INTRODUCTION

This seminar will provide a comprehensive understanding of modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology. This seminar will focus on maximizing the efficiency, reliability, and longevity of these systems and equipment by providing an understanding of the characteristics, selection criteria, common problems and repair techniques, preventive and predictive maintenance.

This seminar is a MUST for anyone who is involved in the selection, applications, or maintenance of modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology because it covers how these systems and equipment operate, the latest maintenance techniques, and provides guidelines and rules that ensure their successful operation. In addition, this seminar will cover in detail the basic design, operating characteristics, specification, selection criteria, advanced fault detection techniques, critical components and all preventive and predictive maintenance methods in order to increase the reliability of these systems and equipment and reduce their operation and maintenance cost.

This seminar will provide the following information for modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology:

- Basic Design
- Specification
- Selection Criteria
- Sizing Calculations
- Enclosures and Sealing Arrangements
- Codes and Standards
- Common Operational Problems
- All Diagnostics, Troubleshooting, Testing, and Maintenance

WHO SHOULD ATTEND

- Engineers of all disciplines
- Managers
- Technicians
➤ Maintenance personnel
➤ Other technical individuals (This seminar is suitable for individuals who do not have a background in instrumentation and control systems)

SEMINAR OUTCOME

➤ **Equipment Operation:** Gain a thorough understanding of the operating characteristics of modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology

➤ **Equipment Diagnostics and Inspection:** Learn in detail all the diagnostic techniques and inspections required of critical components of modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology

➤ **Equipment Testing:** Understand thoroughly all the tests required for the various types of modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology

➤ **Equipment Maintenance and Troubleshooting:** Determine all the maintenance and troubleshooting activities required to minimize the downtime and operating cost of modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology

➤ **Equipment Repair and Refurbishment:** Gain a detailed understanding of the various methods used to repair and refurbish modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology

➤ **Efficiency, Reliability, and Longevity:** Learn the various methods used to maximize the efficiency, reliability, and longevity of modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology

➤ **Equipment Sizing:** Gain a detailed understanding of all the calculations and sizing techniques used for modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology
➢ **Design Features:** Understand all the design features that improve the efficiency and reliability of modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology

➢ **Equipment Selection:** Learn how to select modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology by using the performance characteristics and selection criteria that you will learn in this seminar

➢ **Equipment Enclosures and Sealing Methods** Learn about the various types of enclosures and sealing arrangements used for modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology

➢ **Equipment Commissioning:** Understand all the commissioning requirements for modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology

➢ **Equipment Codes and Standards:** Learn all the codes and standards applicable for modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology

➢ **Equipment Causes and Modes of Failure:** Understand the causes and modes of failure of modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology

➢ **System Design:** Learn all the requirements for designing different types of modern control systems, digital control, distributed control systems (DCSs), supervisory control and data acquisition (SCADA) systems, industrial instrumentation, control valves, actuators, and smart technology

**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 material written by the instructor:

1. Practical manual (400 pages)

PROGRAMME OUTLINE

Day 1 – Feedback Control and Proportional-Integral-Derivative Algorithm

- Introduction to Feedback Control Systems
- Process and Instrument Elements of the Feedback Loop
- Control Performance Measures
- Integral Error Measures, Decay ratio, Period of Oscillation, Manipulated-Variable Overshoot
- Selection of Variables for Control
- Feedback Control Algorithm
- Proportional Control
- Integral Control
- Derivative Control
- Proportional-Integral-Derivative Controller

Day 2 – Proportional-Integral-Derivative Controller Tuning for Dynamic Performance

- Determining Tuning Constants that Give Good Control Performance
- Controlled-Variable Performance (Integral Absolute Error)
- Good Control Performance with Model Errors
- Manipulated-Variable Behavior
- Correlations for Tuning Constants
- Fine-Tuning the Controller
- Stability of Control Systems
- Controller-Tuning Based on Stability
- Effect of Process Dynamics on Tuning
- Types of Control Systems
- Continuous and Discrete Data Control Systems
- Cascade Control Systems

Day 3 – Distributed Control Systems (DCS)

- Structure of the Distributed Control System (DCS)
- Discrete Proportionl-Integral-Derivative (PID) Control Algorithm
- Effect of Digital Control on Stability
- Tuning and Performance
- Smart Sensors
- Controller Algorithms
- Monitoring and optimization
Distributed Control System (DCS) Architecture and Advantages

Day 4 – Distributed Control Systems (DCS) Components and Features, Supervisory Control and Data Acquisition (SCADA) System, and Intelligent (Smart) Transmitters

- Distributed Control Systems Components and Features
- Supervisory Control and Data Acquisition (SCADA) System
- Advantages of Distributed Control System (DCS)
- Microprocessors and Microcomputers
- Microprocessor Architecture
- Microcomputer System
- Smart Systems
- Intelligent (Smart) Transmitters
- Microprocessor-Based Transmitters (Smart Transmitters)
- Smart (Intelligent) Pressure Transmitters
- Advantages of Intelligent Instrumentation
- Comparison Between Intelligent and Non-Intelligent Instrumentation
- Stand-Alone Controllers
- Self-Tuning, Sequencing, and Networking
- HART Protocol

Day 5 – Control Valves and Actuators

- General Categories of Control Valves
- Rangeability, End Connections, Shutoff Capability
- Valve Sizing
- Choked Flow
- Gas and Steam Sizing
- Control Valve Sizing and selection
- Control Valve Cavitation
- Control Valve Noise
- Pneumatic of Actuators
- Piston Actuators
- Electric Actuators
- Hydraulic Actuators
- Positioners
- Live Loading
- Diagnostic Testing of Control Loops
- Air-Operated Valves Diagnostics
- Motors-Operated Valves Diagnostics
Faculty

Philip Kiameh

Philip Kiameh, M.A.Sc., B.Eng., D.Eng., P.Eng. (Canada) has been a teacher at University of Toronto, Canada for 20 years. In addition, Prof Kiameh has taught courses and seminars to more than four thousand working engineers and professionals around the world, specifically Europe and North America. Prof Kiameh has been consistently ranked as "Excellent" or "Very Good" by the delegates who attended his seminars and lectures.

Prof Kiameh wrote 6 books for working engineers from which four have been published by McGraw-Hill, New York. Below is a list of the books authored by Prof Kiameh:


4- Power Plant Instrumentation and Controls: Simulation to Minimize Downtime (450 pages), April 2012.

5- Industrial Instrumentation and Modern Control Systems (400 pages), Custom Publishing, University of Toronto, University of Toronto Custom Publishing (1999).

6- Industrial Equipment (600 pages), Custom Publishing, University of Toronto, University of Toronto Custom Publishing (1999).

Prof. Kiameh has received the following awards:

1. The first "Excellence in Teaching" award offered by the Professional Development Center at University of Toronto (May, 1996).

2. 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).

3. Awarded graduation “With Distinction” from Dalhousie University when completed Bachelor of Engineering degree (1983).


Prof. Kiameh performed research on power generation equipment with Atomic Energy of Canada Limited at their Chalk River and Whiteshell Nuclear Research Laboratories. He also has more than 27 years of practical engineering experience with Ontario Power Generation (formerly, Ontario Hydro - the largest electric utility in North America).

While working at Ontario Hydro, Prof. Kiameh acted as a Training Manager, Engineering Supervisor, System Responsible Engineer and Design Engineer. During the period of time that Prof Kiameh 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, Prof Kiameh worked as the manager of a section dedicated to providing training for the staff at the power stations. The training provided by Prof Kiameh covered in detail the various equipment and systems used in power stations.

Professor Philip Kiameh 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.

**Course Fee**

The fee for this course is 1,100 USD + applicable taxes for the 2-day seminar; 1,600 USD + applicable taxes for the 3-day seminar; 2,700.00 USD + applicable taxes for the 5-day seminar.

**On-site Training**

ETC seminars can be delivered on-site at your premises. For more information, please contact Mr. Philip Kiameh at p.kiameh@engineeringtrainingcentre.com or by phone in North America at 416-509-5052.
**Group Discounts, Cancellations and Withdrawals**

Registration will cover all seminar materials and refreshments which will be offered during breaks and lunch. For companies sending more than one delegate the following discounts will apply:

1- 10% discount to the second delegate,
2- 15% discount to the third delegate,
3- 20% discount to the fourth delegate,
4- 25% discount to the fifth and subsequent delegate registrations.

To withdraw from a course you must send your request, in writing, with a copy of the receipt to our office. The following conditions will apply: All cancellations received fifteen or more business days prior to the commencement of the seminar will receive full refund minus a 200 USD administration charge. All cancellations received less than fifteen business days prior to the commencement of the seminar will not be refunded. However, a credit of equal value will be provided for any future ETC seminar within the period of one year following the cancellation.

**Notes**

1- In the event of an emergency a delegate who has registered for a seminar may allow a different person to attend in his/her place at no additional cost.

2- ETC reserves the right to cancel or change the date or location of its events. ETC is not responsible for the purchase of non-refundable travel arrangements or accommodation or any associated cancellation. To avoid any fees or charges, please contact ETC to confirm that the course is running before confirming travel arrangements and accommodations.