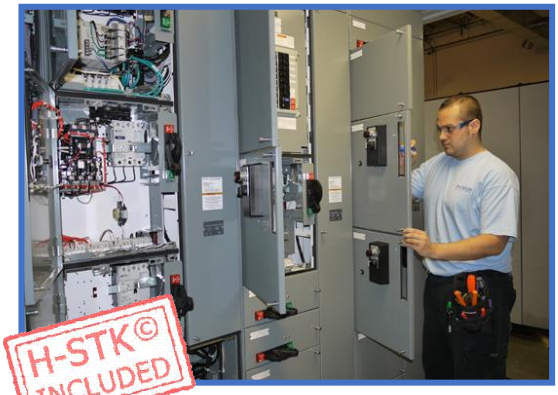
COURSE OVERVIEW EE1101
Modern Power Plant

Course Title
Modern Power Plant



Course Date/Venue
Session 1: July 07-11, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: October 20-24, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
EE1101

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 participants with a detailed and up-to-date overview of Modern Power Plant. It covers the types of power plants, key components of boilers, turbines, generators, power generation methods and power plant cycles and efficiencies; the basic thermodynamics in power plants, types of modern power plants and modern power plant design principles; the power plant safety standards and regulations, boiler and combustion systems, turbines, generators, heat recovery and steam generation; the cooling towers and their functions, types of cooling systems, water usage and environmental impacts; the power distribution and transmission basics, synchronization with the electrical grid, protection and control systems; and the smart grid technologies for modern power plants.

Further, the course will also the supervisory control and data acquisition (SCADA) and distributed control systems (DCS); the automation in plant monitoring and optimization, real-time data analysis and decision-making; the preventive and predictive maintenance, power plant troubleshooting techniques, reliability engineering in power plants and condition monitoring tools and techniques; and the plant shutdown and turnaround management including risk assessment and management.

During this interactive course, participants will learn the environmental impact of power plants and carbon capture and storage (CCS) technologies; the CCS principles and processes, integration of CCS in modern power plants, environmental benefits, challenges of CCS and future of CCS in reducing carbon footprints; the renewable energy integration, water management and conservation, sustainable design and green technologies; the emerging technologies in power generation, digitalization and the internet of things (IoT); the artificial intelligence and machine learning in power plants, smart grid and energy storage solutions; and the decentralized power generation.

Course Objectives

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

- Apply and gain a comprehensive knowledge on modern power plant
- Identify the types of power plants, key components of boilers, turbines, generators, power generation methods and power plant cycles and efficiencies
- Discuss the historical development of power plants, basic thermodynamics in power plants, types of modern power plants and modern power plant design principles
- Review power plant safety standards and regulations and recognize boiler and combustion systems, turbines, generators, heat recovery and steam generation
- Identify cooling towers and their functions, types of cooling systems, water usage and environmental impacts
- Discuss power distribution and transmission basics, synchronization with the electrical grid, protection and control systems and smart grid technologies for modern power plants
- Describe supervisory control and data acquisition (SCADA) and distributed control systems (DCS) as well as apply automation in plant monitoring and optimization, real-time data analysis and decision-making
- Employ preventive and predictive maintenance, power plant troubleshooting techniques, reliability engineering in power plants and condition monitoring tools and techniques
- Carryout plant shutdown and turnaround management including risk assessment and management
- Discuss environmental impact of power plants and carbon capture and storage (CCS) technologies
- Apply techniques for improving energy efficiency in power plants, heat recovery and waste heat utilization, energy audits and performance benchmarking and sustainable practices and energy conservation technologies
- Carryout renewable energy integration, water management and conservation, sustainable design and green technologies
- Discuss the emerging technologies in power generation, digitalization and the internet of things (IoT)
- Determine artificial intelligence and machine learning in power plants, smart grid and energy storage solutions and decentralized power generation

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 modern power plant for electrical engineers, mechanical engineers, energy engineers, plant operators, technicians, supervisors, maintenance and reliability engineers, project managers, project engineers, health, safety, environment (HSE) professionals and other technical staff.

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 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: -

- 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.

- 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 **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.

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

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of Power Plant Systems*** *Definition and Types of Power Plants • Key Components: Boilers, Turbines, Generators • Power Generation Methods: Thermal, Hydro, Nuclear and Renewables • Overview of Power Plant Cycles and Efficiencies*
0930 – 0945	*Break*
0945 – 1030	***Historical Development of Power Plants*** *Early Power Generation Technologies • Evolution of Power Plant Design and Technology • Key Innovations in Power Generation • Challenges in Transitioning from Traditional to Modern Plants*
1030 – 1130	***Basic Thermodynamics in Power Plants*** *Laws of Thermodynamics and their Application • Heat and Energy Conversion Processes • Efficiency and Performance Measures • Thermodynamic Cycles in Power Plants (Rankine, Brayton)*
1130 – 1215	***Types of Modern Power Plants*** *Combined Cycle Power Plants (CCPP) • Gas Turbine Power Plants • Cogeneration and CHP (Combined Heat and Power) • Renewable Energy Power Plants (Solar, Wind)*
1215 – 1230	*Break*
1230 – 1330	***Modern Power Plant Design Principles*** *Design Criteria for Efficiency and Sustainability • Role of Automation and Control Systems • Material Selection and Plant Life Cycle Considerations • Designing for Environmental Compliance*
1330 – 1420	***Power Plant Safety Standards & Regulations*** *Industry Standards (e.g., ASME, IEC, IEEE) • Safety Regulations and Compliance • Health and Safety Risks in Power Plant Operation • Safety Systems and Protocols*
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

0730 – 0830	***Boiler & Combustion Systems*** *Types of Boilers Used in Power Plants • Combustion Processes and Efficiency • Fuel Types and their Impact on Design • Emissions Control and Reduction Technologies*
0830 – 0930	***Turbines & Generators*** *Types of Turbines: Steam, Gas and Water Turbines • Generator Operation and Electrical Output • Matching Turbine Design to Plant Requirements • Operational Challenges in Turbines*
0930 – 0945	*Break*

0945 – 1100	***Heat Recovery & Steam Generation*** *Heat Recovery Steam Generators (HRSG) • Boiler Feed Water Treatment • Steam Generation and Temperature Control • Superheating and Reheating Techniques*
1100 – 1215	***Cooling Systems in Power Plants*** *Cooling Towers and their Functions • Types of Cooling Systems: Once-through, Recirculating • Water Usage and Environmental Impacts • Cooling System Maintenance and Challenges*
1215 – 1230	*Break*
1230 – 1330	***Electrical Systems & Grid Integration*** *Power Distribution and Transmission Basics • Synchronization with the Electrical Grid • Protection and Control Systems • Smart Grid Technologies for Modern Power Plants*
1330 – 1420	***Automation & Control Systems*** *Supervisory Control and Data Acquisition (SCADA) • Distributed Control Systems (DCS) • Automation in Plant Monitoring and Optimization • Real-Time Data Analysis and Decision-Making*
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

0730 – 0830	***Preventive & Predictive Maintenance*** *Importance of Routine Inspections and Diagnostics • Predictive Maintenance Technologies (Vibration, Thermography) • Condition Monitoring Techniques • Scheduling and Tracking Maintenance Activities*
0830 – 0930	***Power Plant Troubleshooting Techniques*** *Root Cause Analysis in Power Plants • Identifying and Resolving Mechanical Failures • Troubleshooting Electrical Issues in Power Generation • Case Studies of Common Power Plant Faults*
0930 – 0945	*Break*
0945 – 1100	***Reliability Engineering in Power Plants*** *Key Performance Indicators (KPIs) for Reliability • Failure Modes and Effects Analysis (FMEA) • Reliability-Centered Maintenance (RCM) • Improving Plant Uptime and Reducing Downtime*
1100 – 1215	***Condition Monitoring Tools & Techniques*** *Vibration Analysis and Thermography • Ultrasound Testing and Acoustic Emission Analysis • Performance Monitoring of Turbines and Boilers • Remote Sensing and Diagnostic Technologies*
1215 – 1230	*Break*
1230 – 1330	***Plant Shutdown & Turnaround Management*** *Planning and Executing Safe Plant Shutdowns • Inspection, Repair, and Overhaul During Shutdowns • Managing Critical Equipment and Spare Parts • Health and Safety Considerations During Turnarounds*

1330 – 1420	***Risk Assessment & Management*** *Identifying Hazards and Risks in Plant Operation • Quantitative and Qualitative Risk Assessment Methods • Risk Mitigation Strategies • Emergency Response Planning and Execution*
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

0730 – 0830	***Environmental Impact of Power Plants*** *Air, Water and Soil Pollution from Power Plants • Waste Management: Ash, Sulfur, CO_2 and NOx • Environmental Regulations and Compliance (EPA, Local Laws) • Impact Assessments and Monitoring*
0830 – 0930	***Carbon Capture & Storage (CCS) Technologies*** *CCS Principles and Processes • Integration of CCS in Modern Power Plants • Environmental Benefits and Challenges of CCS • Future of CCS in Reducing Carbon Footprints*
0930 – 0945	*Break*
0945 – 1100	***Energy Efficiency & Conservation*** *Techniques for Improving Energy Efficiency in Power Plants • Heat Recovery and Waste Heat Utilization • Energy Audits and Performance Benchmarking • Sustainable Practices and Energy Conservation Technologies*
1100 – 1215	***Renewable Energy Integration*** *Solar, Wind and Geothermal Power in Modern Plants • Hybrid Power Plants: Combining Conventional and Renewable Sources • Grid Integration of Intermittent Renewable Energy • Challenges and Opportunities in Renewable Energy Adoption*
1215 – 1230	*Break*
1230 – 1330	***Water Management & Conservation*** *Water Usage in Power Generation • Strategies for Water Conservation in Cooling and Steam Systems • Desalination Technologies and their Integration in Power Plants • Legal and Ethical Issues Surrounding Water Use*
1330 – 1420	***Sustainable Design & Green Technologies*** *Green Building Standards and Certifications (LEED, BREEAM) • Energy-Efficient Plant Design • Renewable Energy Technologies for Powering Plants • Zero-Emission and Net-Zero Plants*
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*

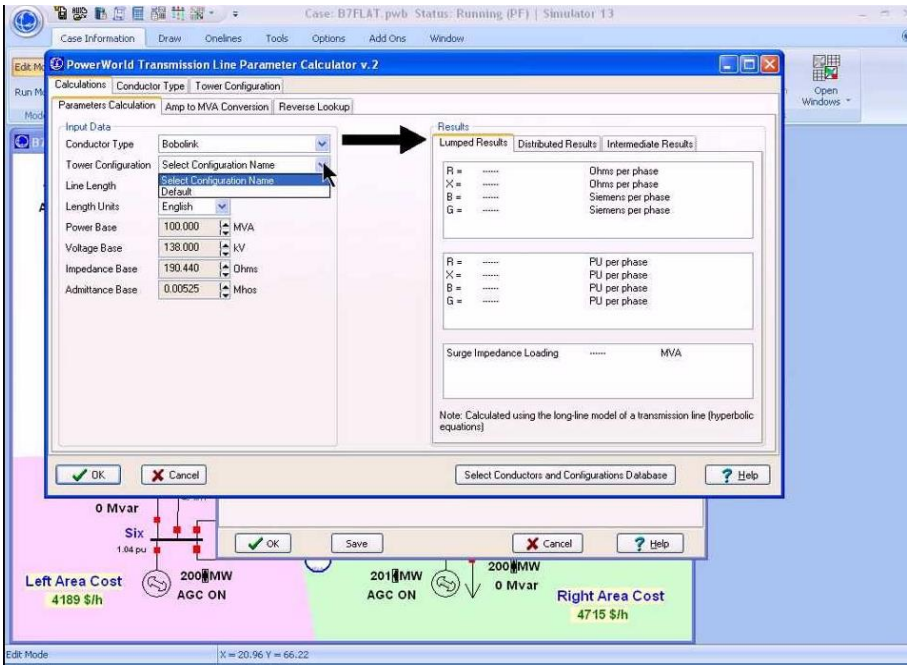
Day 5

0730 – 0830	***Emerging Technologies in Power Generation*** *Advanced Turbine and Combustion Technologies • Energy Storage Systems for Power Plants • Advanced Grid Technologies: Smart Grids and Microgrids • Fuel Cells and Hydrogen-Based Power Generation*
0830 – 0930	***Digitalization & the Internet of Things (IoT)*** *Digital Twin Technology in Power Plants • IoT Applications for Predictive Maintenance and Optimization • Big Data Analytics for Power Plant Operations • Cybersecurity in Industrial Control Systems*

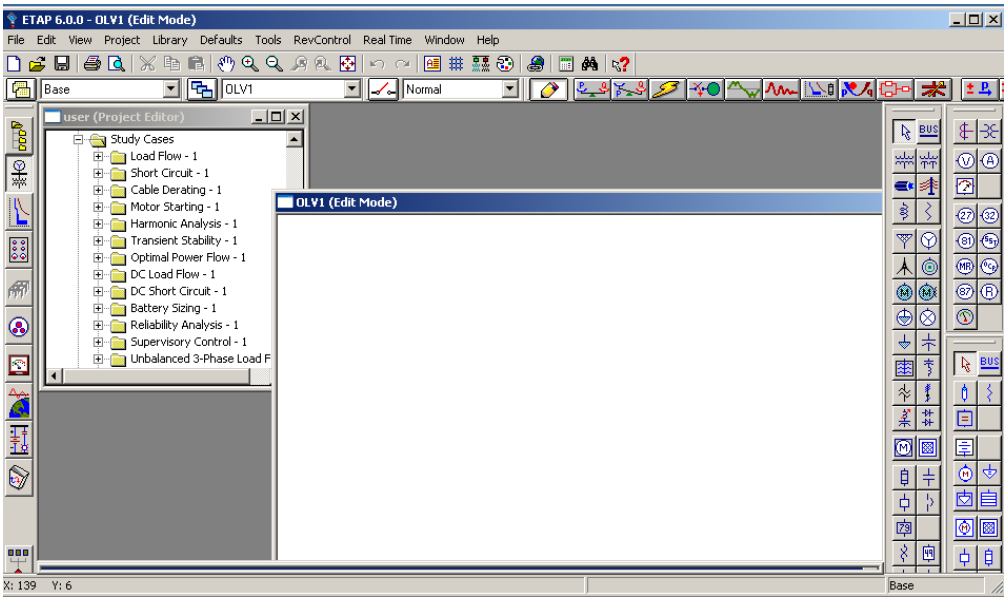
0930 – 0945	*Break*
0945 – 1100	***Artificial Intelligence & Machine Learning in Power Plants*** *AI Applications for Power Plant Optimization • Machine Learning for Predictive Analytics • Autonomous Systems for Plant Monitoring and Control • Case Studies of AI Implementation in Power Plants*
1100 – 1215	***Smart Grid & Energy Storage Solutions*** *Overview of Smart Grids and their Benefits • Energy Storage Technologies: Batteries, Pumped Hydro, Flywheels • Integration of Energy Storage in Power Plants • The Role of Smart Grids in Sustainable Energy Management*
1215 – 1230	*Break*
1230 – 1300	***Decentralized Power Generation*** *Microgrids and Distributed Energy Resources (DER) • Benefits and Challenges of Decentralized Systems • Hybrid Power Generation Systems • Future Trends in Local Energy Generation*
1300 - 1345	***Future of Power Plants: Challenges & Opportunities*** *Climate Change and its Impact on Power Generation • Decarbonization and Sustainable Power Solutions • The Transition to Low-Carbon and Renewable Energy Systems • Global Trends and Policies Shaping the Future of Power Plants*
1330 – 1345	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about t Topics that were Covered During the Course*
1345 – 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 simulators “Power World”, “ETAP software” and “Switchgear Simulator”.



Power World Simulator



ETAP Software Simulator

Course Coordinator

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