sensors (Oil, Fuel, Boost) • Speed and Timing Sensors • Sensor Accuracy and Signal Ranges*
1215 – 1230	*Break*
1230 – 1330	***Engine Actuator Overview*** *Fuel Injectors and Solenoids • Governor and Throttle Actuators • Relays and Control Valves • ECM Command Signals to Actuators*

1330 – 1420	***Basics of Diagnostic Tools*** *CAT Electronic Technician (ET) Software Overview • Required Cables and Adapters • Laptop and Communication Setup • Safety Precautions During Diagnostics*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2: Monday, 23rd of February 2026

0730 – 0830	***CAT ET Installation & Configuration*** *Software Installation Requirements • Communication Setup and Troubleshooting • Engine Connection Procedures • User Interface Navigation*
0830 - 0930	***Monitoring Engine Parameters*** *Real-Time Engine Data • Key Performance Indicators (KPIs) • Interpreting Sensor Values • Normal versus Abnormal Readings*
0930 – 0945	*Break*
0945 – 1100	***Event & Fault Code Management*** *Diagnostic Codes versus Event Codes • Active, Logged, and Historical Faults • Code Severity Levels • Clearing and Confirming Faults*
1100 – 1215	***Snapshot & Data Logging*** *Capturing Engine Snapshots • Using Data Logs for Analysis • Time-Based Fault Correlation • Best Practices for Data Recording*
1215 – 1230	*Break*
1230 – 1330	***Engine Configuration & Parameters*** *Adjustable Engine Parameters • Password Levels and Security • Factory Settings versus Field Adjustments • Risks of Improper Configuration*
1330 – 1420	***Troubleshooting Workflow*** *Structured Diagnostic Approach • Using Service Manuals Effectively • Decision Trees and Flow Charts • Avoiding Common Diagnostic Mistakes*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3: Tuesday, 24th of February 2026

0730 – 0830	***Sensor Signal Theory*** *Analog versus Digital Signals • Voltage, Resistance, and Frequency Signals • ECM Reference Voltages • Signal Failure Modes*
0830 – 0930	***Testing Engine Sensors*** *Multimeter Testing Procedures • Comparing Live Data with Specifications • Identifying Sensor Drift and Failure • Proper Sensor Replacement Practices*
0930 – 0945	*Break*
0945 – 1100	***Wiring Harness & Connector Inspection*** *Common Wiring Failure Points • Connector Corrosion and Pin Damage • Harness Routing and Protection • Visual and Physical Inspection Methods*

1100 – 1215	***Electrical Schematic Interpretation*** *Reading CAT Electrical Diagrams • Identifying Power, Ground, and Signal Paths • Understanding Circuit Symbols • Tracing Faults Using Schematics*
1215 – 1230	*Break*
1230 – 1330	***Power Supply & Ground Diagnostics*** *ECM Power Supply Requirements • Ground Integrity Testing • Voltage Drop Testing • Effects of Poor Grounding on Diagnostics*
1330 – 1420	***Intermittent Fault Troubleshooting*** *Identifying Intermittent Electrical Issues • Heat and Vibration-Related Failures • Wiggle Testing Techniques • Data Logging for Intermittent Faults*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4: Wednesday, 25th of February 2026

0730 – 0830	***Electronic Fuel Injection System Overview*** *Unit Injector Operation • Fuel Delivery Control Logic • Timing and Duration Control • ECM Fuel Strategies*
0830 – 0930	***Injector Diagnostics*** *Injector Performance Indicators • Cut-Out and Cylinder Balance Tests • Electrical versus Mechanical Injector Faults • Injector Replacement and Calibration*
0930 – 0945	*Break*
0945 – 1100	***Engine Timing & Speed Control*** *Speed/Timing Sensor Diagnostics • Synchronization Issues • Timing-Related Fault Codes • Effects on Performance and Emissions*
1100 – 1215	***Air & Exhaust System Interaction*** *Turbocharger and Boost Pressure Diagnostics • Intake Air Temperature Effects • Exhaust Temperature Monitoring • Air-Fuel Ratio Considerations*
1215 – 1230	*Break*
1230 – 1330	***Engine Protection & Derate Strategies*** *Engine Protection Logic • Alarm versus Shutdown Conditions • Power Derate Causes • Diagnostic Steps for Derate Complaints*
1330 – 1420	***Performance Complaint Diagnostics*** *Low Power Troubleshooting • Excessive Fuel Consumption • Rough Running and Misfire • Black Smoke and Exhaust Issues*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5: Thursday, 26th of February 2026

0730 – 0830	***Advanced ECM Diagnostics*** *ECM Self-Tests • Internal ECM Fault Identification • Software Version Compatibility • When to Replace the ECM*
0830 – 0930	***Communication Network Diagnostics*** *Data Link Architecture • CAN/J1939 Communication Basics • Data Link Fault Codes • Troubleshooting Communication Failures*

0930 – 0945	*Break*
0945 – 1100	***Cold Start & Shutdown Issues*** *Cold Start Strategy Diagnostics • Glow Plug and Start Aid Systems • Shutdown Logic and Fault Causes • Post-Shutdown Data Analysis*
1100 – 1215	***Advanced Troubleshooting Techniques*** *Root Cause Analysis • Fault Replication Methods • Eliminating Multiple Fault Interactions • Documentation of Diagnostic Findings*
1215 – 1230	*Break*
1230 – 1300	***Real-World Case Studies*** *Common CAT 3500 Diagnostic Scenarios • Step-by-Step Fault Resolution • Lessons Learned from Field Cases • Preventive Diagnostic Strategies*
1300 – 1345	***Final Review & Best Practices*** *Diagnostic Safety Reminders • Efficient Troubleshooting Habits • Maintenance Recommendations*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-

Course Coordinator

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