ENTERPRISE 50
Celebrating Singapore's Enterprising Spirit 2022

powerEDGE®
Empower your future

CLASSROOM TRAINING

GAS TURBINES, CO-GENERATION AND COMBINED CYCLE POWER PLANTS

Computer Simulation, Selection, Applications, Operation, Maintenance, Performance Monitoring, Power Augmentation, Economics, Profit Optimization, Revenue and Life Cycle Cost Analysis and Case Studies

5 full-day training, 7 hours per session
(total 35 hours)

GLOBAL LEADER IN POWER & UTILITIES TRAINING

COURSE OVERVIEW

This 5 full-day course will cover all aspects of gas turbines, co-generation and combined cycle power plants. It will cover in detail all the components of these types of power plants such as: compressors, gas and steam turbines, heat recovery steam generators, deaerators, condensers, lubricating systems, instrumentation, control systems, and economics.

The design, selection considerations, operation, maintenance, pay-back period, economics of co-generation plants and combined cycles, as well as, emission limits, reliability, monitoring and governing systems are also covered in detail. This course will also provide up-dated information in respect to all the significant improvements that have been made to co-generation and combined cycles power plants, during the last two decades.

The course will illustrate through sophisticated computer simulation how gas turbines, co-generation and combined cycle plants perform under steady-state and transient conditions. In addition, the participants will learn how to use the computer simulation program which provides the following benefits:

- Allow the operator to extend the gas turbine operating period by avoiding unnecessary outages and maintenance activities.
- Determination of essential gas turbine maintenance activities to reduce the duration of outages.
- Profit optimization of co-generation and combined cycle plants.
- Minimization of the environmental emissions of co-generation and combined cycle plants.

Course Level	Basic or Foundation
Maximum Number of Participants	20

COURSE LEARNING OUTCOMES

- **Power Plant Computer simulation:** Gain a thorough understanding of computer simulation of gas turbines, co-generation, and combined cycle plants.
- **Power Plant Components and Systems:** Learn about all components and subsystems of the various types of power plants such as gas turbines, co-generation and combined cycle plants
- **Power Plants Economics:** Examine the advantages, applications, performance and economics of power plants such as: gas turbines, co-generation, and combined cycle plants
- **Power Plant Equipment:** Learn about various power plant equipment including: compressors, turbines, governing systems, combustors, deaerators, feed water heaters, etc.
- **Power Plant Maintenance:** Learn all the maintenance activities required for power plants such as: gas turbines, co-generation plants and combined cycles to minimize their operating cost and maximize their efficiency, reliability, and longevity
- **Power Plant Environmental Emissions:** Learn about the monitoring and control of environmental emissions.
- **Power Plant Instrumentation and Control Systems:** Learn about the latest instrumentation and control systems of gas turbines, co-generation and combined cycles power plants
- **Power Plant Reliability and Testing:** Increase your knowledge of power plant predictive and preventive maintenance, reliability and testing.
- **Power Plant Selection and Applications:** Gain a detailed understanding of the selection considerations and applications of power plants such as: gas turbines, co-generation and combined-cycle power plants
- **Power Plant Profitability:** Learn about the reliability, life cycle cost, profitability, refurbishment, and life extension methods for gas turbines, co-generation and combined cycle power plants.

WHO SHOULD ATTEND

- Engineers of all disciplines
- Managers
- Technicians
- Maintenance personnel
- Other technical individuals

TRAINING METHODOLOGY

The instructor relies on a highly interactive training method to enhance the learning process.This method ensures that all the delegates gain a complete understanding of all the topics covered. The training environment is highly stimulating, challenging, and effective because the participants will learn by case studies which will allow them to apply the material taught to their own organization.

SPECIAL FEATURE

Each delegate will receive a copy of the following materials written by the instructor:

- *"POWER GENERATION HANDBOOK" second edition, published by McGraw-Hill in 2012 (800 pages)*
- *Practical manual (500 pages)*

5 FULL-DAY COURSE OUTLINE

Day 1

Gas Turbine Fundamentals, Design, Calculations, Applications, Protective Systems, and Tests, Gas Turbine Compressors, Compressor Surge and Stall, Surge and Stall Prevention Systems, Compressor Seals and Magnetic Bearings

- Gas Turbine Fundamentals
- Overview of Gas Turbines
- Gas Turbine Design
- Gas Turbine Calculations
- Gas Turbine Applications in Power Stations, Gas Turbine Protective Systems, and
- Tests
- Gas Turbine Compressors
- Dynamic Compressors Technology
- Compressors Auxiliaries, Off-Design Performance, Stall, and Surge
- Centrifugal Compressors – Components, Performance Characteristics, Balancing, Surge Prevention Systems, and Testing
- Dynamic Compressors Performance
- Compressor Seal Systems
- Dry Seals, Advanced Sealing Mechanisms, and Magnetic Bearings

Day 2

Gas Turbine Components and Auxiliaries, Computer Simulation of Gas Turbines

- Gas Turbine Combustors
- Axial-Flow Turbines
- Gas Turbine Materials
- Gas Turbine Lubrication and Fuel Systems
- Gas Turbine Bearing and Seals
- Gas Turbine Instrumentation and Control Systems
- Gas Turbine Performance Characteristics
- Gas Turbine Operating and Maintenance Considerations
- Gas Turbine Emission Guidelines and Control Systems
- Computer Simulation of Gas Turbines
- Effects of ambient temperature and pressure on gas turbine performance
- Simulation of effects of component deterioration on engine performance
- Power Augmentation
- Simulation of engine control system performance
- Profits, Revenue and Life Cycle Cost Analysis
- Non-Dimensional Analysis
- Computer Simulation Applications

Day 3

Heat Recovery Steam Generators, Steam Power Plants, Steam Turbines, Co-Generation Plants, Arrangement of Co-Generation Plants, Economics of Co-Generation Plants, Turbine Controls

- Heat Recovery Steam Generators
- Steam Power Plants
- Steam Turbines
- Reheaters
- Condensers
- Feedwater Heaters
- Efficiency and Heat Rate
- Supercritical Plants
- Co-generation Plants
- Arrangement of Co-generation plants
- Economics of Co-generation Plants
- The Steam Drum
- Superheaters and Reheaters
- Economizers
- Fans
- The Stack
- Heat Recovery Steam Generator Control
- Thrust bearings
- Labyrinth seals
- Turbine controls
- Testing of Turbine blades

5 FULL-DAY COURSE OUTLINE

Day 4

Steam Turbines and Auxiliaries, Steam Turbine Maintenance, Turbine Governing Systems, Power Station Performance Monitoring, Turbine Instrumentation, Features Enhancing The Reliability and Maintainability of Steam Turbines

- Turbine Types
- Compound Turbines
- Turbine Control Systems
- Steam Turbine Maintenance
- Steam Generators, Heat Exchangers, and Condensers
- Power Station Performance Monitoring
- The Turbine Governing Systems
- Steam Chests and Valves
- Turbine Protective Devices
- Turbine Instrumentation
- Lubrication Systems
- Gland Sealing System
- Frequently Asked Questions about Turbine-Generator Balancing, Vibration Analysis and Maintenance
- Features Enhancing The Reliability and Maintainability of Steam Turbines

Day 5

Combined Cycles, Co-generation Plants, Steam Turbine Selection for Combined Cycle Power Systems, Best Power Enhancement Option for Combined Cycle Plants, Co-Generation Application Considerations, Economics of Combined Cycles Co-Generation Plants, Combined Cycles Case Studies, Computer Simulation of Combined Cycles Power Plants

- Combined Cycles
- Integrated Gasification Combined Cycles
- Single-Shaft Combined Cycle Power Generating Plants
- Steam Turbine Selection for Combined Cycle Power Systems
- Absorption Chillers
- Selection of The Best Power Enhancement Option for Combined Cycle Plants
- Economic and Technical Considerations for Combined Cycle Performance
- Enhancement Options

Day 5 (Continued)

- Applications of Co-generation and Combined Cycle Plants
- Selection Considerations of Combined Cycles and Co-generation Plants
- Co-generation Application Considerations
- University of Toronto Central Steam, Co-generation and District Heating Plant
- Economics of Combined Cycles Co-generation Plants
- Combined Cycles Case Studies
- Computer Simulation of Gas Turbines and Combined Cycles – Exercises and
- Solutions

EXPERT COURSE FACULTY

Phillip Kiameh

Your specialist course leader has more than 32 years of practical engineering experience with Ontario Power Generation (OPG), one of the largest electric utility in North America. He was previously involved in research on power generation equipment with Atomic Energy of Canada Limited at their Chalk River and Whiteshell Nuclear Research Laboratories.

While working at OPG, he acted as a Training Manager, Engineering Supervisor, System Responsible Engineer and Design Engineer. During the period of time, he worked as a Field Engineer and Design Engineer, he was responsible for the operation, maintenance, diagnostics, and testing of gas turbines, steam turbines, generators, motors, transformers, inverters, valves, pumps, compressors, instrumentation and control systems. Further, his responsibilities included designing, engineering, diagnosing equipment problems and recommending solutions to repair deficiencies and improve system performance, supervising engineers, setting up preventive maintenance programs, writing Operating and Design Manuals, and commissioning new equipment.

Later, he worked as the manager of a section dedicated to providing training for the staff at the power stations. The training provided by him covered in detail the various equipment and system used in power stations.

In addition, he has taught courses and seminars to more than four thousand working engineers and professionals around the world, specifically Europe and North America. He has been consistently ranked as “Excellent” or “Very Good” by the delegates who attended his seminars and lectures.

He written 5 books for working engineers from which 3 have been published by McGraw-Hill, New York. Below is a list of the books authored by him;

- Power Generation Handbook: Gas Turbines, Steam Power Plants, Co-generation, andCombined Cycles, second edition, (800 pages), McGraw-Hill, New York, October 2011.
- Electrical Equipment Handbook (600 pages), McGraw-Hill, New York, March 2003.
- Power Plant Equipment Operation and Maintenance Guide (800 pages), McGraw-Hill, New York, January 2012.
- Industrial Instrumentation and Modern Control Systems (400 pages), Custom Publishing, University of Toronto, University of Toronto Custom Publishing (1999).
- Industrial Equipment (600 pages), Custom Publishing, University of Toronto, University of Toronto, University of Toronto Custom Publishing (1999).

Furthermore, he has received the following awards:

- The first “Excellence in Teaching” award offered by PowerEdge, Singapore, inDecember 2016
- The first “Excellence in Teaching” award offered by the Professional Development Center at University of Toronto (May, 1996).
- The “Excellence in Teaching Award” in April 2007 offered by TUV Akademie (TUV Akademie is one of the largest Professional Development centre in world, it is based in Germany and the United Arab Emirates, and provides engineering training to engineers and managers across Europe and the Middle East).
- Awarded graduation “With Distinction” from Dalhousie University when completed Bachelor of Engineering degree (1983).

Lastly, he was awarded his Bachelor of Engineering Degree “with distinction” from Dalhousie University, Halifax, Nova Scotia, Canada. He also received a Master of Applied Science in Engineering (M.A.Sc.) from the University of Ottawa, Canada. He is also a member of the Association of Professional Engineers in the province of Ontario, Canada.

IN-HOUSE TRAINING SOLUTIONS

Organisations today require crucial skills to improve performance, as well as a clear returns on their training investment ROI. By aligning training interventions to focus on your specific business needs and objectives, **powerEDGE** is able to deliver results way and above what can be achieved via conventional training approaches.

Our in-house training solutions offer a full spectrum of short courses and curricular that can be customized to your exact needs and be brought right to your doorstep!

Our clients have come to rely on our robust integrated learning approach as a fundamental component of their talent development and performance improvement strategy. Our unique approach comprises of the following phases:

- Detailed assessment with business issue needs analysis through pre-course evaluations and other assessment tools
- In-depth consultation development and organizational alignment
- Programme and curriculum development refinement
- Strategic evaluation process to validate learnings' achieved with ROI
- Targeted and focused re-enforcement to ensure knowledge transfer

Looking to train the whole team? Email us at ***info@asiaedge.net*** to know more about our in-house training or request for a quotation.

OTHER RELATED TRAINING YOU CAN ATTEND:

Introduction to Power Systems

Maintenance, Inspection, Diagnostics, Testing and Refurbishment of Key Electrical Equipment

Heat Rate Optimization of Coal Power Plants

Root Cause Analysis for Boilers and Steam Cycle Failures

Commissioning of Electrical Equipment

Maintenance of Steam and Gas Turbines: Diagnostic Testing, Troubleshooting, Maintenance, and Features Enhancing the Reliability and Maintainability of Steam and Gas Turbines

REGISTRATION

Classroom Training

GAS TURBINES, CO-GENERATION AND COMBINED CYCLE POWER PLANTS

REGISTRATION FORM

Name: _____ **Job Title:** _____ **Department:** _____
Telephone: _____ **Email Address:** _____
Preferred Course & Date: _____

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Telephone: _____ **Email Address:** _____
Preferred Course & Date: _____

Name: _____ **Job Title:** _____ **Department:** _____
Telephone: _____ **Email Address:** _____
Preferred Course & Date: _____

Name: _____ **Job Title:** _____ **Department:** _____
Telephone: _____ **Email Address:** _____
Preferred Course & Date: _____

COMPANY DETAILS

Organization Name: _____ **Industry:** _____
Address: _____
Postcode: _____ **Country:** _____ **Contact Number:** _____

PAYMENT METHODS & POLICY

By cheque / bank draft: Make payable to Asia Edge Pte Ltd.
By telegraphic transfer: Please quote the invoice number on the remittance advice.

(Payment by SGD):
Account name: Asia Edge Pte Ltd **Bank:** OCBC Bank Singapore
Bank code: 7339 **Branch code:** 508 **Account number:** 508-762903-001

(Payment by USD):
Account name: Asia Edge Pte Ltd **Bank:** OCBC Bank Singapore
Bank code: 7339 **Branch code:** 665 **Account number:** 665-000774-301

Swift code: OCBCSGSG
Bank address: 65 Chulia Street OCBC Centre, Singapore 049513

All bank charges to be borne by payer. Please ensure that Asia Edge Pte Ltd receives the full invoiced amount.

Payment is due in full at the time of registration. Full payment is mandatory for event attendee. By signing on this registration form, I acknowledge and agree to the payment term mentioned.

* GST - exclusive price is only applicable for overseas corporate customers, subject to qualifying conditions.

CANCELLATIONS & SUBSTITUTIONS

You may substitute delegates at any time before the event starts. Asia Edge Pte Ltd does not provide refunds for last minute cancellations. For cancellations received in writing more than 7 days or less prior to an event (including day 7), no credits will be issued.

In the event Asia Edge Pte Ltd cancels an event, delegate payments at the date of cancellation will be credited to a future Asia Edge Pte Ltd event. This credit will be available for up to 1 year from the date of issuance.

In the event that Asia Edge Pte Ltd postpones an event, delegate payments at the postponement date will be credited towards the rescheduled date. If the delegate is unable to attend the rescheduled event, the delegate will receive a 100% credit.

For more info, visit/contact us at

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