COURSE OVERVIEW EE1099
Artificial Intelligence for Power Sector

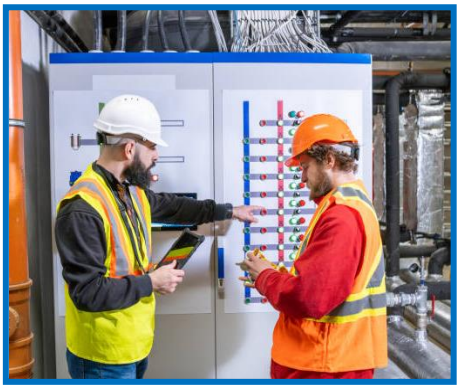
Course Title
Artificial Intelligence for Power Sector

Course Date/Venue
Session 1: May 26-30, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: September 29-October 03, 2025/ Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
EE1099

Course Duration/Credits
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 Artificial Intelligence for Power Sector. It covers the AI in the power industry, data fundamentals for AI applications and machine learning basics for engineers; the AI ecosystem and tools for power applications and digital transformation in utilities; the AI in conventional power plant operations, AI for renewable energy forecasting and predictive maintenance in generation assets; the load prediction and unit commitment and automated dispatch optimization; and the economic load dispatch using AI and integration with DERs (distributed energy resources).

Further, the course will also discuss the AI for decarbonization strategies, AI applications in grid operations, AI in asset health and grid reliability and fault detection and restoration; the AI for distribution network optimization, AI in outage management and customer service and AI in smart grid technologies; the load profiling and consumer behavior and non-technical loss detection; and the energy theft detection and real-time alerts and pattern detection.

During this interactive course, participants will learn the load forecasting at different levels, dynamic pricing and demand elasticity, AI in demand response program planning and home energy management via AI; the performance of AI and energy storage optimization and recommendation systems for energy usage; the personalized energy-saving tips, AI-driven billing and forecasting and customer segmentation; the AI projects in utilities, bias and fairness in AI models, and explainable AI (XAI) in operations; the data privacy and compliance and AI and workforce transformation; the cyber threats to AI-powered grid systems, AI in threat detection, securing data pipelines and regulatory compliance; the smart pumping optimization, AI-based desalination energy forecasting, joint water-electricity demand forecasting and AI for leakage and pressure control; the generative AI in utilities and AI + blockchain for grid traceability; the quantum computing in energy optimization; and the autonomous grid agents and AI-powered microgrids.

Course Objectives

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

- Apply and gain an in-depth knowledge on artificial intelligence for power sector
- Discuss AI in the power industry, data fundamentals for AI applications, machine learning basics for engineers, AI ecosystem and tools for power applications and digital transformation in utilities
- Carryout AI in conventional power plant operations, AI for renewable energy forecasting and predictive maintenance in generation assets
- Apply load prediction and unit commitment, automated dispatch optimization, economic load dispatch using AI and integration with DERs (distributed energy resources)
- Employ AI for decarbonization strategies, AI applications in grid operations, AI in asset health and grid reliability and fault detection and restoration
- Apply AI for distribution network optimization, AI in outage management and customer service and AI in smart grid technologies
- Carryout load profiling and consumer behavior, non-technical loss detection, energy theft detection and real-time alerts and pattern detection
- Apply load forecasting at different levels, dynamic pricing and demand elasticity, AI in demand response program planning and home energy management via AI
- Perform AI and energy storage optimization, recommendation systems for energy usage, personalized energy-saving tips, AI-driven billing and forecasting and customer segmentation
- Implement AI projects in utilities and discuss bias and fairness in AI models, explainable AI (XAI) in operations, data privacy and compliance and AI and workforce transformation
- Recognize cyber threats to AI-powered grid systems, AI in threat detection, securing data pipelines and regulatory compliance
- Apply smart pumping optimization, AI-based desalination energy forecasting, joint water-electricity demand forecasting and AI for leakage and pressure control
- Describe generative AI in utilities, AI + blockchain for grid traceability, quantum computing in energy optimization and autonomous grid agents and AI-powered microgrids

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 artificial intelligence for power sector for electrical engineers, power sector professionals, data scientists, AI professionals, policy makers, energy regulators, utility company executives and other technical staff.

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.

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 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** with over **30 years** of extensive experience. His expertise widely covers **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, **Process Control & Instrumentation**, **Process Control** Troubleshooting & Problem Solving, **Process Control System**, Advanced Process Control (**APC**) Technology, **Process Control & Loop Tuning**, **Process Control & Automation**, **Data Accuracy & System Function**, **Control System Interface**, **Artificial Intelligence** Application, **Data Analytics and its Importance**, **AI is Used in Exploration and Production**, **AI for Reservoir Management**, Distributed Control Systems (**DCS**), Programmable Logic Controller (**PLC**), Interruptible Power Systems (**UPS**), Supervisory Control and Data Acquisition (**SCADA**), **Network** Comprehensive, Systems Analysis, **SCADA Security**, ESD System Function, Analysis & Control, Modern **Power Systems Protective Relaying**, **Custody Measurement & Loss Control**, **Fiber Optics** Access Network Planning, **Process Analyzer** & Analytical Instrumentation, **HV/MV Substation** Design & Maintenance, **Combined Cycle Power Generation**, **PLC & SCADA Automation**, Advanced **Online Analyzer**, **Protection Relay** Maintenance, Power System Faults, Current & Voltage **Transformers**, Power System Neutral Grounding, Feeder Overcurrent Protection, **Electrical Protection Systems**, Bus Protection, Motor Protection, **Transformer Protection**, **Generator Protection**, Numerical Relays, **ESD System Analysis** & **Control**, **Custody Measurement**, Safety Instrumented System (**SIS**), Safety Integrity Level (**SIL**), **Power System**, **Power Supply** Design Management, **Diesel Generator**, **Electric Motors** and Basic **Electricity** & **Electrical Codes**. Further, he is also well-versed in **Communications**, **Telecommunications**, Mobile Protocols, 4G LTE, GSM/UMTS, CMDA2000, **WIMAX** Technology, HSPA+, **Alarm** Management System, **Computer Architecture**, Logic & Microprocessor Design, Embedded Systems Design plus **Computer Networking** with **CISCO**, **Network Communication**, **Industrial Digital Communication**, Designing **Telecommunications Distribution System**, Electrical Engineering, **WiMAX Broadband Wireless System**, TT Intranet & ADSL Network, TT Web & Voicemail, Off-site ATM Network, IT Maintenance, Say2000i, IP Phone, National Address & ID Automation, Electricity Distribution Network, Customs Network & Maintenance, **LAN** & **WAN Network**, UYAP Network, **Network Routing Protocols**, Multicast Protocols, Network Management Protocols, Mobile & Wireless Networks and Digital Signal Processing.

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

Dr. Tay has **PhD**, **Master** and **Bachelor** degrees in **Electrical & Electronics Engineering** from the **Dokuz Eylul University** and the **Middle East Technical University** (**METU**) respectively. Further, he is a **Certified Instructor/Trainer**, 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 further hold certification in Fundamentals of Process Control and Understanding Process Control: An Overview and delivered and presented innumerable trainings, courses, workshops, seminars and conferences worldwide.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the workshop 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	***Introduction to AI in the Power Industry*** *Definition & Key Concepts of AI, ML, DL • History & Evolution of AI in Energy • Benefits & Limitations of AI Adoption • Role of AI in Future Energy Systems*
0930 – 0945	*Break*
0945 – 1030	***Data Fundamentals for AI Applications*** *Types of Data in Power Systems • Data Acquisition & IoT Integration • Data Preprocessing & Quality Assurance • Real-Time versus Historical Data Handling*
1030 – 1130	***Machine Learning Basics for Engineers*** *Supervised versus Unsupervised Learning • Regression & Classification Models • Model Training & Validation • Feature Selection & Engineering*
1130 – 1215	***AI Ecosystem & Tools for Power Applications*** *Overview of Popular Platforms (TensorFlow, PyTorch, MATLAB) • Cloud-Based AI Tools (AWS, Azure, Google AI) • SCADA & AI Integration Potential • Open-Source Datasets & AI Apis*
1215 – 1230	*Break*
1230 – 1330	***Digital Transformation in Utilities*** *Smart Grid versus Traditional Grid • AI as a Pillar in Digital Transformation • Cybersecurity & AI • AI's Role in Smart Meters & Demand Forecasting*
1330 – 1420	***Case Studies in Power Sector AI*** *Global AI Use Cases in Transmission Networks • Renewable Generation & AI Optimization • Predictive Maintenance Via AI • Load Balancing Using Neural Networks*
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	***AI in Conventional Power Plant Operations*** *Boiler Optimization & Emissions Reduction • Turbine Efficiency Modeling • Fuel Consumption Forecasting • AI-Driven Control System Tuning*
0830 – 0930	***AI for Renewable Energy Forecasting*** *Wind & Solar Power Forecasting Models • Hybrid Model Approaches (Physical + AI) • Weather Integration in Prediction Models • Real-Time Dispatching Based on Forecasts*
0930 – 0945	*Break*
0945 – 1100	***Predictive Maintenance in Generation Assets*** *Condition Monitoring with AI Sensors • Remaining Useful Life (RUL) Prediction • Anomaly Detection Algorithms • Failure Mode & Risk Prioritization*

1100 – 1215	***Energy Management System (EMS) with AI*** *Load Prediction & Unit Commitment • Automated Dispatch Optimization • Economic Load Dispatch Using AI • Integration with Ders (Distributed Energy Resources)*
1215 – 1230	*Break*
1230 – 1330	***AI for Decarbonization Strategies*** *Emissions Prediction & Control • Carbon Intensity Tracking Via ML • Scenario Analysis for Policy Evaluation • Optimizing Thermal Power Shutdown Schedules*
1330 – 1420	***Hands-On: AI Model for Solar Power Forecasting*** *Dataset Preparation & Visualization • Model Building in Python • Accuracy Evaluation & Improvement • Deployment Options & Dashboards*
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	***AI Applications in Grid Operations*** *Voltage & Frequency Regulation • Real-Time Load Forecasting • Optimal Power Flow Prediction • Reactive Power Management*
0830 – 0930	***AI in Asset Health & Grid Reliability*** *Transformer Health Diagnostics • Circuit Breaker Failure Predictions • Cable Insulation Degradation Monitoring • Dynamic Asset Prioritization*
0930 – 0945	*Break*
0945 – 1100	***Fault Detection & Restoration*** *Fault Type Classification (AI-Based) • Fault Location Estimation • Automatic Isolation & Service Restoration • Real-Time Grid Event Analysis*
1100 – 1215	***AI for Distribution Network Optimization*** *Load Balancing & Phase Optimization • Dynamic Line Rating Via AI • Loss Minimization Strategies • AI-Based Capacitor Bank Control*
1215 – 1230	*Break*
1230 – 1330	***AI in Outage Management & Customer Service*** *AI-Enabled Outage Prediction • Automated Fault Ticketing • Chatbots for Customer Interaction • Intelligent Outage Restoration Path*
1330 – 1420	***Hands-On: Grid Fault Classifier Using ML*** *Labeling & Feature Extraction • Training & Testing Model • Confusion Matrix & Performance Metrics • Use in SCADA/EMS Environment*
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	***AI in Smart Grid Technologies*** *AI & Distributed Energy Management • Resilience & Self-Healing Capabilities • Load Curve Shaping • Grid Edge Intelligence*
0830 – 0930	***Smart Meter Data Analytics*** *Load Profiling & Consumer Behavior • Non-Technical Loss Detection • Energy Theft Detection • Real-Time Alerts & Pattern Detection*

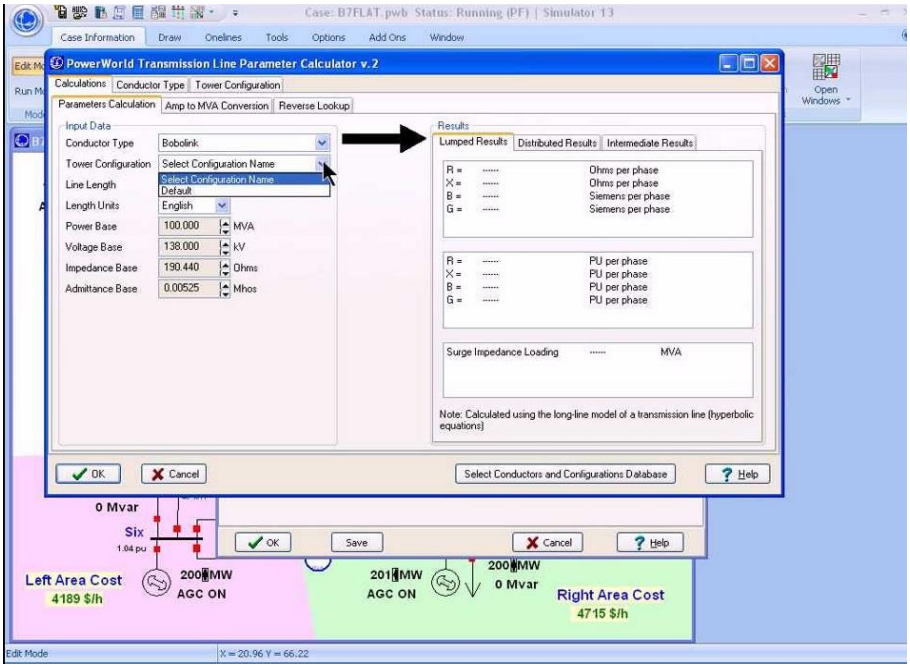
0930 – 0945	*Break*
0945 – 1100	***AI for Demand Forecasting & Response*** *Load Forecasting at Different Levels • Dynamic Pricing & Demand Elasticity • AI in Demand Response Program Planning • Home Energy Management Via AI*
1100 – 1215	***AI & Energy Storage Optimization*** *State of Charge Prediction • Battery Degradation Forecasting • Optimal Charging/Discharging Algorithms • Storage for Grid Balancing*
1215 – 1230	*Break*
1230 – 1330	***AI-Driven Customer Engagement & Services*** *Recommendation Systems for Energy Usage • Personalized Energy-Saving Tips • AI-Driven Billing & Forecasting • Customer Segmentation*
1330 – 1420	***Hands-On: Load Forecasting Using Neural Networks*** *Neural Network Setup & Data Input • Training the ANN Model • Forecast Visualization • Error Evaluation & Corrections*
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

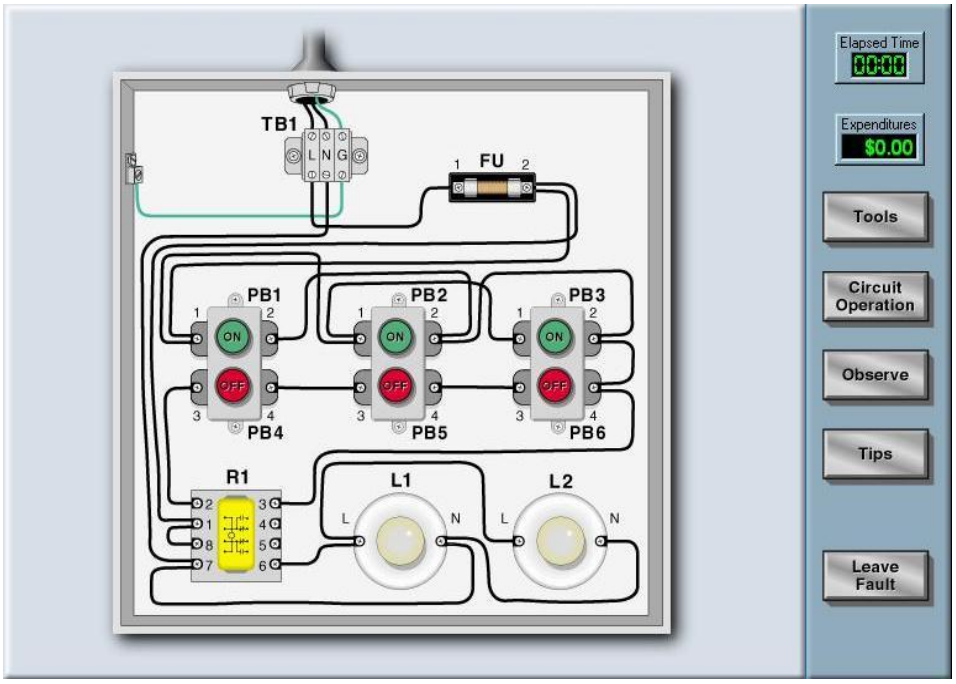
0730 – 0830	***Implementing AI Projects in Utilities*** *Roadmap From PoC to Full-Scale Deployment • Agile Model for AI Projects • AI Team Structures in Power Utilities • Success Factors & Common Pitfalls*
0830 – 0930	***AI Governance & Ethics*** *Bias & Fairness in AI Models • Explainable AI (XAI) in Operations • Data Privacy & Compliance • AI & Workforce Transformation*
0930 – 0945	*Break*
0945 – 1030	***Cybersecurity Considerations for AI Systems*** *Cyber Threats to AI-Powered Grid Systems • AI in Threat Detection • Securing Data Pipelines • Regulatory Compliance*
1030 – 1130	***AI in Water-Energy Nexus Optimization*** *Smart Pumping Optimization • AI-Based Desalination Energy Forecasting • Joint Water-Electricity Demand Forecasting • AI for Leakage & Pressure Control*
1130 – 1230	***Emerging Trends & Future Opportunities*** *Generative AI in Utilities • AI + Blockchain for Grid Traceability • Quantum Computing in Energy Optimization • Autonomous Grid Agents & AI-Powered Microgrids*
1230 – 1245	*Break*
1245 – 1345	***Final Workshop: AI Strategy Design for EWEC*** *Identify EWEC-Specific Challenges • Group Exercise: Build an AI Pilot Roadmap • Discuss Data Requirements & Partner Ecosystems • Presentation of AI Roadmaps & Peer Feedback*
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*

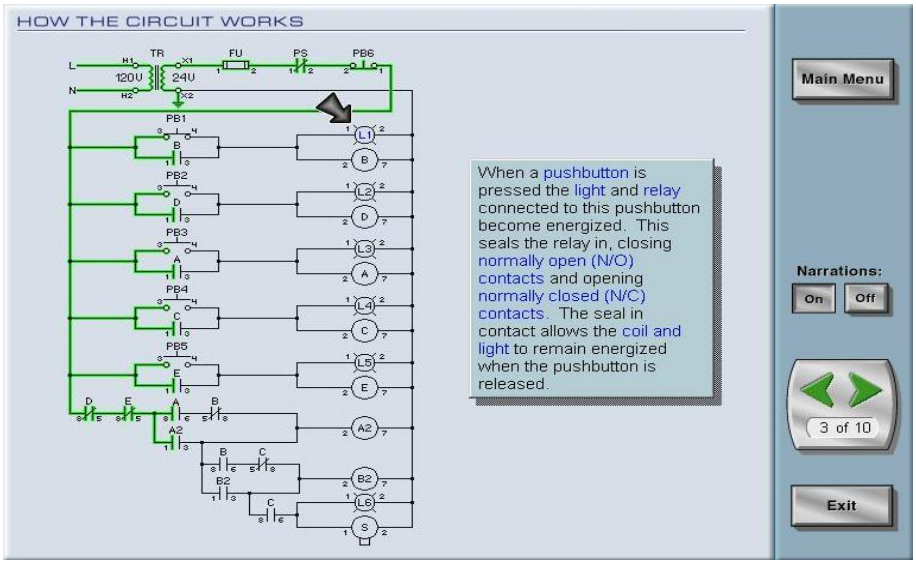
Simulators (Hands-on Practical Sessions)

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 "Power World", "Simutech Troubleshooting Electrical Circuits V4.1" and "ETAP software".

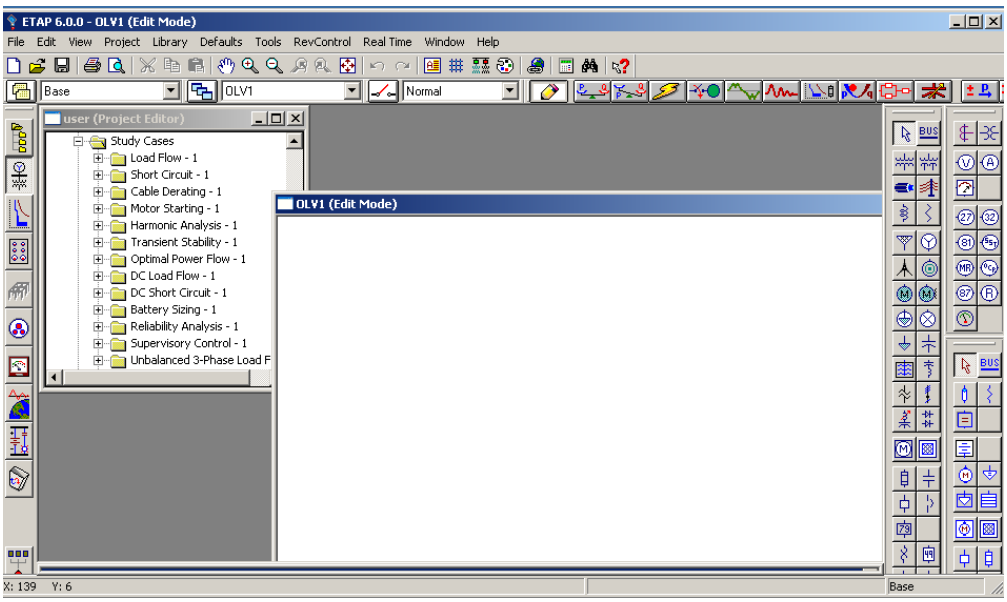


Power World Simulator





Simutech Troubleshooting Electrical Circuits V4.1



ETAP Software Simulator

Course Coordinator

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