COURSE OVERVIEW EE0571
Electrical Power Systems Coordination

Course Title
Electrical Power Systems Coordination

Course Date/Venue
December 22-26, 2024/Al Aziziya Hall, The Proud Hotel Al Khobar, Al Khobar, KSA

Course Reference
EE0571

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

Course Description

This practical, 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 Electrical Power Systems Coordination. It covers the power system components, architecture, and flow of electricity; the principles of power system operation and the concept of coordination in power systems; the protection devices and their roles in power systems; the different types of faults and their impacts on power systems; the system reliability through effective coordination; the principles and applications of overcurrent protection in power systems; and the coordination of protective devices, time-current curves (TCC), short circuit analysis for coordination and relay settings and coordination.

During this interactive course, participants will learn the differential protection in transformers, generators and motors; the role of distance protection in transmission lines and its coordination; the pilot protection schemes, voltage and frequency protection and coordination in distributed generation systems; the types of stability in power systems and the impact of renewable energy sources on coordination; the coordination issues and solutions in smart grid environments; the techniques for achieving protection and coordination over large geographical areas; the coordinating protection in microgrid systems and steps in planning power system protection and coordination; implementing and updating coordination plans and testing and commissioning protective schemes to ensure proper coordination; and the regulatory framework and standards affecting power system coordination.

Course Objectives

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

- Apply and gain an in-depth knowledge on electrical power systems coordination
- Discuss power system components, architecture, and flow of electricity
- Explain the principles of power system operation and the concept of coordination in power systems
- Identify the protection devices and their roles in power systems including the different types of faults and their impacts on power systems
- Enhance system reliability through effective coordination
- Discuss the principles and applications of overcurrent protection in power systems
- Apply coordination of protective devices, time-current curves (TCC), short circuit analysis for coordination and relay settings and coordination
- Interpret the differential protection in transformers, generators and motors and the role of distance protection in transmission lines and its coordination
- Apply pilot protection schemes, voltage and frequency protection and coordination in distributed generation systems
- Recognize the types of stability in power systems and the impact of renewable energy sources on coordination
- Explore coordination issues and solutions in smart grid environments and implement techniques for achieving protection and coordination over large geographical areas
- Carryout coordinating protection in microgrid systems and steps in planning power system protection and coordination
- Implement and update coordination plans as well as test and commission protective schemes to ensure proper coordination
- Review regulatory framework and standards affecting power system coordination

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**.*

Accommodation

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

Who Should Attend

This course provides an overview of all significant aspect and considerations of electrical power systems coordination for power dispatchers, technicians, electric

systems operators and switchmen who are involved in the operation, control and dispatching of electrical power system.

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:

- 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.

- 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 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. Mike Tay, PhD, MSc, BSc, is a **Senior Electrical**, **Instrumentation & Communications Engineer & IT Specialist** with over **35 years** of extensive experience. His expertise widely covers in **Protective Devices** Troubleshooting, **Protective Devices** Testing & Maintenance, **Uninterruptible Power Supply** (**UPS**) Design, Industrial **UPS Systems & Battery Power Supplies** Maintenance & Troubleshooting, **UPS & Battery** System, **Battery & Battery Charger & UPS** and Measurement Devices, UPS **System & Battery Chargers** Maintenance & Troubleshooting, **UPS & Battery** Design, Operation, Maintenance & Troubleshooting, UPS **Operation & Alarm Panel** Reading, **Circuit Breaker**, **HV Switchgear Operation & Maintenance**, **HV/LV Equipment**, **High Voltage Electrical Safety**, **LV & HV Electrical System**, **HV Equipments Inspection & Maintenance**, **LV Distribution Switchgear & Equipment**, **Protection Relay Maintenance**, **Application** & **Testing**, **System Analysis**, **Power System Faults**, **Protection Scheme Components**, **Current** & **Voltage Transformers**, **Power System Neutral Grounding**, **Feeder Overcurrent Protection**, **Electrical Protection Systems**, **Bus Protection**, **Motor Protection**, **Starting** & **Control**, **Transformer Protection**, **Generator Protection**, **Capacitor Protection**, **Numerical Relays**, **Power System**, **Power Supply Design Management**, **Basic Electronics & Transformers**, **Diesel Generator**, **Electric Motors**, **Electrical Fundamentals**, **Basic Electricity** & **Electrical Codes SCADA Security**, **Process Control Instrumentation**, **Process Instrumentation & Control**, **Process Control**, **Instrumentation**, Troubleshooting & Problem Solving, Instrumentation Engineering, Process Control (**PCI**) & Safeguarding, **Instrument Calibration & Maintenance**, **Instrumented Safety Systems**, High Integrity Protection Systems (**HIPS**), Process Controller, **Control Loop & Valve Tuning**, **Compressor Control & Protection**, **Control Systems**, Programmable Logic Controllers (**PLC**), **SCADA System**, **PLC & SCADA** – Automation & Process Control, **PLC & SCADA** Systems Application, Technical **DCS/SCADA**, **PLC-SIMATIC S7 300/400**: Configuration, Programming and Troubleshooting, **PLC, Telemetry and SCADA** Technologies, Cyber Security of Industrial Control System (**PLC, DCS, SCADA & IED**), Basics of **Instrumentation Control System, DCS**, **Distributed Control System** – Operations & Techniques, Distributed Control System (**DCS**) Principles, **IT Service Management Strategy**, **Information Technology** Architectures, **E-Communication & Collaboration** Skills, **Virtual Communication**, **Social Networking**, **Business Intelligence** Tools, **IT Disaster Recovery & Planning**, **IT Risk Management** Concepts, **IT Risk Management** Standard Approaches, I**T Risk Management** Planning, **IT Risk** Identification and **IT Risk Monitoring** & **Control**.

During his career life, Dr. Tay worked with various companies such as the **KOC Sistem**, **Meteksan Sistem**, **Altek BT**, **Yasar University**, **Dokuz Eylul University**, **METU** and occupied significant positions like the **Aegean Region Manager**, **Group Leader**, **Technical Services Manager**, **Field Engineer**, **Senior Electrical Engineer**, **Instrumentation Engineer**, **Research Assistant**, **Instructor**, **Technical Advisor** and the **Dr. Instructor**.

Dr. Tay has **PhD**, **Master** and **Bachelor** degrees in **Electrical & Electronic Engineering** from the **Dokuz Eylul University** and the **Middle East Technical University** (**METU**) respectively. Further, he is a **Certified Instructor/Trainer**, **Technical Trainer (Australia)**, **Trainer** for **Data-Communication System (England & Canada)**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**), a **Certified CISCO** (**CCSP**, **CCDA**, **CCNP**, **CCNA**, **CCNP**) **Specialist**, a **Certified CISCO IP Telephony Design Specialist**, **CISCO Rich Media Communications Specialist**, **CISCO Security Solutions** & **Design Specialist** and **Information Systems Security** (**INFOSEC**) **Professional**. He has delivered and presented innumerable training courses and workshops worldwide.

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 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 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: ***Sunday, 22nd of December 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0900	***Overview of Electrical Power Systems:*** *Introduction to Power System Components, Architecture, and Flow of Electricity*
0900 - 0930	***Principles of Power System Operation:*** *How Power Systems are Operated and Controlled*
0930 – 0945	*Break*
0945 – 1030	***System Coordination:*** *The Concept of Coordination in Power Systems for Reliability and Efficiency*
1030 – 1130	***System Protection Basics:*** *Protection Devices and their Roles in Power Systems (Fuses, Circuit Breakers, Relays)*
1130 – 1245	*Break*
1245 – 1320	***Fault Types & Analysis:*** *Different Types of Faults and their Impacts on Power Systems*
1320 - 1420	***Coordination for System Reliability:*** *Strategies to Enhance Reliability through Effective Coordination*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2: ***Monday, 23rd of December 2024***

0730 – 0830	***Overcurrent Protection:*** *Principles and Applications of Overcurrent Protection in Power Systems*
0830 - 0930	***Coordination of Protective Devices:*** *Techniques for Coordinating Fuses, Circuit Breakers, and Protective Relays*

0930 – 0945	Break
0945 – 1100	***Time-Current Curves (TCC):*** *Understanding and Utilizing TCCs for Device Coordination*
1100 – 1230	***Short Circuit Analysis for Coordination:*** *Methods for Performing Short Circuit Analysis to Aid in Protective Device Selection and Coordination*
1230 – 1245	Break
1245 – 1320	***Relay Settings & Coordination:*** *Setting Relays for Optimal Coordination and System Protection*
1320 - 1420	***Workshop: Device Coordination Exercise:*** *Hands-on Exercise Using Simulation Software for Device Coordination*
1420 – 1430	***Recap***
1430	Lunch & End of Day Two

Day 3: Tuesday, 24th of December 2024

0730 – 0830	***Differential Protection:*** *Principles and Applications of Differential Protection in Transformers, Generators, and Motors*
0830 - 0930	***Distance Protection:*** *The Role of Distance Protection in Transmission Lines and its Coordination*
0930 – 0945	Break
0945 – 1100	***Pilot Protection Schemes:*** *Pilot Protection and its Application in Power System Coordination*
1100 – 1230	***Voltage & Frequency Protection:*** *Techniques for Protecting Against Voltage and Frequency Anomalies*
1230 – 1245	Break
1245 – 1320	***Coordination in Distributed Generation Systems:*** *Challenges and Strategies for Coordinating Protection in Systems with Distributed Generation*
1320 - 1420	***Case Study: Real-World Coordination Problem:*** *Analysis of a Coordination Problem and Discussion of Potential Solutions*
1420 – 1430	***Recap***
1430	Lunch & End of Day Three

Day 4: Wednesday, 25th of December 2024

0730 – 0830	***Power System Stability Basics:*** *The Types of Stability in Power Systems and their Importance*
0830 - 0930	***Impact of Renewable Energy Sources on Coordination:*** *Challenges and Strategies for Integrating Renewables into the Grid*
0930 – 0945	Break
0945 – 1100	***Advanced Coordination for Smart Grids:*** *Exploring Coordination Issues and Solutions in Smart Grid Environments*
1100 – 1230	***Wide Area Protection & Control:*** *Techniques for Achieving Protection and Coordination Over Large Geographical Areas*
1230 – 1245	Break
1245 - 1320	***Coordination in Microgrids:*** *Specific Considerations for Coordinating Protection in Microgrid Systems*
1320 – 1420	***Simulation Tools for Coordination Studies:*** *Overview of Software Tools Used for Power System Coordination and Analysis*
1420 – 1430	***Recap***
1430	Lunch & End of Day Four

Day 5: **Thursday, 26th of December 2024**

0730 – 0830	***Planning for System Coordination:*** *Steps in Planning Power System Protection and Coordination*
0830 – 0930	***Implementing Coordination Changes:*** *Best Practices for Implementing and Updating Coordination Plans*
0930 – 0945	*Break*
0945 – 1130	***Testing & Commissioning of Protective Schemes:*** *Procedures for Testing and Commissioning to Ensure Proper Coordination*
1130 - 1200	***Regulatory & Standards Overview:*** *Understanding the Regulatory Framework and Standards Affecting Power System Coordination*
1200 - 1215	*Break*
1215 – 1330	***Future Trends in Power System Coordination:*** *Discussion on the Future of Power Systems and the Evolving Role of Coordination*
1330 - 1345	***Course Conclusion***
1400 – 1415	***POST TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (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 “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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