COURSE OVERVIEW EE1116-3D
Basic Electronics (Analog & Digital)

Course Title
Basic Electronics (Analog & Digital)

Course Date/Venue
Please see page 3

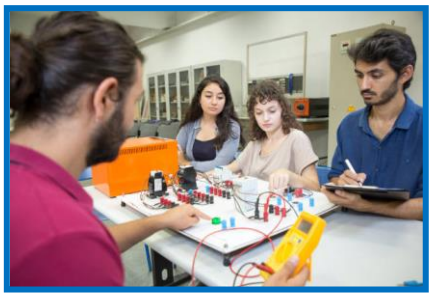
Course Reference
EE1116-3D

Course Duration
Three days/1.8 CEUs/18 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 Basic Electronics (Analog and Digital). It covers the basic electrical concepts, electrical components and analog signals; the amplifiers and their applications, analog filters, signal modulation and digital electronics; the logic gates, combinational logic circuits and sequential logic circuits; the analog-to-digital and digital-to-analog conversion, types of ADCs, digital-to-analog converters (DAC), sample-and-hold circuits and applications in industrial control systems; the digital logic in microcontrollers, basics of microcontroller architecture and input and output interfaces; and the microcontroller programming concepts and industrial applications of microcontrollers.



During this interactive course, participants will learn the power supply types, voltage regulators, power dissipation and efficiency and power supply applications in control systems; troubleshooting analog circuits and the common faults in resistor, capacitor, and inductor networks; the oscilloscopes and multimeters for troubleshooting, open, short, and faulty components and troubleshooting techniques and best practices; the the common digital circuit faults, logic analyzers, test equipment, check flip-flops and logic gate outputs; the simulating analog circuits, digital circuits and logic design; the types of sensors, signal conditioning and amplification for sensors; and the analog and digital output of sensors and industrial applications in refinery processes.

Course Objectives

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

- Apply and gain a basic knowledge on analog and digital electronics
- Discuss the basic electrical concepts, electrical components and analog signals
- Identify amplifiers and their applications, analog filters, signal modulation and digital electronics
- Recognize logic gates, combinational logic circuits and sequential logic circuits
- Describe analog-to-digital and digital-to-analog conversion, types of ADCs, digital-to-analog converters (DAC), sample-and-hold circuits and applications in industrial control systems
- Discuss digital logic in microcontrollers, basics of microcontroller architecture, input and output interfaces, microcontroller programming concepts and industrial applications of microcontrollers
- Recognize power supply types, voltage regulators, power dissipation and efficiency and power supply applications in control systems
- Troubleshoot analog circuits and identify the common faults in resistor, capacitor, and inductor networks
- Use oscilloscopes and multimeters for troubleshooting, identify open, short, and faulty components and apply troubleshooting techniques and best practices
- Identify the common digital circuit faults, use logic analyzers and test equipment, check flip-flops and logic gate outputs and deal with timing issues in digital circuits
- Recognize simulating analog circuits, digital circuits and logic design and interpret simulation results for real-world implementation
- List the types of sensors, signal conditioning and amplification for sensors, analog and digital output of sensors and industrial applications in refinery processes

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 electronics (analog and digital) for electrical engineers, electronics engineers, computer engineers, technicians and other technical staff.

Course Date/Venue

Session(s)	Date	Venue
1	May 25-27, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
2	June 23-25, 2025	Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
3	August 11-13, 2025	Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
4	October 05-07, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE

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$ 3,750 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 **1.8 CEUs** (Continuing Education Units) or **18 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. Herman Eksten, PE, PgDiP, is a **Senior Electrical Engineer** with over **30 years** of extensive experience within the **Petrochemical**, **Oil & Gas** and **Power** industries specializing in **Electrical Safety**, Certified **HV Electrical Safety**, **Low Voltage Electrical Safety**, **Electrical Circuits**: Series and Parallel Connection, **Electrical Faults & Protective Devices**, Risk Control Methods, **LOTO – Breakers** Operation in Electricity Substation, **LOTO** Principles and Procedures, **Arc Flash Risk Assessment**, Safety in **Power Electronic Equipment & Lasers**, **Circuit Breakers & Switchgears**, **Switchgear Assets Management**, **Circuit Breakers Control Circuits**, **Substation Maintenance** Techniques, **High Voltage Operation, Electrical Protection**, **Overhead Lines & Substation**, **Power Supply**, **High Voltage Substation**, **Electrical Protection Design**, **Earthing & Lightning Protection Design, Underground Equipment**, **Distribution Network Maintenance & Construction**, **Transformers Operation & Maintenance**, **Electric Power System, Power Plant Management**, **Substation Commissioning & Troubleshooting**, **Cable Splicing & Termination, Electrical Installation & Maintenance**, **Power Generation Operation & Control, Switchgear Life Assessment**, **Structured Cabling, Electric Power System, Power System Stability, Power System Planning & Economics**, **Power Flow** Analysis, **Combined Cycle Power Plant**, **UPS & Battery System, Variable Speed Drives,** and **HV Motors & Transformers**. He is currently the **Lead Electrical Engineer** of **SNC-LAVALIN** wherein he is responsible for basic designs and successful implementation of electrical engineering to plant overhead lines and substations.

During his career life, Mr. Eksten held various positions such as the **Lead Electrical Engineer**, **Operations Manager**, **Project Engineer**, **Technical Specialist**, **Customer Executive**, **District Manager**, **Electrical Protection Specialist**, **High-Voltage Operator** and **Apprentice Electrician** for FOX Consulting, UHDE (ThyssenKrupp Engineering), TWP Projects/Consulting (EPMC-Mining), ISKHUS Power, Rural Maintenance (PTY) Energia de Mocambique Lda., Vigeo (PTY) Ltd and ESKOM.

Mr. Eksten is a **Registered Professional Engineering Technologist** and has a Postgraduate Diploma in Management Development Programme and a National Higher Diploma (NHD) in Electrical Power Engineering. Further, he is a **Certified Instructor/Trainer**, a Senior member of the South African Institute Electrical Engineers (**SAIEE**) and holds a Certificate of Registration Membership Scheme from the Engineering Council of South Africa (**ESCA**). He has further delivered numerous trainings, courses, seminars, workshops and conferences internationally.

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	***Basic Electrical Concepts*** *Voltage, Current & Resistance • Ohm's Law & Power • AC versus DC circuits • Electrical Safety Considerations*
0930 – 0945	*Break*
0945 – 1030	***Electrical Components Overview*** *Resistors, Capacitors, Inductors • Diodes & Transistors • Functions of Semiconductors • Introduction to Integrated Circuits (ICs)*
1030 – 1130	***Basics Analog Signals*** *Definition of Analog Signals • Sine Wave, Square Wave & Triangular Waveforms • Frequency, Amplitude & Phase • Signal Measurement Tools: Oscilloscopes & Multimeters*
1130 – 1215	***Amplifiers & Their Applications*** *Operational Amplifiers (Op-Amps) • Amplification Types: Voltage & Power Amplifiers • Negative Feedback in Amplifiers • Amplifier Applications in Process Control*
1215 – 1230	*Break*
1230 – 1330	***Analog Filters*** *Low-pass, High-pass, Band-pass & Band-stop Filters • Frequency Response of Filters • Filter Design Principles • Real-world Applications of Filters*
1330 – 1420	***Signal Modulation*** *Amplitude Modulation (AM) • Frequency Modulation (FM) • Phase Modulation (PM) • Modulation in Communication Systems*
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	***Basics of Digital Electronics*** *Digital versus Analog Signals • Binary Numbers & Logic • Decimal to Binary Conversion • Boolean Algebra Basics*
0830 – 0930	***Logic Gates*** *AND, OR, NOT Gates • NAND, NOR, XOR & XNOR Gates • Truth Tables & Gate Functions • Implementation of Gates with ICs*
0930 – 0945	*Break*
0945 – 1100	***Combinational Logic Circuits*** *Adders, Subtractors & Multiplexers • Encoders & Decoders • Demultiplexers & Code Converters • Karnaugh Maps & Simplification of Logic Circuits*
1100 – 1215	***Sequential Logic Circuits*** *Flip-Flops (SR, D, T, JK) • Registers & Counters • Asynchronous & Synchronous Sequential Circuits • Timing Diagrams & Clock Signals*

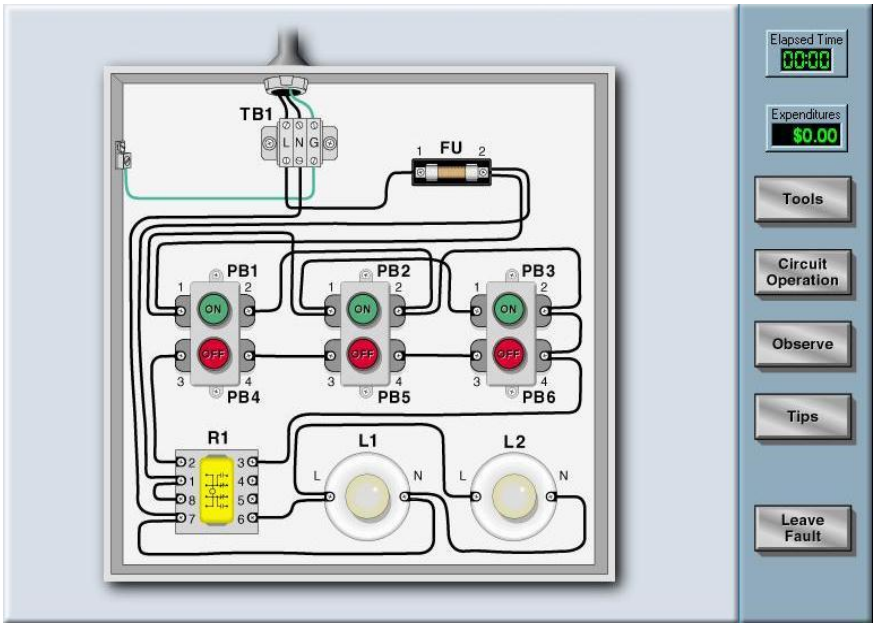
1215 – 1230	*Break*
1230 – 1330	***Analog-to-Digital & Digital-to-Analog Conversion*** *Types of ADCs: Successive Approximation, Flash & Delta-Sigma • Digital-to-Analog Converters (DAC) • Sample-and-Hold Circuits • Applications in Industrial Control Systems*
1330 – 1420	***Digital Logic in Microcontrollers*** *Basics of Microcontroller Architecture • Input & Output Interfaces • Microcontroller Programming Concepts • Industrial Applications of Microcontrollers*
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

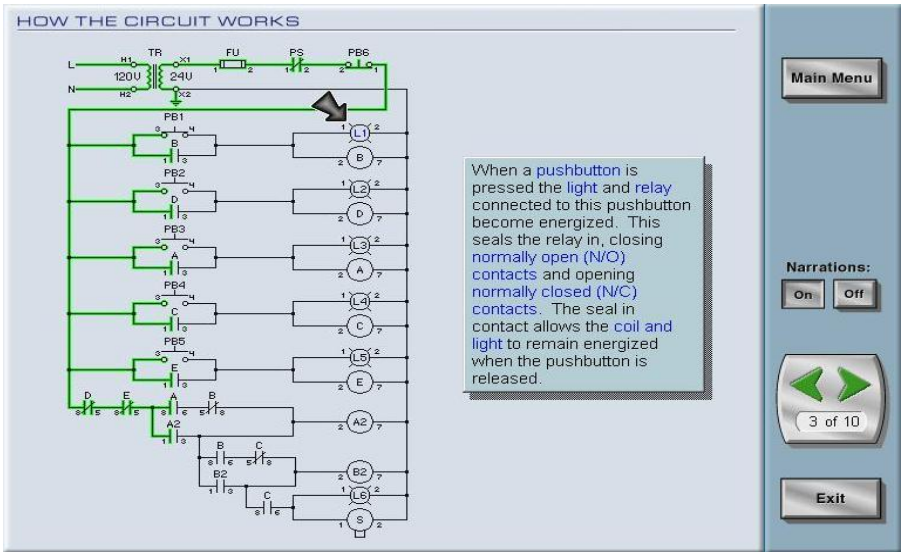
0730 – 0830	***Power Supplies & Voltage Regulators*** *Power Supply Types: Linear versus Switching • Voltage Regulators: Zener Diodes & Integrated Regulator Circuits • Power Dissipation & Efficiency • Power Supply Applications in Control Systems*
0830 – 0930	***Troubleshooting Analog Circuits*** *Common Faults in Resistor, Capacitor & Inductor Networks • Using Oscilloscopes & Multimeters for Troubleshooting • Identifying Open, Short & Faulty Components • Troubleshooting Techniques & Best Practices*
0930 – 0945	*Break*
0945 – 1100	***Troubleshooting Digital Circuits*** *Common Digital Circuit Faults • Using Logic Analyzers & Test Equipment • Checking Flip-Flops & Logic Gate Outputs • Dealing with Timing Issues in Digital Circuits*
1100 – 1230	***Circuit Simulation Tools*** *Introduction to Circuit Simulation Software (e.g., LTspice, Multisim) • Simulating Analog Circuits • Simulating Digital Circuits & Logic Design • Interpreting Simulation Results for Real-World Implementation*
1230 – 1245	*Break*
1245 – 1345	***Sensors & Transducers in Industrial Applications*** *Types of Sensors: Temperature, Pressure & Flow • Signal Conditioning & Amplification for Sensors • Analog & Digital Output of Sensors • Industrial Applications in Refinery Processes*
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” and “Power World”.

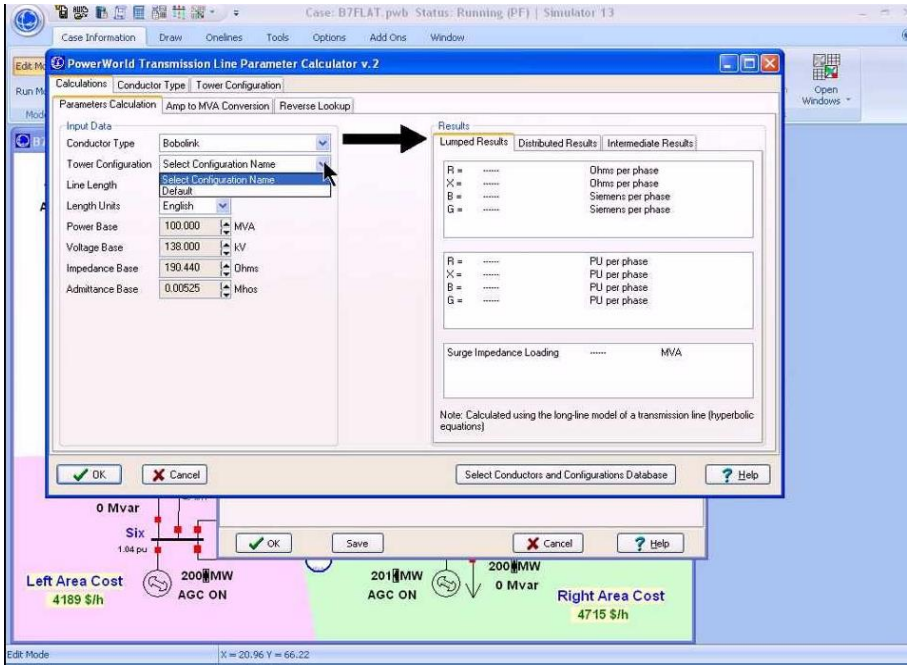


Basic Techniques



Basic Control Circuits

Motor Control Techniques



Power World Simulator

Course Coordinator
Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org