



ELGER
Electronics



exxer Skills for
the Future

THE UNION OF EXPERTISE AND SKILLS A NEW LEVEL OF EXCELLENCE IN EDUCATION!

EXXER was born from the merger of two companies passionate **about technology, innovation, and education.**


With the purpose of offering more and more excellence tools to assist in technological education, we believe the union of practical and theoretical learning is what makes the difference in accelerating human and world development!



TECHNOLOGY ● INNOVATION ● EDUCATION



ELGER Electronics

 **Electronics is the basis of all technologies for today's digital world. It is a basic discipline for the most diverse courses in the areas of technology in electronics, automation and control, computing and systems development, renewable energies, telecommunications, etc. In addition, of course, the various possibilities of development and use of applied electronics itself.**

The ELGER series provides kits that allow working in a practical way on analog and digital electronics areas, such as:

- Basic electricity;
- Analog electronics;
- Digital electronics;
- Power electronics.


The ELGER kits are compact in size, which allows optimizing the laboratory space.

They are built to protect the components from direct contact during use, thus increasing their service life.


They have silk-screen (serigraph) printing with diagrams and symbols that facilitate the understanding of the circuits and the assembly for trials.

Modular system that allows the integration of digital and analog electronics topics. Arduino and CPLD boards (Complex Programmable Logic Device) make it possible to address the most modern topics in digital electronics.

Software and applications complement the learning solution, ensuring greater effectiveness through more dynamic and modern learning.

 All kits in this series have a comprehensive courseware, focused on teaching by skills and easy to use by teachers.

We have complete solutions for training and updating teachers, ensuring the best use of the kit's resources.

 **Ask our experts for more information and the detailed technical features of each equipment in the series.**

MAIN SKILLS AND COMPETENCIES

ANALOG ELECTRONICS

- Check the operation of the voltage divider;
- Check the operation of the current divider;
- Identify Kirchhoff's laws;
- Analyze diode characteristic curve;
- Analyze the operation of different types of rectifiers: Half Wave, Center Tapped Full Wave and Full Wave Bridge rectifiers;
- Learn how a transistor works as a common emitter, common base, common collector and differential amplifier;
- Understand about the types of class amplifiers: class A, class B, class AB and class C;
- Learn about the behavior of FET types: JFET (Junction Field-Effect Transistor) and MOSFET (Metal-Oxide-Semiconductor Field Effect Transistor);
- Check the operation of unicolor LEDs, multicolor LEDs and display;
- Verify the practical use of low-pass, high-pass, band-reject and band-pass filters;
- Carry out tests and trials with operational amplifiers in adder/subtractor, integrator/differentiator circuit configurations, Schmitt Trigger and Window comparators, and oscillators;
- Check the use and operation of the timer and oscillator from 555 IC;
- Carry out tests and trials and check the behavior of UJT, SCR, TRIAC and DIAC devices;
- Learn about the main DC/DC conversion methods;
- Check and explore the functioning of sensors: inductive, capacitive, temperature, position, ultrasonic, pressure, hall effect, Wheatstone bridge circuits, and load cell sensors.

MAIN SKILLS AND COMPETENCIES

DIGITAL ELECTRONICS

- Identify a problem situation and determine the simplified logical equations as a solution;
- Apply combinational circuits in real situations;
- Learn how to use encoder and decoder circuits;
- Check the operation of Multiplexers and Demultiplexers;
- Know the types of sequential circuits with flip-flops;
- Check the use and operation of integrated counters;
- Check the operation of state machines;
- Learn and test the operation of the BCD decoder circuit for 7-segment display;
- Check the operation of the shift-register;
- Recognize the types of buses that perform data writing and reading;
- Check the use and operation of EEPROM, SRAM and ROM memory;
- Generate and analyze the A/D and D/A converter transfer curve;
- Program, validate and test a simple practical example in VHDL language;
- Explore the module with Arduino Uno programmable device using C language.

MAIN SKILLS AND COMPETENCIES

POWER ELECTRONICS

- Carry out tests and trials with single-phase half-wave rectifier with resistive loads;
- Carry out tests and trials with single-phase full-wave rectifier with resistive loads;
- Carry out tests and trials with three-phase three-pulse rectifier with resistive and inductive loads;
- Carry out tests and trials with three-phase six-pulse rectifier with resistive and inductive loads;
- Carry out tests and trials with single-phase half-wave rectifier with resistive loads;
- Carry out tests and trials with single-phase full-wave rectifier with resistive loads;
- Carry out tests and trials with three-phase half-wave rectifier with resistive loads;
- Carry out tests and trials with three-phase full-wave rectifier with resistive loads;
- Carry out tests and trials with single-phase full-wave rectifier with resistive loads;
- Carry out tests and trials with single-phase controller with resistive loads;
- Carry out tests and trials with three-phase controller with resistive loads;
- Carry out tests and trials with single-phase controller using TCA 785 to control triggering of thyristors;
- Carry out tests and trials with single-phase controller using UJT transistor to trigger thyristors;
- Carry out tests and trials with rectifier with filter and step-down chopper;
- Carry out tests and trials with PWM inverter.

PROJECTS

With the Arduino board it is possible to add programmability to the kit. In addition to being a great way to introduce electronic concepts, it allows the proposal of projects involving programming, digital and analog electronics.




TECHNOLOGY HIGHLIGHTS

Manufacturing with SMD components: In addition to being the current electronic manufacturing technology, they are easier to find for maintenance than obsolete PTH components.

Arduino Board: this board, which allows using an Arduino Uno device as one of the modules in the kit, enables the use of this widespread programming platform together with the other boards in the kit, allowing to work on programming topics and interface with circuits from the first electronics classes.

CPLD board: through this card of programmable logic devices (CPLDs and FPGAs) it is possible to make a whole different approach to digital electronics using programmable devices. Combined with other digital electronic boards, we can explore various possibilities for applying this technology, programming both with block-based coding and in languages such as VHDL and Verilog.



 The usability and learning process of each student are extremely important, so we developed educational solutions to provide benefits and differentials for users.

KEY BENEFITS

- Compact Size;
- Modular System;
- Digital and analog electronics on the same baseboard.

KEY DIFFERENTIALS

- Resources that increase the service life of the equipment (protected components, sources and circuits with electrical protection, etc.).
- Arduino and CPLD boards;
- Boards for studying sensor technologies..

CONFIGURACIÓN DE DISPOSITIVO

Producto	Description	Options	Application (optiona)
ELGER2000	electronic equipment of power	see table below	Tina Design Suite
ELGER3000	analog electronics equipment, digital and sensors	see table below	Tina Design Suite

Subjects	Settings		
	ELGER2000-Lxx-001	ELGER2000-Lxx-002	ELGER2000-Lxx-003
AC/AC conversion	✓	✗	✓
AC/DC conversion	✓	✗	✓
dc/ac conversion	✗	✓	✓

Subjects	Settings		
	ELGER2000-Lxx-001	ELGER2000-Lxx-002	ELGER2000-L11-003
Digital electronic	✓	✗	✓
Electronic analogue	✗	✓	✓
sensors	✗	✗	✗

FEATURES

With modular configuration, Safety with NR-12, development software included, protection of main components and courseware included.

ELGER2000

Power Electronics Kit



Settings

- Metallic rack with electrostatic coating;
- Modules with silk-screen (serigraph) printing with indelible engraving;
- Powered parts protected from contact.

DIMENSIONS

	ELGER2000-Lxx-001/002	ELGER2000-Lxx-003
Height	200mm	400mm
Width	480mm	480mm
Depth	300mm	300mm
Weight	15Kg	30Kg

ELECTRICAL FEATURES

Energy	Trifásico 220V – 50/60Hz Trifásico 380V – 50/60Hz
connections	terminales de seguridad de 4 mm

FEATURES

With modular configuration, Safety with NR-12, development software included, protection of main components and courseware included.

ELGER3000

Kit of Analog and Digital Electronics and Sensors



Settings

- Dock station: compact, can be attached to benches and racks
- Natural anodized aluminum rear closure
- Plastic side closure
- TS-type front plate with indelible identification.
- Available in the following configurations: Digital Electronics | Analog Electronics | Digital and Analog Electronics | Digital, Analog and Sensor Electronics.

DIMENSIONS

Height	150mm
Width	350mm
Depth	340mm
Weight	15Kg

ELECTRICAL FEATURES

Energy	Bivolt 110/220Vav – 50/60Hz
connections	Female/female and male/male cables



INDUSTRIAL LABORATORY

PARTNUMBER	DESCRIPTION	TEAM (STUDENT/KIT)	USE
ELGER2000	electronic equipment Power	2 to 3	Frequent 1 kit per team
ELGER3000	electronic equipment analog, digital and sensors	3 to 4	Frequent 1 kit per team

INFRASTRUCTURE


	ELGER2000	ELGER3000
Electric	1 Three-phase Output	1 Single Phase Output

CONNECTIVITY

ethernet connections by season work	1 Ethernet port per kit
WiFi	–
Internet access	recommended
Computer	recommended; according to the minimum requirements of software

USE

Guidelines on the recommended use of the Kit!

 We suggest this configuration for better use in class. Kits and activities are designed according to the team sizes listed on the side.

The minimum necessary infrastructure is a prerequisite to fully use all functionalities of the training kits.

We recommend the computing and connectivity requirements below for using the software and applications provided with the kit.

DEVELOPMENT TOOLS

Our learning solutions are complemented with the development tools and professional software necessary for student training.

ELGER3000

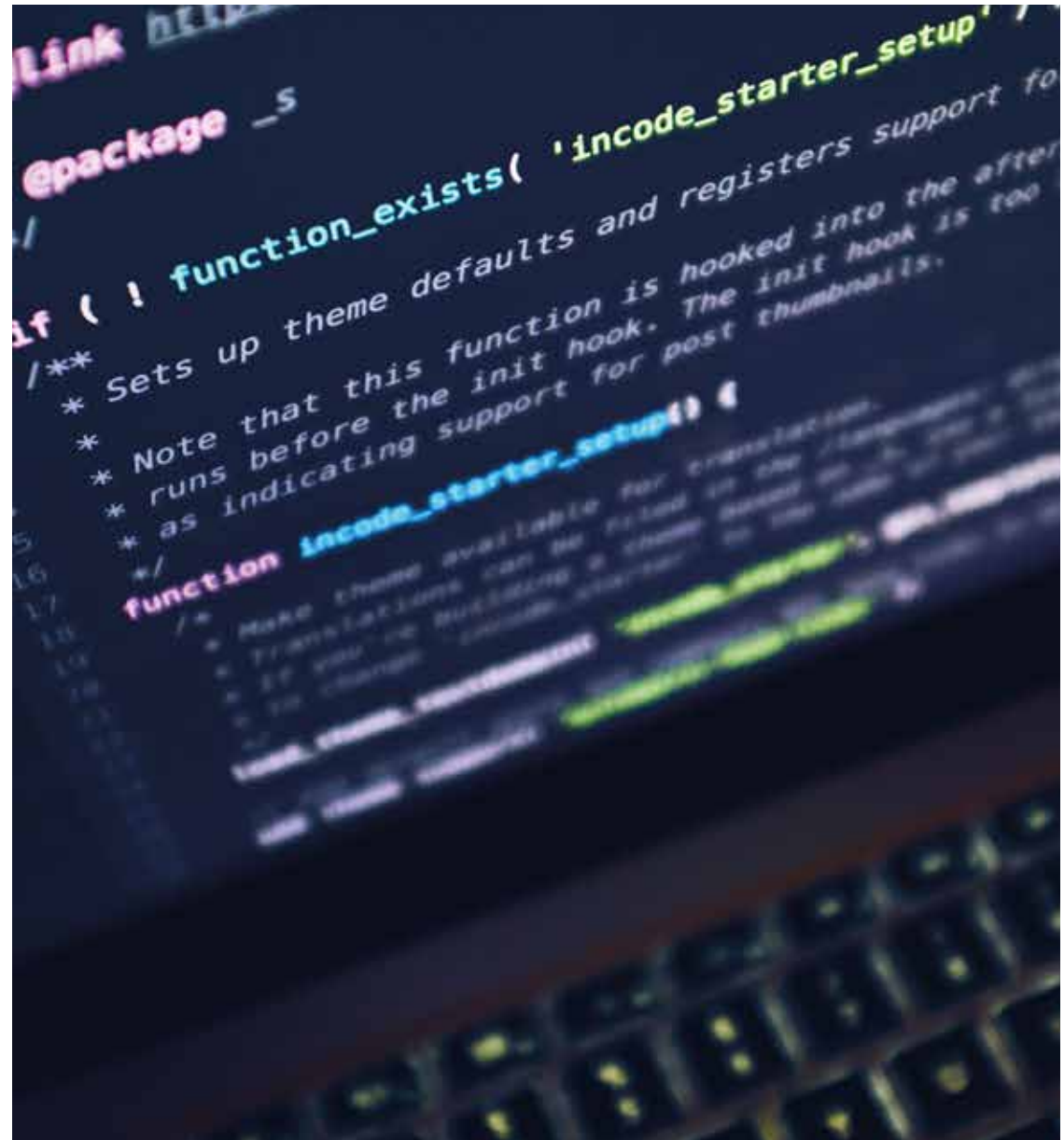
Free Licenses

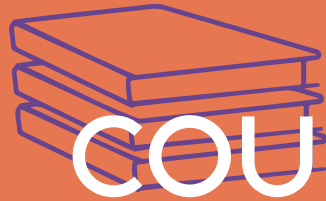
CPLD Module: Quartus II Web Edition: CPLD programming and recording tool.

- Platform: Windows
- License: Freeware

Arduino IDE: Development and programming tool for Arduino Uno.I.

- Platform: Windows, linux, MacOS
- License: Freeware, open source





COURSEWARE

The training kits have a rich courseware with a practical focus, containing practical proposals aimed at training skills and competencies.

In addition to the **User Manual**, which contains information on operation and maintenance, the **Student Guide** is also provided, with proposals for practical activities to be carried out using the kit, and the **Facilitator Guide**, with answers to the proposed activities and guidelines to use the kit in a didactic way. In addition, **Video tutorials** are available to help you easily master the development tools and use the kit.

All of this content is available on our website at the **Facilitator Portal**.



Skills and Competencies

Analog Electronics

Basic Electricity

- Check the operation of the voltage divider;
- Check the operation of the current divider;
- Identify Kirchhoff's laws;
- Learn about the operation of the Wheatstone Bridge circuit;
- Learn about the operation of the NTC thermistor and the LDR (Light Dependent Resistor).

Semiconductors

- Learn about the main diode characteristics;
- Analyze diode characteristic curve;
- Check and analyze the operation of different types of rectifiers: Half Wave, Center Tapped Full Wave and Full Wave Bridge rectifiers;
- Check the operation of the bipolar transistors;
- Learn how a transistor works as a common emitter, common base, common collector and differential amplifier;
- Learn how the power amplifier works and its performance;
- Learn about the types of class amplifiers: class A, class B, class AB and class C;
- Learn about the behavior of FET types: JFET (Junction Field-Effect Transistor) and MOSFET (Metal-Oxide-Semiconductor Field Effect Transistor);
- Learn how the TDA amplifier works;
- Perform tests and trials with current source, characteristic curve, electronic switch and Darlington configuration.

Optoelectronics

- Identify/check the operation of different types of LEDs;
- Check the operation of unicolor LEDs, multicolor LEDs and display;
- Learn how the optical coupler and optical switch work.

Filters and Transformers

- Understand the basic concepts of frequency response from passive elements;
- Check the use and operation of low-pass filters;
- Learn about high-pass filter and its main characteristics;
- Learn about band-reject and band-pass filters and their main characteristics;
- Check the use and operation of series and parallel resonant circuits;
- Learn how a transformer works.

Amplifiers

- Learn about operational amplifiers with inverting and non-inverting configuration;
- Carry out tests and trials with adder and subtractor amplifiers;
- Check and compare the use and operation of integrating and differentiating amplifiers;
- Carry out tests and trials with a logarithmic amplifier;
- Test/try and analyze the behavior of Schmitt Trigger and Window comparators;
- Check the operation of low-pass and high-pass filters;
- Test band-pass and band-reject filters;
- Check the operation of the Wien bridge sine wave oscillator and the square wave oscillator.

Oscillators

- Understand the operation of the phase-shift oscillator;
- Check the operation of the Colpitts oscillator;
- Check the operation of Hartley oscillators;
- Explore the main characteristics of the crystal oscillator;
- Compare the main types of harmonic oscillators.

555 IC Applications

- Check the use and operation of the timer and oscillator from 555 IC;
- Recognize two more different applications using the 555 IC;
- Check the operation of the linear ramp generator and the VCO.

Thyristors

- Test and check the operation of the unipolar transistor;
- Explore SCR applications;
- Test and check the operation of the TRIAC device;
- Check the operation of the DIAC devices.

DC/DC Converters

- Learn about the main DC/DC conversion methods;
- Check the MC34063A IC component manual;
- Learn how the buck converter works.

Sensors

- Understand the different sensing devices;
- Explore and check how inductive sensors and capacitive sensors work;
- Check how temperature-related systems are;
- Explore and check how position sensors work;
- Understand the operation of various sensors: ultrasonic, pressure, hall effect, Wheatstone bridge, and load cell sensors.



Skills and Competencies

Digital Electronics

Logical Ports

- Study the main physical characteristics of the integrated circuits of the TTL family and CMOS semiconductor;
- Identify a problem situation and determine the simplified logical equations as a solution;
- Create and simulate projects in TINA software (optional);
- Apply combinational circuits in real situations;
- Analyze a problem situation and determine the simplified logical equations as a solution.

Encoders and Decoders

- Learn how to use encoder and decoder circuits.

Sequential Circuits

- Learn the types of sequential circuits with flip-flops;
- Check the use and operation of integrated counters;
- Check the operation of state machines.

BCD/7 Segment Decoders and Shift Registers

- Learn about and test the operation of the BCD decoder circuit for 7-segment display;
- Check the operation of *shift-register*.

Bars

- Recognize the types of buses that perform data writing and reading.

Memories

- Learn about the types of memories;
- Detect different volatile memories from non-volatile memories;
- Check the use and operation of a SRAM memory;
- Observe the operating principles of ROM memories;
- Analyze the use and operation of EEPROM memory.

Converters

- Generate and analyze the A/D converter transfer curve;
- Learn about filters for signal reconstruction, anti-aliasing and their main characteristics;
- Analyze the digitization process of a signal and the aliasing effect.

VHDL language

- Study the basic concepts of VHDL programming;
- Program, validate and test a simple practical example in VHDL language.

C Language

- Study the basic concepts of C language programming;
- Explore the module with Arduino Uno programmable device.

Skills and Competencies

Power Electronics

AC/DC Converters

- Carry out tests and trials with single-phase half-wave rectifier with resistive loads;
- Carry out tests and trials with single-phase full-wave rectifier with resistive loads;
- Carry out tests and trials with three-phase three-pulse rectifier with resistive and inductive loads;
- Carry out tests and trials with three-phase six-pulse rectifier with resistive loads;
- Carry out tests and trials with single-phase half-wave rectifier with resistive loads;
- Carry out tests and trials with single-phase full-wave rectifier with resistive loads;
- Carry out tests and trials with three-phase half-wave rectifier with resistive loads;
- Carry out tests and trials with three-phase full-wave rectifier with resistive loads;
- Carry out tests and trials with single-phase full-wave rectifier with resistive loads.

AC Controllers

- Carry out tests and trials with single-phase controller with resistive loads;
- Carry out tests and trials with three-phase controller with resistive loads;
- Carry out tests and trials with single-phase controller using TCA 785 to control triggering of thyristors;
- Carry out tests and trials with single-phase controller using UJT transistor to trigger thyristors.

DC/DC Converters

- Carry out tests and trials with rectifier with filter and step-down chopper.

DC/AC Converters

- Carry out tests and trials with PWM inverter.



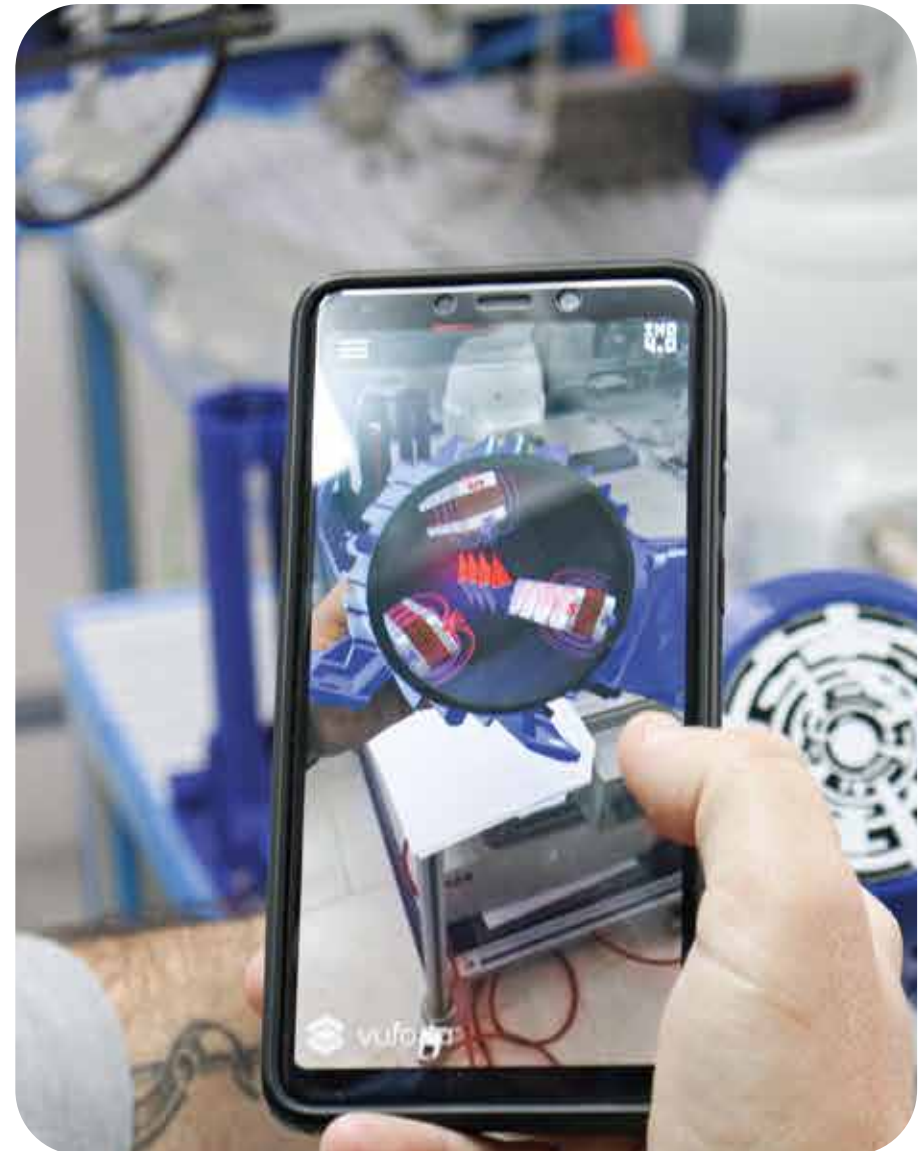
MOBILE APPLICATIONS

A current learning solution is not complete without software and applications. Along with the kits of this series, exclusive licenses are provided for applications on computer and mobile devices that complement and enhance the use of the kits.

Exxer App

AUGMENTED REALITY KITS

- The solutions can be visualized in 3D through augmented reality, allowing the student to have a first contact with such technology and identify their main characteristics.

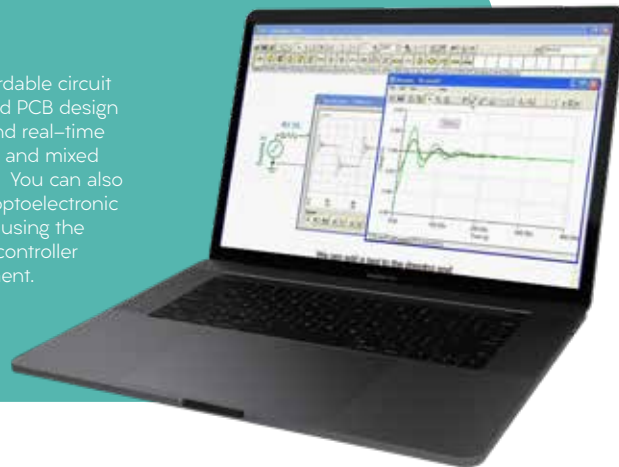


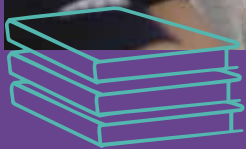
DESKTOP APPLICATIONS

A current learning solution is not complete without software and applications. Along with the kits of this series, exclusive licenses are provided for applications on computer and mobile devices that complement and enhance the use of the kits.

Tina Design Suite

- TINA Design Suite is a powerful yet affordable circuit simulator! It comprises circuit design and PCB design software package for analysis, design, and real-time testing of analog, digital, IBIS, HDL, MCU, and mixed electronic circuits and their PCB layouts. You can also analyze SMPS, RF, communication and optoelectronic circuits; generate and debug MCU code using the integrated flowchart tool; and test microcontroller applications in a mixed-circuit environment.





TRAINING

As important as teaching resources and tools is teacher training. We have a complete package of solutions for your training and upgrading needs.

Quick Start and Tutorials

Quick start is a quick video guide to learn, test and put the product into operation. Tutorials are videos that teach common procedures needed in classes using the kit.

Technical Delivery

In the technical delivery, our experts present the product, its features, as well as maintenance and safety precautions, and put it into operation together with the customers.

Operational Training

The purpose of operational training is to teach facilitators on how to use the kit. The kit courseware is presented and some proposed practices are carried out. It also includes all technical delivery activities.

Technological Training

Technological training is a deeper learning of technology and applied concepts. These courses are not focused on kits but on topics and technical skills to update trainers.

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