

COURSE OVERVIEW EE0024
Power Plant Introduction (Basics)

Course Title

Power Plant Introduction (Basics)

Course Date/Venue

September 09-13, 2024/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference

EE0024

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs



Course Description



This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

This course is designed to provide a thorough understanding of major systems and subsystems found in modern power plants. Steam power plants, gas turbines, co-generation and combined cycle plants. The course deals with fossil fuel power plant technologies with emphasis to steam power plants, diesel power plants and combined cycle power plants.



Mechanical, electrical and instrumentation systems are explained and their importance is emphasised according to their contribution to the power plant operation, efficiency and reliability.



The participants of the course will gain a comprehensive understanding of power plant technologies and equipment as well as the relevant operational and maintenance issues.

Course Objectives

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

- Apply and gain an in-depth knowledge on power plant systems
- Explain steam power plants, steam turbines and auxiliaries, diesel power plants and gas turbines power plants
- Identify combined cycles and its concepts as well as the balance of plant systems
- Recognize bearings, hydraulic and pneumatic systems, valves, actuators and pumps
- Employ power plant field measurements and explain the fundamentals of process control, DCS, PLC and SCADA systems, motors, servos, variable frequency drives and transformers
- Describe synchronous generators, generator components, excitation, AVR and PSS

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, sample video clips of the instructor’s actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.

Who Should Attend

This course provides an overview of all significant aspects and considerations of power plant system for all technical staff who are working in power generation, utilities, process and other heavy industries. This includes fresh-graduate engineers, under-development engineers & technicians and engineers who have limited experience in power generation. Further, this course is suitable for all experienced technical personnel in power generation field who have no engineering degrees or formal training in engineering. Managers and engineers of different disciplines might find this course very useful as an awareness course in power generation.

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.

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

Certificates are accredited by the following international accreditation organizations: -


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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.

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British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council for Independent Further and Higher Education** as an **International Centre**. 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.

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 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:



Mr. Ahmed Abozeid is a **Senior Electrical & Instrumentation Engineer** with over **30 years** of **Onshore & Offshore** experience within the **Oil & Gas** and **Power** industries. His wide expertise covers **HV Cable Design, Cable Splicing & Termination, Cable Jointing Techniques, High Voltage Electrical Safety, HV/MV Cable Splicing, High Voltage Circuit Breaker Inspection & Repair, High Voltage Power System Safe Operation, High Voltage Safety, High Voltage Transformers, Safe Operation of High Voltage & Low Voltage Power Systems, Electric Distribution System Equipment, ABB 11KV Distribution Switchgear, Rotork Operation & Maintenance, Power System Protection and Relaying, Electrical Motors & Variable Speed Drives, Motor Speed Control, Power Electronic Converters, Control Valve, Flowmetering & Custody Transfer, Meters Calibration, Installation & Inspection, Crude Metering & Measurement Systems, Flow Meter Maintenance Troubleshooting, AC Converters Section, Electromagnetic Compatibility (EMC), Motor Failure Analysis & Testing, Machinery Fault Diagnosis, Bearing Failure Analysis Process Control & Instrumentation, Process Control Measurements, Control System Commissioning & Start-Up, Control System & Monitoring, Power Station Control System, Instrumentation Devices, Process Control & Automation, PID Controller, Distributed Control Systems (DCS), Programmable Logic Controllers (PLC), ABB PLC & DCS System, Gas Analyzers, Simulation Testing, Load Flow, Short Circuit, Smart Grid, Vibration Sensors, Cable Installation & Commissioning, Calibration Commissioning and Site Filter Controller.** Further, he is also well-versed in **Fundamentals of Electricity, Electrical Standards, Electrical Power, PLC, Electrical Wiring, Machines, Transformers, Motors, Power Stations, Electro-Mechanical Systems, Automation & Control Systems, Voltage Distribution, Power Distribution, Filters, Automation System, Electrical Variable Speed Drives, Power Systems, Power Generation, Power Transformers, Diesel Generators, Power Stations, Uninterruptible Power Systems (UPS), Battery Chargers and AC & DC Transmission.** He is currently the **Project Manager** wherein he manages, plans and implements projects across different lines of business.

Mr. Ahmed worked as the **Electrical Manager, Electrical Power & Machine Expert, Electrical Process Leader, Team Leader, Electrical Team Leader, Technical Instructor,** and **Instructor/Trainer** from various companies such as the Lafarge Nigeria, Egyptian Cement Company, ECC Training Center, Alrajhi Construction & Building Company and Ameria Cement Company, just to name a few.

Mr. Ahmed has a **Bachelor's** degree in **Electrical Engineering.** Further, he is a **Certified Instructor/Trainer, Certified TQUK Level 3 Vocational Achievement (RQF) Assessor** and has delivered numerous trainings, seminars, courses, workshops and conferences internationally.

Accommodation

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

Course Program

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

Day 1 Monday 09th of September 2024

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0930	Power Plant Fundamentals Concept • Classification • Energy • Power • Thermodynamic Cycles
0930 – 0945	Break
0945 – 1115	Steam Power Plants Rankine Cycle -Efficiency • Generation – Boilers, Economizers, Superheaters, Reheaters, Fuel Systems, Blowdown, Combustion Air Systems, Boiler Control Systems • Expansion – The Steam Turbine • Condensation – Condensers, Cooling Water Systems, Steam Ejectors • Regeneration – Feedwater Heating, Deaerators • Feed – Feedwater System, Pumps
1115 – 1245	Steam Turbines and Auxiliaries Turbine Components and Energy Extraction Mechanisms, Turbine Types, Steam Extraction, Turning Gear, Jacking Oil System, Gland Seal, Lubrication System, Journal Bearings, Thrust Bearings, Hydraulic Control Systems
1245 – 1300	Break
1300 – 1420	Diesel Power Plants Operating Principle • Internal Combustion Engines – Types • Advantages & Disadvantages • Performance/Efficiency
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 Tuesday 10th of September 2024

0730 – 0900	Gas Turbine Power Plants The Simple Gas Turbine Cycle, Gas Turbine Types, Brayton Cycle, The Nonideal Brayton Cycle, Gas Turbine Performance Characteristics, Cycle Improvement, Gas Turbine Operation, Components of a Gas Turbine Power Plant, Gas Turbine Applications, Gas Turbines Versus Other Prime Movers
0900 – 0915	Break
0915 – 1045	Combined Cycles Modifications of the Brayton Cycle, Regeneration, Compressor Intercooling, Turbine Reheat, Water Injection • Design for High Temperature, Materials, Cooling • Combined Cycles, Combined Cycles with Heat-recovery Boiler, Combined Cycles with Multi-Pressure Steam
1045 – 1230	Combined Cycles Concepts Basic Concepts • Single-Pressure Cycle • Dual-Pressure Cycle • Reheat Cycles • Cycles with Supplementary Firing • Cycle Performance
1230 – 1245	Break



1245 – 1420	<p>Balance of Plant Systems <i>Auxiliary Steam Systems - Auxiliary Steam System Components & Operation</i></p> <ul style="list-style-type: none"> • <i>Condensers - Components of a Condenser and Condenser Operation</i> • <i>Steam Plant Water System – Condensate Systems and Feedwater Systems</i> • <i>Cooling Water Systems – Circulating Water Systems and Closed-Loop Cooling Water Systems</i> • <i>Processed Water Systems – Major Components and Operation</i> • <i>Demineralized Water Systems –System Components and Operation</i> • <i>Wastewater Systems – Components and Operation</i> • <i>Compressed Gas Systems – Nitrogen Systems, Hydrogen Systems and Carbon Dioxide Systems</i> • <i>Compressed Air Systems – Components of the Compressed Air Systems and Compressed Air System Operation</i> • <i>Fire Protection Systems - System Components and Operation</i>
1420 – 1430	<p>Recap <i>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</i></p>
1430	<i>Lunch & End of Day Two</i>

Day 3: Wednesday 11th of September 2024

0730 – 0900	<p>Bearings <i>Principles of Lubrication • Bearing Types & Functions • Rolling Contact Bearings • Sliding Surface Bearings</i></p>
0900 – 0915	<i>Break</i>
0915 – 1100	<p>Hydraulic & Pneumatic Systems <i>Hydraulic Fluids • Hydraulic Filters • Hydraulic Seals • Hydraulic Pumps • Hydraulic Reservoirs & Accumulators • Hydraulic Control Valves • Pneumatic Valves • Coolers & Dryers • Air Receivers</i></p>
1100 – 1230	<p>Valves & Actuators <i>Valve Types • Components • Mounting Methods • Gate Valves • Globe Valves • Needle Valves • Butterfly Valves • Ball Valves • Plug Valves • Check Valves • Relief & safety Valves • Actuators – Types, Pneumatic, Electric, Hydraulic</i></p>
1230 – 1245	<i>Break</i>
1245 – 1420	<p>Pumps <i>Pump Purpose, Classification & Terminology • Positive Displacement Pumps • Centrifugal Pumps • Special Purpose Pumps • Mechanical Seals</i></p>
1420 – 1430	<p>Recap <i>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</i></p>
1430	<i>Lunch & End of Day Three</i>

Day 4: Thursday 12th of September 2024

0730 – 0900	<p>Power Plant Field Measurements <i>Pressure Measurement • Temperature Measurement • Level Measurement • Flow Measurement • Vibration Measurement • Field Communications – Transmitter Classifications, HART and 4-20mA</i></p>
0900 – 0915	<i>Break</i>





0915 - 1015	Process Control Fundamentals Terminology • Principles • Basic Control Loop - Pressure Control , Temperature Control, Flow Control, Level Control • Advance Control Loop - Cascade Control, Feedforward Control, Ratio Control, Selective Control • Control Algorithms - ON/OFF, Multistep, Proportional, Integral, Derivative, PID Control
1015 - 1130	DCS, PLC & SCADA Systems DCS • PLC • SCADA • Comparison
1130 - 1230	Motors & Servos AC & DC Motors • Motor Control • Servo Drives
1230 - 1245	Break
1245 - 1420	Variable Frequency Drives Fundamentals of VFDs
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: Friday 13th of September 2024

0730 - 0900	Transformers Importance • Types & Construction • Operation & Losses • Impedance Transformation • Circuit Analysis • Magnetizing Current • Equivalent Circuit • Transformer Parameters • Regulation • Efficiency • Interconnection with the Grid - Power Distribution, Main Output Transformers, Unit Service Transformers and Station Service Transformers • Transformer Classifications and Ratings - Cooling Methods • Main Components of a Power Transformer - Gas Detector Relays, Transformer Oil Characteristics and Tap Changers • Transformer Maintenance
0900 - 0915	Break
0915 - 1045	Synchronous Generators Construction, Speed • Excitation Methods • Internal Generated Voltage • Equivalent Circuit, Phasor Diagram, Power and Torque
1045 - 1230	Generator Components Rotor • Stator • Seals
1230 - 1245	Break
1245 - 1345	Generator Excitation, AVR and PSS Generator Excitation • Automatic Voltage Regulator (AVR) • Power System Stabiliser (PSS)
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

Simulators (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art “GE Multilin Relay 469” and “GE Multilin Relay 750”.



GE Multilin Relay 469 Simulator



GE Multilin Relay 750 Simulator

Course Coordinator

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