COURSE OVERVIEW EE0142
Busway System Design and Implementation

Course Title
Busway System Design and Implementation

Course Date/Venue
Session 1: July 06-10, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: December 08-12, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
EE0142

Course Duration
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 Busway System Design and Implementation. It covers the fundamentals of busway systems including its types and applications in industrial and commercial settings; the industry standards and compliance and the components of a busway system; the load and power requirements analysis and busway system layout and planning; the safety considerations in busway systems including electrical design considerations and mechanical design aspects; and the busway sizing and selection as well as installation procedures and best practices.

During this interactive course, participants will learn the busway earthing and bonding, overcurrent protection devices and coordination with circuit breakers and fuses; the busway design for oil & gas facilities and integrating busway with power distribution systems; the power quality and busway performance optimization; the remote monitoring and smart busway systems; the energy efficiency and sustainability; the pre-commissioning inspection and testing, functional testing, performance verification and busway fault diagnosis and troubleshooting; the busway maintenance strategies, retrofitting and upgrading; and the risk management and safety in busway maintenance.

Course Objectives

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

- Apply and gain a good working knowledge on busway system design and implementation
- Discuss the fundamentals of busway systems including its types and applications in industrial and commercial settings
- Review industry standards and compliance and identify the components of a busway system
- Carryout load and power requirements analysis and busway system layout and planning
- Recognize safety considerations in busway systems including electrical design considerations and mechanical design aspects
- Apply busway sizing and selection as well as installation procedures and best practices
- Discuss busway earthing and bonding, overcurrent protection devices for busways and coordination with circuit breakers and fuses
- Illustrate busway design for oil & gas facilities, integrate busway with power distribution systems and implement power quality and busway performance optimization
- Apply remote monitoring and smart busway systems as well as energy efficiency and sustainability in busway design
- Employ pre-commissioning inspection and testing, functional testing, performance verification and busway fault diagnosis and troubleshooting
- Implement busway maintenance strategies, retrofitting and upgrading busway systems and risk management and safety in busway maintenance

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 busway system design and implementation for project managers, facilities managers, electrical engineers, electrical technicians, urban planners system designers/consultants, contractors and builders, safety inspectors and regulatory bodies or authorities.

Accommodation

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

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 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 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. Pan Marave, PE, MSc, BEng, is a **Senior Electrical & Instrumentation Engineer** with over **40 years** of extensive experience in **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries. His expertise includes , **Electrical Generator & Power Transformers**, **Circuit Breakers**, **Switchgears**, **Transformers**, **Circuit Breaker**, **HV Switchgear Maintenance**, **Motor Controllers**, **Motor Control Circuit**, **HV/LV Electrical** Authorisation, Basic **Electricity**, **Electrical & Special Hazards**, **Personnel Protection**, **HV/LV Equipment**, **Electrical Switching** Practices, **Emergency Planning**, **Safety Management**, Safety Instrumented Systems (**SIS**), Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**), **DCS**, **SCADA** & **PLC**, **Measurement** (**Flow**, **Temperature**, **Pressure**), **Process Analyzers** & **Analytical Instrumentation**, **Process Control**, **Instrumentation** & **Safeguarding, Process Controller**, **Control Loop & Valve Tuning**, Industrial **Distribution Systems**, Industrial **Control & Control Systems**, **Power Generation & Transmission**Power Systems **Protection & Relaying**, **Earthing**, **Power System Protective Relay**, **Bonding**, **Grounding**, **Lightning & Surge Protection**, Electric Power **Substation** & **Systems**, Electrical Engineering Principles, **Electrical Fault Analysis**, Electrical Networks & Distribution **Cables, Hazardous Areas Classification** and **Detailed Engineering Drawings**, **Codes** & **Standards**. Furthermore, he is also well-versed in Microprocessors Structure, Lead Auditor (**ISO 9000:2000**), **ISO 9002**, Quality Assurance, and Projects & Contracts Management.

Presently, Mr. Marave is the **Technical Advisor** of **Chamber of Industry & Commerce** in Greece. Prior to this, he gained his thorough practical experience through several positions as the **Technical Instructor**, **Engineering Manager**, **Electronics & Instruments Head**, **Electrical**, **Electronics & Instruments Maintenance Superintendent**, **Assistant General Technical Manager** and **Engineering Supervisor** of various international companies such as the **Alumil** Mylonas, **Athens Papermill**, **Astropol** and the **Science Technical Education**.

Mr. Marave is a **Registered Professional Engineer** and has **Master's** and **Bachelor's** degrees in **Electrical Engineering** from the **Polytechnic Institute of New York** and **Pratt Institute of New York** (**USA**) respectively. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and an active member of the **Technical Chamber** and the Institute of Electrical and Electronics Engineer (**IEEE**) in Greece. He has presented and delivered **numerous international** courses, conferences, trainings 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 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

0730 - 0800	*Registration & Coffee*
0800 - 0815	*Welcome & Introduction*
0815 - 0830	*PRE- TEST*
0830 - 0930	***Fundamentals of Busway Systems*** *Definition and Purpose of Busway Systems ● Types of Busways (Feeder, Plug-in, and Flexible Busways) ● Comparison of Busways vs. Traditional Cable Systems ● Applications in Industrial and Commercial Settings*
0930 - 0945	*Break*
0945 - 1045	***Industry Standards & Compliance*** *IEC, IEEE, and ANSI Standards for Busways ● NFPA 70 (National Electrical Code) and IEC 61439 ● Safety and Regulatory Considerations in Facilities ● Role of Busways in Electrical Distribution Compliance*
1045 - 1130	***Components of a Busway System*** *Bus Bars and Conductor Materials (Copper vs. Aluminum) ● Housing and Enclosure Materials ● Joint and Connection Mechanisms ● Tap-Off Units and Their Applications*
1130 – 1230	***Load & Power Requirements Analysis*** *Calculating Load Demand for Different Applications ● Voltage and Current Ratings Selection ● Short Circuit Ratings and Withstand Capacity ● Coordination with Power Distribution Systems*
1230 – 1245	*Break*
1245 - 1330	***Busway System Layout & Planning*** *Planning Busway Routes and Configurations ● Factors Influencing Layout Decisions ● Consideration of Future Expansions ● Coordination with Architectural and Structural Constraints*
1330 – 1420	***Safety Considerations in Busway Systems*** *Overcurrent Protection and Grounding Requirements ● Fault Protection and Arc Flash Hazards ● Busway Safety in Explosive Environments (Hazardous Areas) ● Personal Protective Equipment (PPE) and Risk Mitigation*
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	***Electrical Design Considerations*** *Voltage Drop Calculations ● Power Factor and Efficiency Considerations ● Harmonics and THD (Total Harmonic Distortion) Effects ● Load Balancing Techniques*
0830 – 0930	***Mechanical Design Aspects*** *Structural Considerations for Busway Installation ● Thermal Expansion and Contraction in Busways ● Seismic Design and Vibration Management ● Busway Housing and Protection Against Environmental Factors*

0930 - 0945	*Break*
0945 - 1100	***Busway Sizing & Selection*** *Selecting Busway Size Based on Load Requirements ● Impact of Ambient Temperature on Sizing ● Current Carrying Capacity and Derating Factors ● Selection of Tap-Off Boxes for Different Applications*
1100 - 1230	***Installation Procedures & Best Practices*** *Site Preparation and Pre-Installation Checks ● Alignment and Mounting of Busway Components ● Connection of Busway Joints and Expansion Sections ● Testing and Quality Assurance During Installation*
1230 – 1245	*Break*
1245 - 1330	***Busway Earthing & Bonding*** *Grounding Requirements for Busways ● Earthing System Types (TN, TT, IT) and Their Applications ● Bonding Connections to Reduce Electrical Noise ● Inspection and Testing of Earthing Systems*
1330 – 1420	***Protection & Coordination with Switchgear*** *Overcurrent Protection Devices for Busways ● Coordination with Circuit Breakers and Fuses ● Short-Circuit Current Ratings and Protection Settings ● Selectivity and Cascading in Electrical Protection*
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	***Busway Design for Oil & Gas Facilities*** *Challenges in Petroleum Industry Applications ● Explosion-Proof and Hazardous Area Considerations ● Protection Against Corrosive and High-Temperature Environments ● Maintenance-Free and Modular Busway Solutions*
0830 - 0930	***Integration with Power Distribution Systems*** *Interfacing with Switchgear, Transformers, and MCCs ● Busway System Redundancy and Reliability ● Fault Isolation Strategies for Critical Loads ● Emergency Power and Backup Considerations*
0930 - 0945	*Break*
0945 - 1100	***Power Quality & Busway Performance Optimization*** *Addressing Voltage Fluctuations and Flicker ● Harmonic Mitigation and Filter Integration ● Preventing Electromagnetic Interference (EMI) ● Improving Power Factor with Capacitor Banks*
1100 - 1230	***Remote Monitoring & Smart Busway Systems*** *Use of SCADA and IoT for Busway Monitoring ● Sensors for Temperature and Load Analysis ● Real-Time Fault Detection and Predictive Maintenance ● Integration with Digital Twin Technology*
1230 – 1245	*Break*
1245 – 1330	***Energy Efficiency & Sustainability in Busway Design*** *Energy Loss Reduction Techniques ● Optimizing Busway Routing for Efficiency ● Green Energy Integration (Solar/Wind Power) ● Busway Recycling and Sustainable Manufacturing*

1330 - 1420	***Case Studies & Best Practices*** *Successful Busway Installations in Facilities ● Lessons Learned from Electrical System Failures ● Design Improvements for Future Projects ● Hands-On Group Discussion and Troubleshooting Scenarios*
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	***Pre-Commissioning Inspection & Testing*** *Visual and Mechanical Inspections ● Torque Testing of Busway Joints ● Megger Testing for Insulation Resistance ● Thermal Imaging for Hotspot Detection*
0830 – 0930	***Functional Testing & Performance Verification*** *Load Testing and Voltage Drop Measurements ● Continuity Testing for Conductors ● Current Carrying Capacity Validation ● Vibration and Mechanical Stress Testing*
0930 - 0945	*Break*
0945 - 1100	***Busway Fault Diagnosis & Troubleshooting*** *Identifying and Resolving Common Issues ● Hotspots, Loose Connections, and Joint Failures ● Methods for Locating Busway Faults ● Corrective Actions for System Restoration*
1100 - 1230	***Busway Maintenance Strategies*** *Predictive vs. Preventive Maintenance Approaches ● Periodic Inspection Schedules and Checklists ● Cleaning and Re-Torquing Procedures ● Remote Monitoring for Predictive Failure Prevention*
1230 – 1245	*Break*
1245 - 1330	***Retrofitting & Upgrading Busway Systems*** *Considerations for Expanding an Existing System ● Upgrading to Higher Capacity or Smart Busways ● Replacement of Aging Busway Components ● Challenges and Solutions for Brownfield Projects*
1330 – 1420	***Risk Management & Safety in Busway Maintenance*** *Electrical Hazard Identification and Risk Assessment ● Lockout/Tagout (LOTO) Procedures for Busway Systems ● Fire Safety and Arc Flash Protection ● Emergency Response Planning and First Aid*
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*

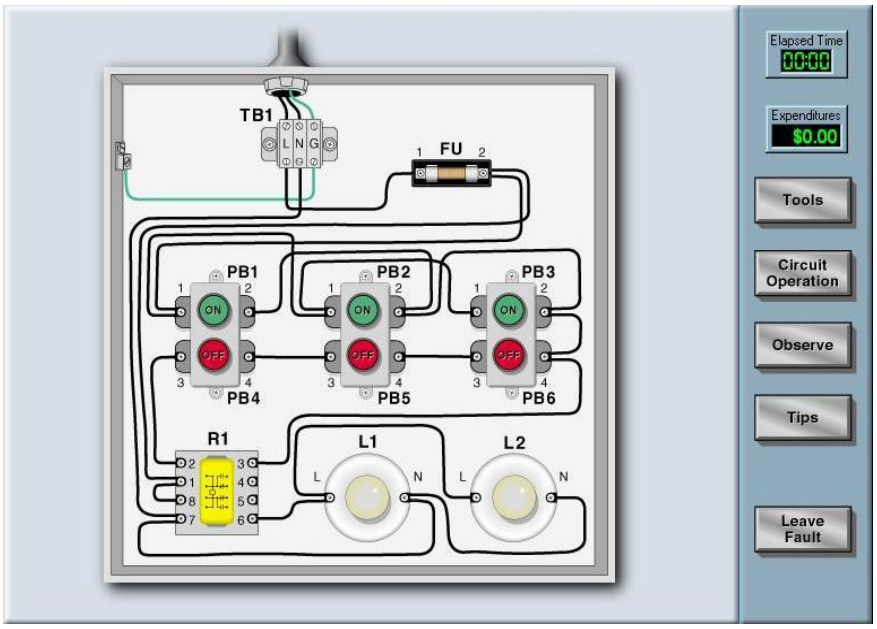
Day 5

0730 - 0900	***Real-World Busway System Design Workshop*** *Designing a Busway System for a Petroleum Facility ● Choosing Components Based on Application Requirements ● Creating a Load Distribution Plan ● Validating Design with Load Flow Analysis*
1030 - 1045	*Break*
1045 - 1100	***Hands-On Busway Installation & Testing*** *Simulated Installation of Busway Sections ● Connection of Tap-Off Units and Accessories ● Performing Electrical and Mechanical Inspections ● Functional Testing and Live Load Connection*

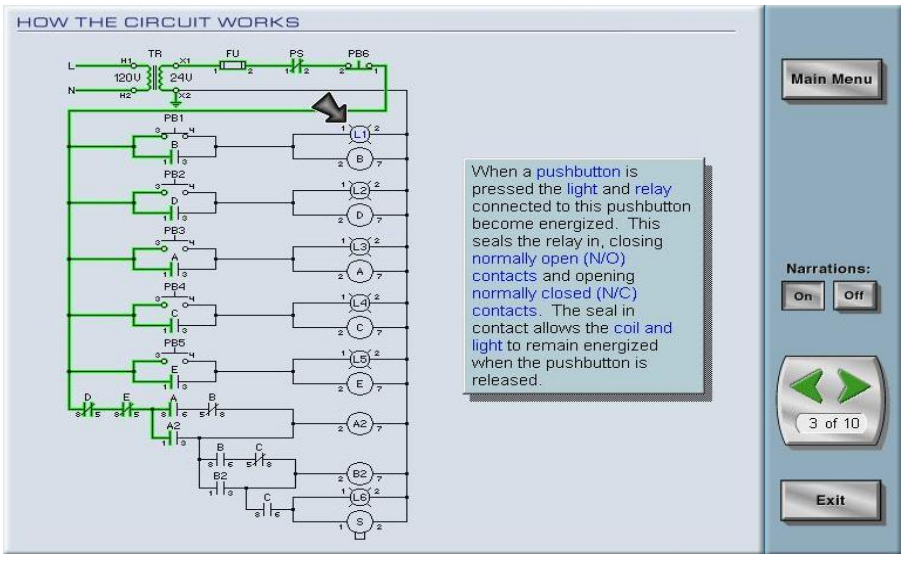
1100 - 1230	***Protection Coordination Exercise*** *Setting Up Protective Devices for a Busway System ● Coordination Between Fuses, Breakers, and Relays ● Performing Selectivity Analysis Using Simulation Tools ● Verifying Short-Circuit Protection Strategies*
1230 - 1245	*Break*
1245 - 1345	***Failure Analysis & Troubleshooting Simulation*** *Identifying Symptoms of a Faulty Busway System ● Investigating Insulation Failures and Joint Overheating ● Implementing Corrective Measures and Repairs ● Revalidating the System After Repairs*
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*

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 “Haward Troubleshooting”, “Power World”, “GE Multilin Relay 469” and “GE Multilin Relay 750.

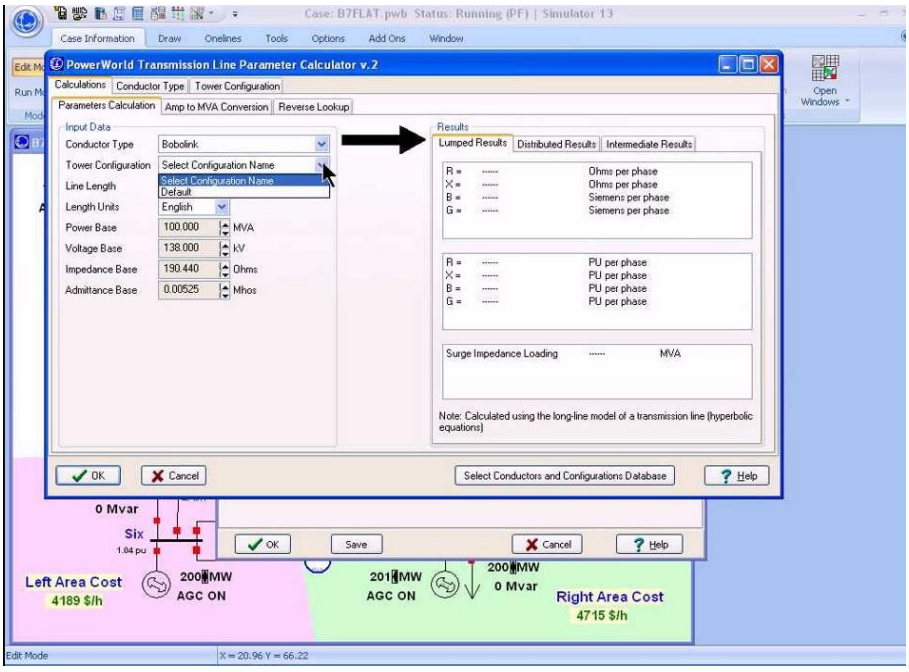


Basic Techniques



Basic Control Circuits

Motor Control Techniques



Power World Simulator

GE Multilin Relay 469 Simulator

GE Multilin Relay 750 Simulator

Course Coordinator
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