COURSE OVERVIEW EE0410

Power Optimization & Energy Management System in Modern Power Generation Industry

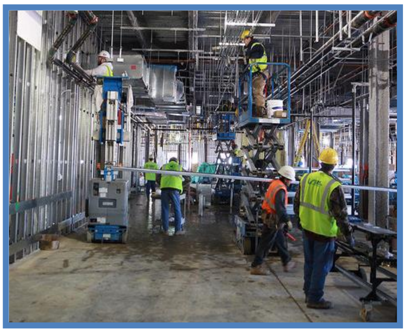
Course Title
Power Optimization & Energy Management System in Modern Power Generation Industry

Course Date/Venue
Session 1: June 22-26, 2025/Business Meeting, Crowne Plaza Al Khobar, Al Khobar, KSA
Session 2: November 16-20, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
EE0410

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

Course Description



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

The efficient and optimum economic operation and planning of electric power generation systems have always occupied an important position in the electric power industry. Prior to 1973 and the oil embargo that signalled the rapid escalation in fuel prices, electric utilities in the United States spent about 20% of their total revenues on fuel for the production of electrical energy.

In the 5 years after 1973, U.S. electric utility fuel costs escalated at a rate that average 25% compounded on an annual basis. The efficient use of the available fuel is growing in importance, both monetarily and because most of the fuel used represents irreplaceable natural resources. A savings in the operation of a small percent represents a significant reduction in operating cost, as well as in the quantities of fuel consumed. It is no wonder that this area has warranted a great deal of attention from engineers through the years.

This course represents an important step in an engineering area that has been and is still undergoing rapid change. It concerns established engineering problem areas (i.e., economic dispatch and control of interconnected systems) that have taken on new importance in recent years.

The original problem of economic dispatch for thermal systems was solved by numerous methods years ago. Recently, there has been a rapid growth in applied mathematical methods and the availability of computational capability for solving problems of this nature so that more involved problems have been successfully solved. With deregulation, market rules and economic principles dictate that commodities be priced at the marginal value of their production.

As a result, it's necessary to work with ever-more-sophisticated algorithms using optimization techniques-either for the optimal dispatch of the system itself, or for pricing commodities and the settlement of markets. Succeeding in this new environment takes a good understanding of methods that involve linear and nonlinear optimization, including optimal power flow, locational marginal prices for energy, and the auction of hedging instruments.

The use of optimization methods is familiar territory to academicians and researchers. Yet, it today's world of deregulated electricity markets, it's just as important for electric power professionals to have a solid grasp of these increasingly relied upon techniques. Making those techniques understandable is the hallmark of this course. In its comprehensive, skill-building overview of optimization techniques, this course puts you on a good position regarding the latest and rapid development in this interesting field.

Course Objectives

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

- Apply an up-to-date knowledge and skills in power optimization of energy management system in modern power generation industry
- Enumerate the characteristics of power generation units and explain the transmission system effects
- Describe the economic dispatch of thermal units and methods of solution
- Discuss unit commitment and generation with limited energy supply
- Illustrate the production cost models
- Discuss the interchange of power and energy
- Employ power system security and estimation in power systems as well as identify the optimal power flow

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 a wide understanding and deeper appreciation of power optimization of energy management system in modern power generation industry for all electrical system planners, power control engineers, power operator engineers, power system engineers and EMS Managers/Engineers in the electrical industry. The course also a valuable workshop for researchers, practicing power/electrical engineers and engineering participants.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course.

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.

- USA International Association for Continuing Education and Training (IACET)

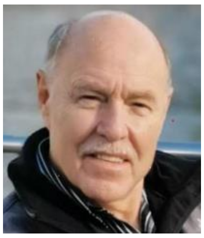
Haward Technology is an Authorized Training Provider by the International Association for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, Virginia 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 1-2013 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 1-2013 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 Association 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:



Mr. Fred Du Plessis is a **Senior Electrical Engineer** with over **45** years of extensive experience within the **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries. His expertise widely covers in the areas of **Thermal Gas Power Generation**, **Power Station** Operations, **Power Generation Plant Outage** Management, **Power System** Analysis, **Power System** Generation & Distribution, **Electric Power System** Design, **Renewable Energy**, **Energy Storage** Technologies, Maintenance, Testing & Troubleshooting, **Transformer Protection**, **Transformer** Problem and Failure Investigations, **Power System Operation and Control**, Fault Analysis in **Power Systems**, **HV/MV Cable Splicing**, **High Voltage Electrical Safety**, **High Voltage Circuit Breaker** Inspection & Repair, **High Voltage Power** System, **HV Equipment** Inspection & Maintenance, **HV Switchgear** Operation & Maintenance, Resin / **Heat Shrink & Cold Shrink** Joints, **HV/LV Equipment**, ORHVS for Responsible and Authorized Person **High Voltage Regulation**, **Transformers** Maintenance, inspections & repairs, Commissioning of **LV & HV Equipment**, Oil Purification and **High Voltage Maintenance**, HT Switch Gear -Testing, Safe Operating, Maintenance, Inspection & Repairs on **LV & HT Cables** - Testing (Pulse & Megger), Line Patrol in **Low Voltage & Distribution**, **Transmission**, **Operating Principles up to 132KV**, Abnormal Conditions & Exceptions, Commissioning & Testing, **Transformer Inspections & Repairs**, **Live Line Work up to 33KV**, **Basic Power System Protection**, **High Voltage** Operating Preparedness Phasing (**110V to 132KV**), **HV Operating & Fault** Finding (up to 132KV), Maintenance & Construction Supervision, **VSD/VFD** Installations & Testing, **Electrical Panel Design**, **VSD/VFD Installations & Testing**, Instrument Installation and wiring, **AC/DC Supplies & Change Over Systems**, **AC & DC Winders** and VLF Testing, **Gas Turbines**, **Steam Turbine** with a **Station Generation**, **Project** Management & Project Controls, **Water Treatment & Reverse Osmosis** Plant Management and **Mechanical Maintenance** Management.

During Mr. Du Plessis's career life, he has gained his practical experience through several significant positions and dedication as the **Project Manager/Owner**, **Maintenance Manager**, **Project Excecution Manager**, **Commissioning & Operating Manager**, **Acting Operating Manager**, **Optimization/Commissioning Manager**, **Operating Support Manager**, **Operating Production/Shift Manager**, **Operations Lead Engineer**, **Electrical Engineer**, **Production/Maintenance Planner**, **Unit Shift Supervisor**, Principal **Plant Operator**, **Workshop & Maintenace Consultant**, Assistant **Electrical Supervisor**, Trainee **Motor Mechanic** and **Senior Instructor**/**Trainer** from various international **power station** companies like the Dunamis Energy, Peterhead Power Station, Lijaco Services, Eskom, Matla Power Station, Grootvlei Power Station, Ellisras Brick & Ceramic, Hlalisanani Mechanical Contractor, Matimba Power Station, Matimba Power Station, Eskom Kriel Power Station and Transvaal Provincial.

Mr. Du Plessis has a **Bachelor's** (with Honours) degree in **Operations Management**. Further, he holds certification in Red & Silver Seal Accreditation Power Generation – (ESETA), a SAMTRAC & NOSA **Auditor** – (NOSA), a **Certified Instructor/Trainer** and has further delivered various trainings, seminars, conferences, workshops and courses globally.

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

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 Program

The following program is planned for this course. However, the course director(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

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0945	***Introduction*** *Purpose of the Course • Course Scope • Economic Importance • Problem New and Old*
0945 – 1000	*Break*
1000 – 1130	***Characteristics of Power Generation Units*** *Characteristics of Steam Units • Variations in Steam Unit Characteristics • Cogeneration Plants • Typical Generation Data*
1130 – 1315	***Economic Dispatch of Thermal Units and Methods of Solution*** *The Economic Dispatch Problem • Thermal System Dispatching with Network Losses Considered • The Lambda-Iteration Method • Gradient Methods of Economic Dispatch • Newton's Method*
1315 – 1330	*Break*
1330 – 1420	***Economic Dispatch of Thermal Units and Methods of Solution (cont'd)*** *Economic Dispatch with Piecewise Linear Cost Functions • Economic Dispatch Using Dynamic Programming • Base Point and Participation Factors • Economic Dispatch Versus Unit Commitment • Optimization within Constraints • Dynamic-Programming Applications*
1420 - 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0900	***Transmission System Effects*** *The Power Flow Problem and Its Solution*
0900 – 0915	*Break*
0915 – 1100	***Transmission System Effects (cont'd)*** *Transmission Losses ● Power Flow Input Data for Six-Bus System*
1100 – 1230	***Unit Commitment*** *Introduction ● Hydro-Constraints ● Must Run ● Fuel Constraints*
1230 – 1245	*Break*
1245 – 1420	***Unit Commitment (cont'd)*** *Unit Commitment Solution Methods ● Dual Optimization on a Nonconvex Problem*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0900	***Generation with Limited Energy Supply*** *Introduction ● Take-or-Pay Fuel Supply Contract ● Composite Generation ● Production Cost Function*
0900 – 0915	*Break*
0915 – 1100	***Generation with Limited Energy Supply (cont'd)*** *Solution by Gradient Search Techniques ● Hard Limits and Slack Variables ● Fuel Scheduling by Linear Programming*
1100 – 1230	***Production Cost Models*** *Introduction ● Uses and Types of Production Cost Programs ● Probabilistic Production Cost Programs*
1230 – 1245	*Break*
1245 – 1420	***Production Cost Models (cont'd)*** *Sample Computation and Exercise ● Probability Methods and Uses in Generation Planning*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0900	***Interchange of Power and Energy*** *Introduction ● Economy Interchange between Interconnected Utilities ● Interutility Economy Energy Evaluation ● Interchange Evaluation with Unit Commitment*
0900 – 0915	*Break*
0915 – 1100	***Interchange of Power and Energy (cont'd)*** *Multiple-Utility Interchange Transactions ● Other Types of Interchange*
1100 – 1230	***Interchange of Power and Energy (cont'd)*** *Power Pools ● Transmission Effects and Issues ● Transactional Involving Nonutility Parties*
1230 – 1245	*Break*
1245 – 1420	***Power System Security*** *Introduction ● Factors Affecting Power System Security ● Contingency Analysis: Detection of Network*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0900	***Estimation in Power Systems*** *Introduction Power System Estimation • Maximum Likelihood Weighted Least-Squares*
0900 – 0915	*Break*
0915 – 1100	***Estimation in Power Systems (cont'd)*** *Estimation of an AC Network • State Estimation by Orthogonal Decomposition • Application of Power Systems Estimation*
1100 – 1230	***Optimal Power Flow*** *Introduction • Solution of the Optimal Power Flow • Linear Sensitivity Analysis*
1230 – 1245	*Break*
1245 – 1345	***Optimal Power Flow (cont'd)*** *Linear Programming Methods • Security-Constrained Optimal Power Flow • Interior Point Algorithm • Bus Incremental Costs*
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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