COURSE OVERVIEW EE1137

Transformer Factory Test

Course Title
Transformer Factory Test

Course Date/Venue
Please refer to page 5

Course Reference
EE1137

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 Transformer Factory Test. It covers the transformer types and applications, transformer construction and core types, cooling methods and transformer rating nameplate interpretation; the transformer manufacturing process and standards for transformer testing; the high-voltage test laboratories overview, test instruments and calibration, safety precautions in HV testing and grounding and shielding practices; and the factory test plan and documentation, core magnetization and visual inspection.

Further, the course will also discuss the winding resistance measurement, resistance testing, temperature correction, test procedure and connection methods and acceptable limits and troubleshooting; the insulation resistance and polarization index, turns ratio and phase displacement test; the no-load loss and current measurement, short-circuit impedance, load loss and vector group verification; and the voltage (AC withstand) test, induced voltage (double frequency) test and partial discharge measurement.

During this interactive course, participants will learn the lightning impulse test (type test), switching impulse test (special test) and bushing and OLTC insulation testing; the temperature rise test (type test), oil and gas analysis, magnetic balance and zero sequence impedance, noise level and vibration test and OLTC and tap changer functional test; the special tests for customer requirements, dielectric test demonstration, data recording and interpretation; and the failure analysis in factory testing, FAT reporting and client witnessing.

Course Objectives

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

- Apply and gain an in-depth knowledge on transformer factory test
- Discuss transformer types and applications, transformer construction and core types, cooling methods and transformer rating nameplate interpretation
- Carryout transformer manufacturing process and standards for transformer testing
- Apply high-voltage test laboratories overview, test instruments and calibration, safety precautions in HV testing and grounding and shielding practices
- Employ factory test plan and documentation as well as core magnetization and visual inspection
- Illustrate winding resistance measurement covering resistance testing, temperature correction, test procedure and connection methods and acceptable limits and troubleshooting
- Recognize insulation resistance and polarization index and apply turns ratio and phase displacement test
- Carryout no-load loss and current measurement and describe short-circuit impedance and load loss and vector group verification
- Employ applied voltage (AC withstand) test, induced voltage (double frequency) test and partial discharge measurement
- Illustrate lightning impulse test (type test), switching impulse test (special test) and bushing and OLTC insulation testing
- Carryout temperature rise test (type test), oil and gas analysis, magnetic balance and zero sequence impedance, noise level and vibration test and OLTC and tap changer functional test
- Implement special tests for customer requirements, dielectric test demonstration, data recording and interpretation, failure analysis in factory testing and FAT reporting and client witnessing

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 transformer factory test for utility or end-user representatives, EPC contractors / project engineers, transformer design and quality engineers (manufacturer), independent third-party inspectors (optional but common), maintenance or asset management engineers and commissioning engineers (optional)

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

Haward's 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**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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:

Mr. Ahmed Alaa, MSc, BSc, API-SIEE is a **Senior Electrical & Instrumentation Engineer** with extensive years of experience within the **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries. His expertise widely covers in the areas of API Source Inspector Electrical Equipment, Electrical Equipment Inspection, **HV/MV Cable Splicing**, **Cable & Over Head Power Line**, **HV/MV Switchgear, HV Cable** Design, **Cable** Splicing & Termination, **High Voltage Electrical Safety**, **Medium & High Voltage Equipment**, **High Voltage Circuit Breaker** Inspection & Repair, **High Voltage Power** System, **HV Equipment** Inspection & Maintenance, **HV Switchgear** Operation & Maintenance, Resin / **Heat Shrink & Cold Shrink** Joints, **HV/LV Equipment**, **LV & HV Electrical System**, **LV**, **MV & HV Cable** Installations & Properties, ORHVS for Responsible and Authorized Person **High Voltage Regulation**, **Transformers** Maintenance, inspections & repairs, Commissioning of **LV & HV Equipment**, Electrical Transient Analysis Program (ETAP), Programmable Logic Control (**PLC**), PLC for Process Control & Automation, Programmable Logic Controller (**PLC**) Operations, Maintenance and Troubleshooting, Programmable Logic Controllers (**PLC**), **PLC** Basics to Advanced Application, Power Management System (**PMS**), Variable Speed Drive (**VSD**), Advanced **ABB VSD** Controllers, **VSD** commissioning and troubleshooting, Power Management System (PMS), Marine Vessel Power Management Systems, Electrical Equipment & Control System, Ex Equipment, **Power System Operation and Control**, Fault Analysis in **Power Systems**, **LV & MV** Electric Power Systems for Industrial Plants, Electric Power System Operation, **Electric Motors & Variable Speed Drives**, **Electric Motor** Selection, Maintenance & Control, **Motor Operation & Maintenance**, **Electric Motor Protection**, **UPS** and **Battery** System, **UPS & Battery** Design, Operation, Maintenance & Troubleshooting, **UPS, DC System & Battery** Design, Operation, Maintenance & Troubleshooting Testing & Maintenance, Installing and Testing **Electric Wires & Cables**, Cable Jointing Appreciation, **Circuit Breaker & Switchgear**, **Transformer & Circuit Breakers** Testing & Maintenance and **Motor Control Circuit** Troubleshooting.

During Mr. Ahmed's career life, he has gained his practical experience through several significant positions and dedication as the **Senior Electrical Engineer**, **Electromechanical Engineer**, **Electrical Maintenance Engineer**, **Electrical Instructor** and **Instructor/Trainer** from various companies like the Khalda Petroleum Company, Qarun Petroleum Company, Arab Contractor Company and Uniplast Company.

Mr. Ahmed has a **Bachelor's** degree in **Electrical Engineering**. Further, he is a **Certified Instructor/Trainer** and a **Certified API Source Inspector Electrical Equipment** (**SIEE**). He has further delivered numerous trainings, courses, workshops, seminars and conferences internationally.

Accommodation

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

Course Date/Venue

Session(s)	Date	Venue
1	April 19-23, 2026	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
2	June 15-19, 2026	Ruben Boardroom, The Rubens at The Palace, Buckingham Palace Road, London, United Kingdom
3	August 30-September 03, 2026	Meeting Room 4, Four Seasons Hotel Cairo at Nile Plaza, Corniche El Nil, Garden City, Cairo, Egypt
4	September 20-24, 2026	Pierre Lotti Meeting Room, Movenpick Hotel Istanbul Golden Horn, Istanbul, Turkey
5	November 15-19, 2026	Meeting Plus 9, City Centre Rotana, Doha, Qatar
6	December 07-11, 2026	Salon Expo, NH Hotel Plaza de Armas, Seville, Spain
7	January 24-28, 2027	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
8	February 08-12, 2027	Ruben Boardroom, The Rubens at The Palace, Buckingham Palace Road, London, United Kingdom
9	March 21-25, 2027	Meeting Plus 9, City Centre Rotana, Doha, Qatar

Course Fee

Dubai	**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.
London	**US$ 8,800** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Cairo	**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.
Istanbul	**US$ 6,000** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Doha	**US$ 6,000** per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Seville	**US$ 8,800** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

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 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 Power Transformers*** *Transformer Types and Applications • Transformer Construction and Core Types • Cooling Methods (ONAN, ONAF, OFAF, etc.) • Transformer Rating Nameplate Interpretation*
0930 – 0945	*Break*
0945 – 1030	***Transformer Manufacturing Process*** *Core and Winding Assembly • Insulation Systems • Tank Fabrication and Assembly • Drying and Oil-Filling Processes*
1030 – 1130	***Standards for Transformer Testing*** *IEC 60076 Series Overview • IEEE C57 Standard Overview • Definitions: Routine, Type, and Special Tests • Factory Acceptance Testing (FAT) Requirements*
1130 – 1215	***Test Setup, Instrumentation & Environment*** *High-Voltage Test Laboratories Overview • Test Instruments and Calibration • Safety Precautions in HV Testing • Grounding and Shielding Practices*
1215 – 1230	*Break*
1230 – 1330	***Factory Test Plan & Documentation*** *Test Sequences and Scheduling • Pre-Test Checklists and Risk Assessment • Test Certificates and Reports • Witness Testing Procedures*
1330 – 1420	***Core Magnetization & Visual Inspection*** *Visual Inspection Post-Assembly • Core Magnetization and Demagnetization • Measuring Residual Magnetism • Core Lamination and Clamping Checks*
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	***Winding Resistance Measurement*** *Purpose and Principle of Resistance Testing • Temperature Correction • Test Procedure and Connection Methods • Acceptable Limits and Troubleshooting*
0830 – 0930	***Insulation Resistance Polarization Index*** *Principles of Insulation Resistance Testing • Test Voltage Selection • PI and DAR Index Interpretation • Causes of Low Insulation Resistance*
0930 – 0945	*Break*
0945 – 1100	***Turns Ratio & Phase Displacement Test*** *Turns Ratio Principles (TTR Test) • Auto versus Manual TTR Devices • Phase Angle Verification • Interpreting Deviations and Errors*
1100 – 1215	***No-Load Loss & Current Measurement*** *Purpose of No-Load Test • Test Setup with Open-Circuited Secondary • Core Loss Calculation • Factors Affecting Accuracy*

1215 – 1230	*Break*
1230 – 1330	***Short-Circuit Impedance & Load Loss*** *Short-Circuit Test Principle • Measuring Voltage Drop under Load • Load Loss Components • Correction for Temperature*
1330 – 1420	***Vector Group Verification*** *Understanding Vector Group Notation • Polarity and Phase Relationship Test • Vector Group Test Setup • Documentation and Interpretation*
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	***Applied Voltage (AC Withstand) Test*** *Test Purpose and Voltage Selection • Setup and Safety Measures • Pass/Fail Criteria • Effects of Insulation Defects*
0830 – 0930	***Induced Voltage (Double Frequency) Test*** *Need for Overvoltage Testing • Frequency and Duration Requirements • Monitoring Partial Discharges during Test • Detection of Insulation Breakdown*
0930 – 0945	*Break*
0945 – 1100	***Partial Discharge Measurement*** *PD Definition and Implications • Test Voltage Levels and Setup • Measuring Equipment and Couplers • PD Localization Techniques*
1100 – 1215	***Lightning Impulse Test (Type Test)*** *Waveform Requirements and Impulse Generators • Chopping Techniques • Voltage Divider and Oscillograph Setup • Interpreting Impulse Test Results*
1215 – 1230	*Break*
1230 – 1330	***Switching Impulse Test (Special Test)*** *Purpose and Significance • Equipment and Waveform Requirements • Test Procedure for HV Windings • Limitations and Analysis*
1330 – 1420	***Bushing & OLTC Insulation Testing*** *Bushing Capacitance and Power Factor • OLTC Dielectric Strength Test • Tap Changer Position Testing • Gas and Oil Monitoring during Dielectric Test*
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	***Temperature Rise Test (Type Test)*** *Heat Run Test Principles • Load Simulation using Short-Circuit Method • Temperature Measurement using RTDs • Ambient Temperature Correction*
0830 – 0930	***Oil & Gas Analysis*** *Dissolved Gas Analysis (DGA) Basics • Oil Quality and Moisture Content Tests • Interfacial Tension and Dielectric Strength • Oil Sampling and Lab Interpretation*
0930 – 0945	*Break*

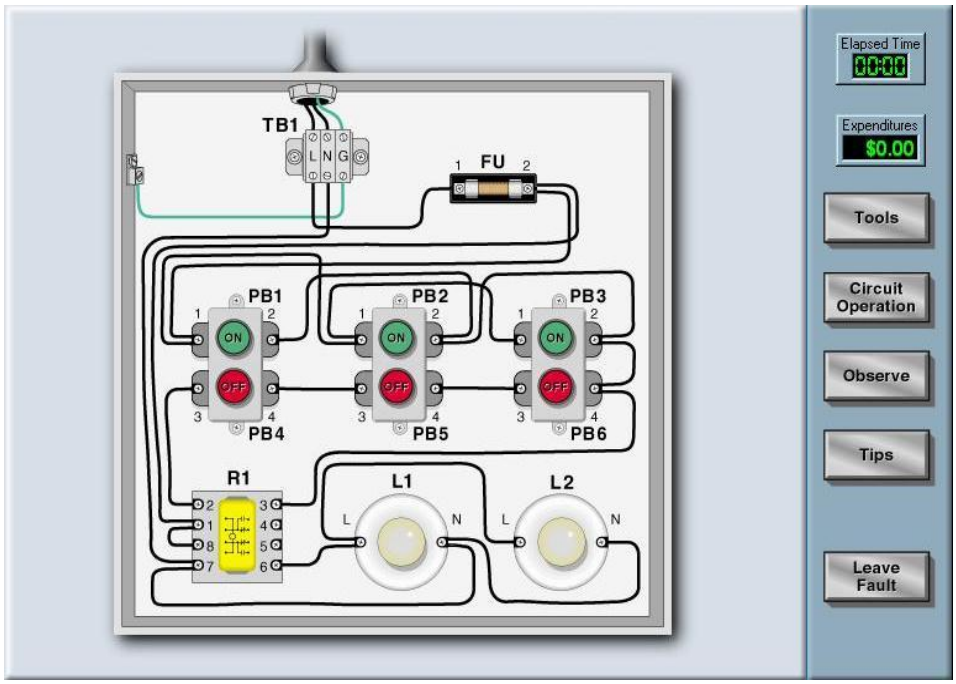
0945 – 1100	***Magnetic Balance & Zero Sequence Impedance*** *Detecting Core and Winding Imbalances • Magnetic Balance Test Setup • Measuring Zero-Sequence Impedance • Analyzing Unbalanced Loads*
1100 – 1215	***Noise Level & Vibration Test*** *Transformer Sound Level Measurement • Instrumentation and Frequency Range • Mechanical Vibration Analysis • Acceptable Sound Power Levels*
1215 – 1230	*Break*
1230 – 1330	***OLTC & Tap Changer Functional Test*** *Tap Position Switching Tests • Contact Resistance Measurements • Motor Operation and Timing Test • Tap Changer Control Logic Simulation*
1330 – 1420	***Special Tests for Customer Requirements*** *Seismic Withstand Tests • Thermal Shock and Load Cycling • EMC/EMI Tests • Customized FAT Checks*
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*

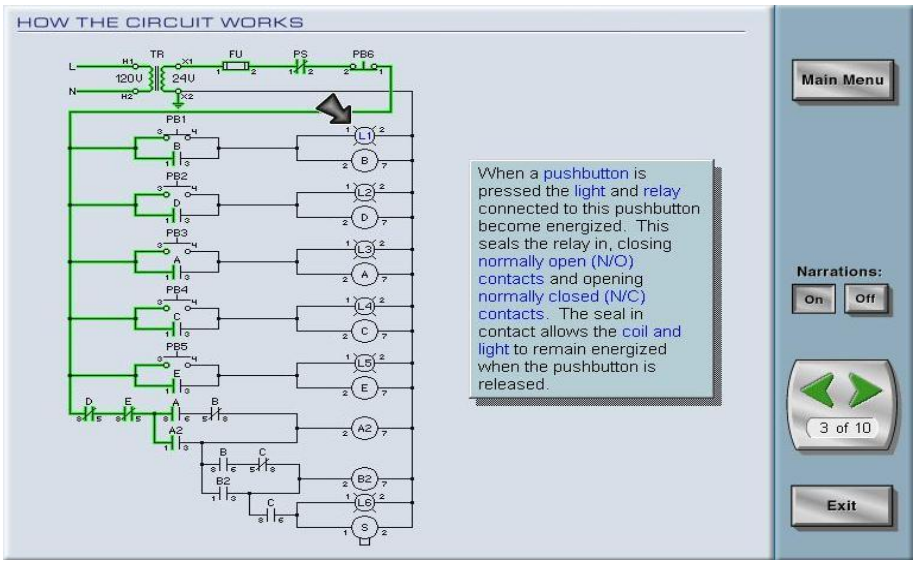
Day 5

0730 – 0830	***Hands-On Electrical Testing*** *TTR Test with Instrument • Insulation Resistance Test • Winding Resistance Measurement • Short-Circuit Impedance Test*
0830 – 0930	***Dielectric Test Demonstration*** *Setup of HV Impulse Generator • Performing Applied and Induced Voltage Tests • Partial Discharge Measurement Demo • Observing Test Waveforms*
0930 – 0945	*Break*
0945 – 1100	***Data Recording & Interpretation*** *Logging Test Data • Correction Factors Application • Evaluation against Standard Limits • Creating Test Summary Sheets*
1100 – 1215	***Failure Analysis in Factory Testing*** *Common Defects in Factory Test • Root Cause Analysis for Failed Tests • Corrective Actions and Retest Procedures • Case Studies of Failure Diagnostics*
1215 – 1230	*Break*
1230 – 1345	***FAT Reporting & Client Witnessing*** *Structuring FAT Documentation • Review of Sample Reports • Handling Client Comments and Concerns • Final Approval and Sign-Off*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about t Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

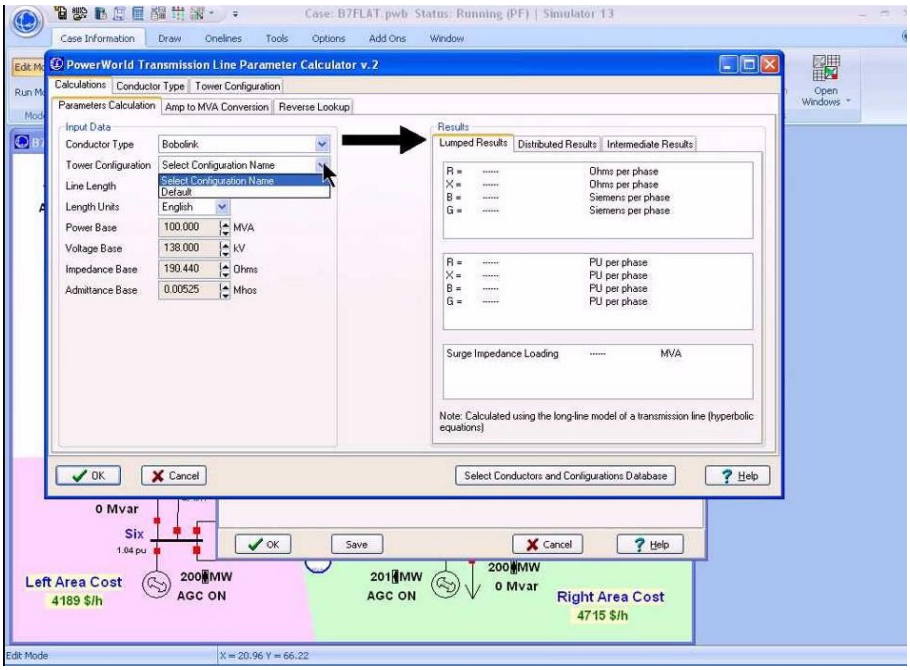
Simulator (Hands-on Practical Sessions)

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

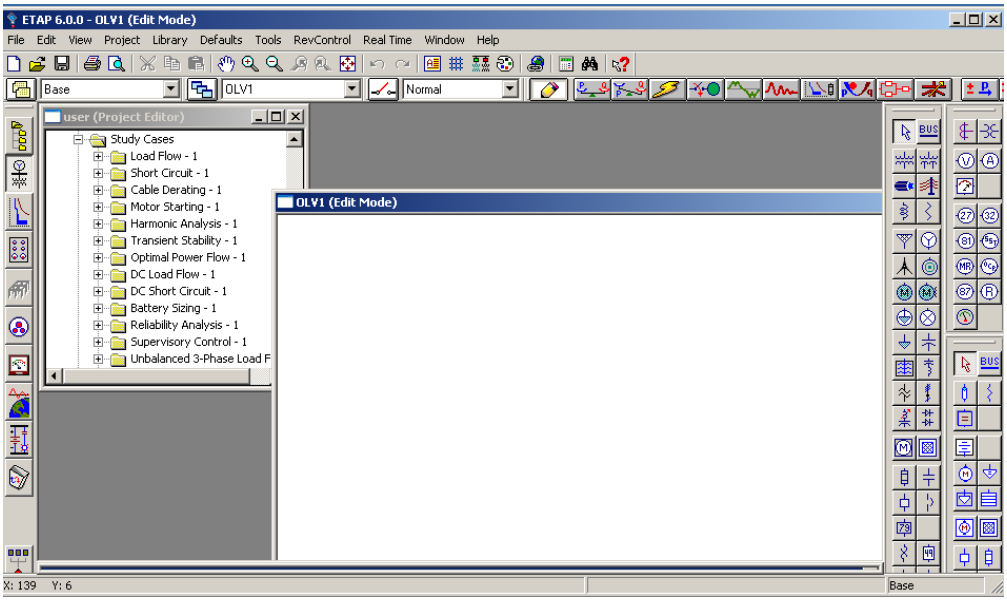




Simutech Troubleshooting Electrical Circuits V4.1



Power World Simulator



ETAP Software Simulator

Course Coordinator
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