NATIONAL INSTRUMENTS

Solutions for

ENGINEERING CURRICULA

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Solutions for Engineering Curricula

INTRODUCTION TO ENGINEERING

OBJECTIVE

Teach students about semiconductor device physics and how it influences larger electronic systems. Also examine the voltage and frequency response of circuits involving transistors and operational amplifiers.

CONCEPTS

- Basic Sensors
- Experiment Design
- Data Acquisition
- Real-World Applications
- Computer Applications and Tools
- Analytical Problem Solving
- Measurements
- Communication Skills
- Engineering Drawing

INTRODUCTION TO ENGINEERING SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

myDAQ

myDAQ introduces students to real engineering projects using intuitive software with built-in instructions. The projects are designed to teach students basic programming and data acquisition fundamentals to better prepare them for future engineering courses while the software walks students through how to complete the project with helpful tips and videos on using the software and hardware.

LEARN MORE

ni.com/mydaq-projects

Solutions for Engineering Curricula

CIRCUITS I

OBJECTIVE

Introduce students to electrical and electronic components, laws, and circuits and give an overview of their applications in electrical and computer engineering.

CONCEPTS

- Charge, Current, and Voltage
- Mesh and Nodal Analysis
- Thevenin/Norton Equivalent Circuits
- Ohm's Law
- Kirchhoff Laws
- Operational Amplifiers
- Capacitance
- Inductance
- Wheatstone Bridge

CIRCUITS I SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

NI ELVIS III

WITH THE TI ELECTRONICS KIT

Combining NI ELVIS III with the TI Electronics Kit gives students every component and instrument needed to learn basic electronics. They engage in their coursework and get involved in relevant projects early in their education using this solution that combines seven instruments with a web-based interface.

LEARN MORE

ni.com/teach/analogkit

ANALOG DISCOVERY 2

The Analog Discovery 2 brings together the hardware and software students need throughout their electrical engineering curriculum in a small, portable form factor so they can experiment and discover at any time and any place. Though the Analog Discovery 2 specifications are limited when compared to NI ELVIS III, it is perfect for any curriculum that calls for coursework outside the lab.

LEARN MORE

ni.com/analog-discovery

Solutions for Engineering Curricula

CIRCUITS II

OBJECTIVE

Introduce students to circuit analysis under different conditions and help them study key characteristics and apply them in building oscillators, filters, and active and passive circuits.

CONCEPTS

- DC and AC Signals
- Active and Passive Filters
- RL, RLC, and LTI Circuits
- Steady State and Transient Analysis
- Active Component Circuit Analysis
- Transistor Models and Data Sheets
- Amplifier 2-Port Models
- Laplace and Fourier Transforms
- Oscillators

CIRCUITS II SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

NI ELVIS III

WITH THE TI ELECTRONICS KIT

With the combination of NI ELVIS III and the TI Electronics Kit, students have every component and instrument they need to learn basic electronics. Combining the seven instruments and a web-based interface into a single solution engages students in their coursework and gets them involved in relevant projects early in their education.

LEARN MORE

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ni.com/analog-discovery

Solutions for Engineering Curricula

DIGITAL LOGIC

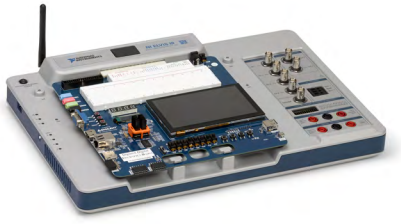
OBJECTIVE

Introduce students to Boolean algebra, the role of digital logic in computing, and the use of hardware description languages (HDLs) to control digital circuits.

CONCEPTS

- Digital Logic Gates
- State Machines
- State Tables and Graphs
- Boolean Algebra
- Latches, Flip Flops, Data Buses
- Combinational and Sequential Circuit Design
- PLD and VHDL
- ADC and DAC
- Memory Types

DIGITAL ELECTRONICS SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA



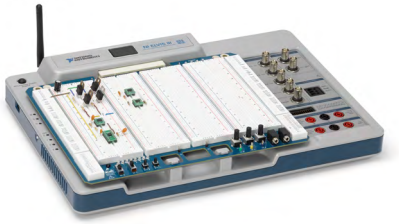
NI ELVIS III

WITH THE DIGILENT DIGITAL ELECTRONICS BOARD

Students learn digital logic with hands-on experiments from the start using the Digilent Digital Electronics Board and NI ELVIS III. You can use Multisim to deploy graphical logic blocks directly to the FPGA and the logic analyzer on NI ELVIS III. This ensures students immediately engage in interactively developing digital circuits before moving on to learn an HDL.

LEARN MORE

ni.com/teach/digital



NI ELVIS III

NI ELVIS III provides a simple, interactive interface to learn digital logic using discrete gates or small Digilent FPGAs. With seven powerful benchtop instruments including a 16-channel logic analyzer/pattern generator and 40 digital I/O pins programmable in LabVIEW or Python, NI ELVIS III is the perfect solution to implementing a custom digital electronics course.

LEARN MORE

ni.com/ni-elvis

ANALOG DISCOVERY 2

The Analog Discovery 2, with a 16-channel logic analyzer, combines the hardware and software students need throughout their electrical engineering curriculum in a small, portable form factor so they can experiment and discover at any time and any place. Though the Analog Discovery 2 specifications are limited when compared to NI ELVIS III, it is perfect for any curriculum that calls for coursework outside the lab.

LEARN MORE

ni.com/analog-discovery

Solutions for Engineering Curricula

SIGNALS AND SYSTEMS

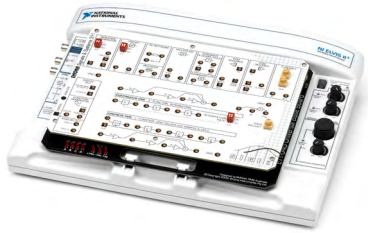
OBJECTIVE

Teach students to conduct analyses of signals and systems in both the time and frequency domains and help them study the impact of feedback in systems using mathematical methods.

CONCEPTS

- Fourier Transform
- Laplace Transform
- z-Transform
- Linear Time-Invariant Systems
- Open- and Closed-Loop Systems
- Transfer Function and Frequency Response
- Stability and Feedback
- Convolution
- Discrete Time Filters

SIGNALS AND SYSTEMS SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA



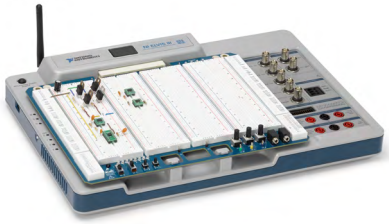
NI ELVIS II+

WITH THE EMONA SIGEX BOARD

Using NI ELVIS II+ and the Emona SIGEx board, students can build a solid foundation in the mathematics of signals and systems with real-world signals. Completed lab manuals explore linear and nonlinear systems, convolution, correlation and matched filters, the Fourier series, Laplace transforms and z-transforms, and more.

LEARN MORE

ni.com/teach/signals



NI ELVIS III

Despite not having a dedicated curriculum, NI ELVIS III integrates all the instruments and I/O that students need for a signals and systems course. Whether measuring response with the built-in Bode analyzer or setting custom scenarios by programming the analog I/O in LabVIEW or Python, NI ELVIS III can be customized to drive project-based learning for any signals and systems course.

LEARN MORE

ni.com/ni-elvis

ANALOG DISCOVERY 2

The Analog Discovery 2 combines the hardware and software students need throughout their electrical engineering curriculum in a small, portable form factor so they can experiment and discover at any time and any place. Though the Analog Discovery 2 specifications are limited when compared to NI ELVIS III, it is perfect for any curriculum that calls for coursework outside the lab.

LEARN MORE

ni.com/analog-discovery

Solutions for Engineering Curricula

MICROELECTRONICS

OBJECTIVE

Teach students about semiconductor device physics and how it influences larger electronic systems. Also examine the voltage and frequency response of circuits involving transistors and operational amplifiers.

CONCEPTS

- Small Signal Modeling
- Basic Switching Circuits
- Impedance Characteristics of Amplifiers
- AC and DC Coupling Techniques
- Amplifier Design and Analysis
- Non-Ideal Op-Amps
- Transistor Operation
- Applications of Microelectronic Circuits

MICROELECTRONIC SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

NI ELVIS III

WITH THE TI ANALOG ELECTRONICS BOARD

Using NI ELVIS III and the TI Analog Electronics Board, students can experiment to understand the fundamental relationship between voltage and current in semiconductor devices. The complete lab manual explores BJT and MOSFET device analysis, operational amplifiers, and common applications of microelectronic circuits.

LEARN MORE
ni.com/teach/analog

NI ELVIS III

NI ELVIS III is an engineering laboratory solution for project-based learning that combines instrumentation and embedded design with a web-driven experience to create an active learning environment. Students can design, build, and troubleshoot circuits using the integrated instruments and the intuitive interface.

LEARN MORE
ni.com/ni-elvis

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LEARN MORE
ni.com/analog-discovery

Solutions for Engineering Curricula

FUNDAMENTALS OF POWER ELECTRONICS

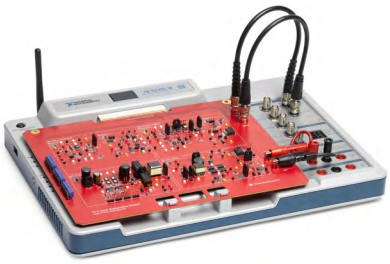
OBJECTIVE

Help students establish a strong knowledge base in power semiconductor devices, their characteristics, power converters, and electrical machines.

CONCEPTS

- Transformers
- Power Factor
- Switching Losses
- Power MOSFET and IGBT Devices
- Induction Machines
- DC-DC Converters
- Synchronous Machines
- Classic Speed Control
- Rectifiers and Thyristors

POWER ELECTRONICS SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA



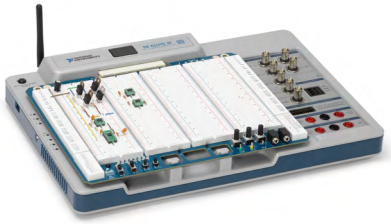
NI ELVIS III

WITH THE TI POWER ELECTRONICS BOARD

Using NI ELVIS III with the TI Power Electronics Board, students obtain a well-rounded understanding of power electronics. They first experiment with simulations and then move to hardware using functional blocks to understand each element that makes up the system. Students build their own buck converters, regulators, and both DC-AC and AC-DC converters. Make students career-ready using a board designed by TI that accelerates the discovery of the power electronics systems they will see in the workforce.

LEARN MORE

ni.com/teach/power



NI ELVIS III

NI ELVIS III combines seven benchtop instruments with embedded control to give students a complete power electronics solution, whether they are characterizing components with the built-in IV analyzer or controlling the switching frequency of a buck converter using one of the 40 digital I/Os programmed in either LabVIEW or Python. Students can build their power circuits on the breadboard or mount custom PCBs on NI ELVIS III to fully design, build, and test power electronics devices.

LEARN MORE

ni.com/ni-elvis

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LEARN MORE

ni.com/analog-discovery

Solutions for Engineering Curricula

POWER ELECTRONICS AND ENERGY SYSTEMS

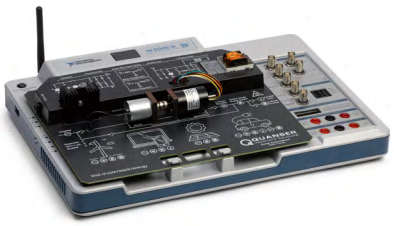
OBJECTIVE

Build on fundamental concepts to teach students design and operation techniques for power generation, power modeling, and transmission equipment.

CONCEPTS

- Single- and Three-Phase Inverters
- Current Control
- Flyback Converters
- PWM-Based Voltage Control
- Harmonics in Voltage and Current
- Switch-Mode Power Conversion
- Motor Drives and Control
- Multi-Pulse Rectifiers
- Forward Converters

ENERGY SYSTEMS SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA



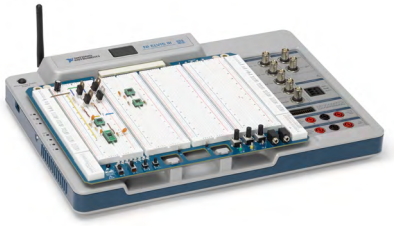
NI ELVIS III

WITH THE QUANSER ENERGY SYSTEMS BOARD

NI ELVIS III with the Quanser Energy Systems Board provides an experimental platform to introduce system-level concepts of power electronics and energy conversion. Students explore electronic and electromechanical components on the board and learn how to use them to convert and condition power from various renewable energy sources.

LEARN MORE

ni.com/teach/energy



NI ELVIS III

NI ELVIS III combines seven benchtop instruments with embedded control to give students a complete power electronics solution, whether they are characterizing components with the built-in IV analyzer or controlling and modifying inverters with the 40 digital I/Os programmed in either LabVIEW or Python. Students can build their power circuits on the breadboard or mount custom PCBs on NI ELVIS III to fully design, build, and test power electronics devices.

LEARN MORE

ni.com/ni-elvis

Solutions for Engineering Curricula

INTRODUCTION TO COMMUNICATIONS SYSTEMS

OBJECTIVE

Introduce students to concepts in modulation, demodulation, wireless propagation environments, and channel modeling as well as their implications on the design and architecture of communications systems.

CONCEPTS

- AM and FM
- Bit Error Rate
- TDMA and TDM
- Sampling and Quantization Techniques for A/D
- Noise and SNR
- CDMA
- SSB and DBBSC
- FDMA and FDM
- Bandwidth

COMMUNICATIONS SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

NI ELVIS III

WITH THE EMONA COMMUNICATIONS BOARD

NI ELVIS III and the Emona Communications Board can help you teach introductory digital and analog communications topics using a completely hands-on approach. Students are engaged with building, measuring, and experimenting on communications systems that are usually only theorized in textbooks. Help them explore various modulation schemes, superheterodyne topology, recovered data restoration, and more communications architecture topics.

LEARN MORE

ni.com/teach/communications

NI USRP

The USRP Software Defined Radio Device is a tunable universal software radio peripheral (USRP), which is a computer-hosted transceiver used to develop and explore software defined radios. With this device, students are introduced to modulation schemes, ways to modify them in LabVIEW, and the underlying mathematics and system design that go into most RF applications.

LEARN MORE

ni.com/teach/intro-comms

Solutions for Engineering Curricula

ADVANCED COMMUNICATIONS SYSTEMS

OBJECTIVE

Teach students to implement robust modern communications systems seen in modern cellular or WLAN devices.

CONCEPTS

- Energy and Frame Detection
- Time and Frequency Synchronization
- Error Correction Coding/Decoding
- Adaptive Equalization
- Frequency Correction
- FDMA and CDMA
- Precoding
- OFDM
- MIMO

ADVANCED COMMUNICATIONS SYSTEMS SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

USRP

The USRP Software Defined Radio Device is a tunable universal software radio peripheral (USRP), which is a computer-hosted transceiver used to develop and explore software defined radios. Students explore tasks such as synchronization, carrier frequency offset, adaptive equalization, and the creation of a full OFDM downlink system like the ones in Wi-Fi or LTE implementations.

LEARN MORE

ni.com/teach/digital-comms

ANALOG DISCOVERY 2

The Analog Discovery 2 combines typical benchtop instruments into a single, portable device so students can experiment and discover at any time and any place. With a maximum sample rate of 100 MS/s and LabVIEW programmability, the Analog Discovery 2 can be used to model simple, low-frequency communications systems.

LEARN MORE

ni.com/analog-discovery

Solutions for Engineering Curricula

INTRODUCTION TO MECHATRONICS ENGINEERING

OBJECTIVE

Teach students about the key technologies involving mechatronics, programming to tackle computing problems, and the techniques required to design intelligent electromechanical systems.

CONCEPTS

- Introduction to Controls
- Matrix Function
- Puzzle-Based Learning
- Data Types and Variables
- Electromechanical Hardware
- Event-Driven Programming
- Sensor Fundamentals
- Actuator Fundamentals
- Filter Design

MECHATRONICS SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

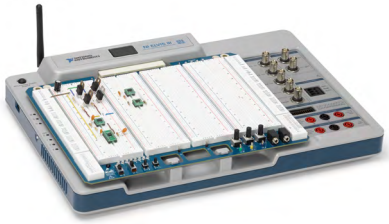
NI ELVIS III

WITH THE QUANSER MECHATRONIC SYSTEMS BOARD

The Quanser Mechatronic Systems Board introduces students to a system-level understanding of mechatronics design in a fun, engaging way. They interact with and control a 5-bar linkage with an attached webcam to practice object tracking, searching algorithms, and more.

LEARN MORE

ni.com/teach/mechsystems



NI ELVIS III

NI ELVIS III engages students in experimentation with mechatronic concepts and initial designs by providing seven benchtop instruments in an intuitive, online interface. Students can use this interface to create designs with the 58 different inputs and outputs that are all programmable with LabVIEW and Python.

LEARN MORE

ni.com/ni-elvis

myRIO

With the myRIO reconfigurable, portable, embedded controller, students learn to design and implement control systems. They can easily accomplish tasks such as component integration, state machine design, and motor control with myRIO and LabVIEW. Though myRIO has fewer features than NI ELVIS III, it is the perfect solution for courses where portability and at-home lab exercises are important.

LEARN MORE

ni.com/myrio

Solutions for Engineering Curricula

MEASUREMENTS AND INSTRUMENTATION

OBJECTIVE

Introduce students to the four main components of taking a measurement and progressing through the signal chain: converting physical phenomena to a measurable signal, conditioning the signal, acquiring the signal, and analyzing the signal.

CONCEPTS

- Signal Chain
- Voltage Measurements
- Current Measurements
- Resistance
- Amplification
- Filters
- Analog-to-Digital Converter
- Error, Noise, Precision, and Accuracy
- Measurement Software
- Measurement System Design

MEASUREMENTS AND INSTRUMENTATION SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

NI ELVIS III

WITH THE AUTOMATED MEASUREMENTS BOARD

Using NI ELVIS III and the Automated Measurements Board, students can experiment with and describe each element of the signal chain and take measurements on a variety of sensors. They can modify both the signal conditioning and even introduce custom sensing all while learning software analysis tools.

LEARN MORE
ni.com/teach/measurements

NI ELVIS III

WITH THE MEASUREMENTS KIT

The Measurements Kit for NI ELVIS III enables the teaching of concepts in measurements and instrumentation by giving students complete access to seven benchtop instruments and every component they need for a measurements class. Students learn about making noise considerations, integrating sensors, acquiring appropriate measurements, and interpreting signal characteristics to advance their design ideas.

LEARN MORE
ni.com/teach/measurementskit

MYRIO

With the myRIO reconfigurable and portable embedded controller, students learn to design and implement control systems. They can easily accomplish tasks such as implementing a PI controller to control the speed of a motor or implementing a PD controller to control the position of a motor with myRIO and LabVIEW. Though myRIO has fewer features than NI ELVIS III, it is the perfect solution for a lab where portability and at-home lab exercises are important.

LEARN MORE
ni.com/myrio

Solutions for Engineering Curricula

CONTROLS

OBJECTIVE

Teach students how to construct transfer functions, determine the frequency response, design controllers, and analyze the behavior of a system.

CONCEPTS

- Classical Controller Design
- State Space Model
- Root Locus Analysis
- Bode Diagram for 1st and 2nd Order Systems
- Stability of Systems With Time Delays
- Lead and Lag Compensators
- Robust Control
- PI, PID Controller
- Nyquist Criterion

CONTROL SYSTEMS SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

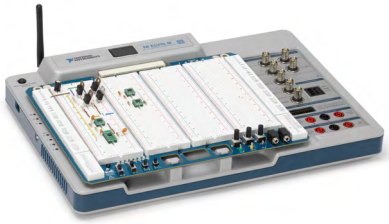
NI ELVIS III

WITH THE QUANSER CONTROLS BOARD

With NI ELVIS and the Quanser Controls Board, students accurately match dynamic models based on both physical principles and experimental tests. The onboard servo system and pendulum module provide students with a convenient experimental platform to test fundamental control theory and nonlinear control theory. Model, simulate, and control through curriculum developed for LabVIEW and The MathWorks, Inc. Simulink© software environments.

LEARN MORE

ni.com/teach/controls



NI ELVIS III

NI ELVIS III is an engineering laboratory solution for project-based learning. It combines instrumentation and embedded FPGA design to enable a full suite of controls capabilities from component characterization to full closed-loop control programming with either LabVIEW or Python.

LEARN MORE

ni.com/ni-elvis

myRIO

myRIO is a reconfigurable, portable, embedded controller that students can use to design and implement control systems. They can easily accomplish tasks such as implementing a PI controller to control the speed of a motor or implementing a PD controller to control the position of a motor with myRIO and LabVIEW. Though myRIO has fewer features than NI ELVIS III, it is the perfect solution for a lab where portability and at-home exercises are important.

LEARN MORE

ni.com/myrio

Solutions for Engineering Curricula

AUTONOMOUS MOBILE ROBOTS

OBJECTIVE

Introduce students to the fundamentals of design and development of robotic systems for industrial and space applications while emphasizing teamwork and robust design.

CONCEPTS

- Closed-Loop Control
- Vision Techniques
- Onboard Perception
- Simultaneous Localization and Mapping Techniques
- Manipulator Kinematics and Dynamics
- Vehicle Motion Modeling and Control
- Sensor Modeling
- Path Planning Algorithms
- Vehicle State Estimation

ROBOTICS SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

NI ELVIS III

WITH THE QUANSER MECHATRONIC SYSTEMS BOARD

The Quanser Mechatronic Systems Board helps students progress from component-level knowledge of mechatronics to system-level understanding of mechatronics design by giving them a direct interface to control a 5-bar linkage with a camera so they can implement bigger system closed-loop control.

LEARN MORE
ni.com/teach/mechsystems

NI ELVIS III

WITH THE QUANSER MECHATRONIC ACTUATORS BOARD

The Quanser Mechatronic Actuators Board introduces students to common actuators and helps them explore actuator interfacing, operation, design considerations, advantages, and limitations. The application board consists of a brushed DC motor, brushless DC motor, unipolar stepper motor, and servo motor.

LEARN MORE
ni.com/teach/actuators

myRIO

With the myRIO reconfigurable, portable, embedded controller, students learn to design and build deployable systems. They can easily accomplish tasks such as implementing controllers for motor control or vehicle motion modeling with the LabVIEW FPGA Module and myRIO. Though myRIO has fewer features than NI ELVIS III, it is the perfect solution for courses where portability and at-home labs are important.

LEARN MORE
ni.com/myrio

Solutions for Engineering Curricula

EXPERIMENTAL METHODOLOGY

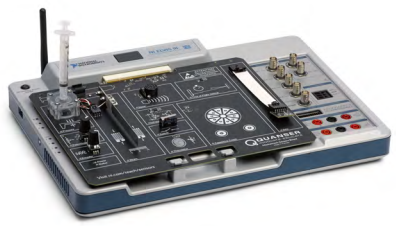
OBJECTIVE

Teach students how to put into practice the logical steps in experimentation: conceptualization, planning, execution, computer-aided data acquisition, analysis, interpretation, conclusion, and reporting.

CONCEPTS

- Basic Measurement Methods
- Sampling With Digital Devices
- Velocity Measurements
- Analog Electrical Devices and Measurement
- Static and Dynamic Characteristics of Data
- Statistical Methods for Data Analysis
- Strain Measurements
- Uncertainty Analysis
- Data Acquisition

EXPERIMENTAL METHODOLOGY SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA



NI ELVIS III

WITH THE QUANSER MECHATRONIC SENSORS BOARD

The Quanser Mechatronic Sensors Board introduces students to different sensors and their advantages and limitations in a mechatronic design context. Students learn the fundamentals of interfacing with these sensors, including how to collect, calibrate, and condition sensor data.

LEARN MORE

ni.com/teach/sensors

NI ELVIS III

WITH THE MEASUREMENTS KIT

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LEARN MORE

ni.com/teach/measurementskit

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LEARN MORE

ni.com/myrio

Solutions for Engineering Curricula

LINEAR CONTROL SYSTEMS

OBJECTIVE

Teach students about the essentials of mathematical system modeling, assessing linear system stability and performance, and designing basic controllers.

CONCEPTS

- Laplace Transform
- Stability and Feedback
- Lead/Lag Controllers
- Open- and Closed-Loop Systems
- Linear Time Invariant Systems
- Using Frequency and s-Domains
- Transfer Function
- State Machines
- Block Diagram Reduction

LINEAR CONTROL SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

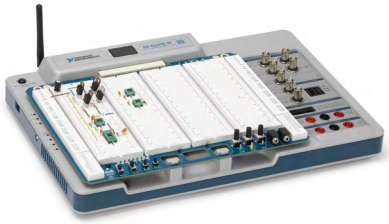
NI ELVIS III

WITH THE QUANSER CONTROLS BOARD

With NI ELVIS and the Quanser Controls Board, students accurately match dynamic models based on both physical principles and experimental tests. The onboard servo system and pendulum module provide students with a convenient experimental platform to test fundamental control theory and nonlinear control theory. Model, simulate, and control through curriculum developed for LabVIEW and The MathWorks, Inc. Simulink® software software environments.

LEARN MORE

ni.com/teach/controls



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ni.com/ni-elvis

myRIO

With the myRIO reconfigurable, portable, embedded controller, students learn to design and implement control systems. They can easily accomplish tasks such as implementing a PI controller to control the speed of a motor or implementing a PD controller to control the position of a motor with myRIO and LabVIEW. Though myRIO has fewer features than NI ELVIS III, it is the perfect solution for courses where portability and at-home lab exercises are important.

LEARN MORE

ni.com/myrio

Solutions for Engineering Curricula

MECHATRONICS WORKSHOP

OBJECTIVE

Teach students the fundamentals of product development with a focus on team collaboration, setting and meeting goals, and development processes.

CONCEPTS

- System Design
- Prototyping
- State Machines
- Problem Definition and Solution Development
- Architecture of Mechatronics Systems
- Analog and Digital Interfacing
- Rapid Prototyping
- Design to Specifications
- Data Acquisition

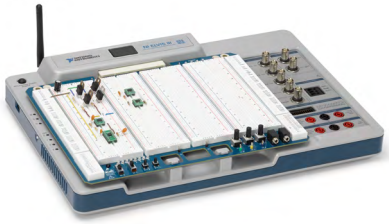
MECHATRONICS SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

NI ELVIS III

WITH THE QUANSER MECHATRONIC SYSTEMS BOARD

The Quanser Mechatronic Systems Board offers a complete system featuring a 5-bar linkage, two motors with encoders, and a webcam. Students use this versatile board to create projects to explore searching algorithms, closed-loop control of multiple systems, and object tracking.

LEARN MORE
ni.com/teach/mechsystems



NI ELVIS III

NI ELVIS III engages students in experimentation with mechatronics concepts and initial designs by providing seven benchtop instruments in an intuitive, online interface. Students can use this interface to create designs with the 58 different inputs and outputs that are all programmable with LabVIEW and Python.

LEARN MORE
ni.com/ni-elvis

myRIO

With the myRIO reconfigurable, portable, embedded controller, students learn to design and implement control systems. They can achieve complete design and implementation cycles by combining LabVIEW with the digital and analog capabilities of myRIO. Though myRIO has fewer features than NI ELVIS III, it is the perfect solution for courses where portability and at-home lab exercises are important.

LEARN MORE
ni.com/myrio

Solutions for Engineering Curricula

MICROPROCESSOR SYSTEMS AND INTERFACING

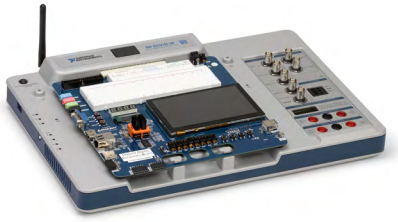
OBJECTIVE

Teach students about microprocessors, their application as control devices in electromechanical systems, and synchronization and data flow.

CONCEPTS

- Memory Access and Allocation
- Parallel and Serial Interfacing
- Synchronization and Data Flow
- Microprocessor System Architecture
- Actuation Control via D/A Conversion
- Internal Data Handling and Control
- Direct Memory Access
- Interrupt Programming
- Communication Protocols

MICROPROCESSOR SYSTEMS SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

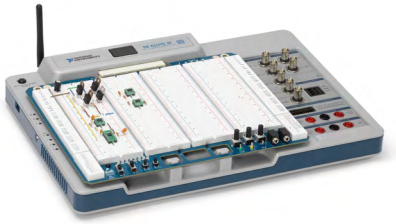


NI ELVIS III

WITH THE DIGILENT DIGITAL ELECTRONICS BOARD

The Digilent Digital Electronics Board combined with NI ELVIS III introduces students to digital logic with hands-on experiments from the start. Use Multisim to deploy graphical logic blocks directly to the FPGA and the logic analyzer on NI ELVIS III. This ensures students immediately engage in interactively developing digital circuits before moving on to learn an HDL.

LEARN MORE
ni.com/teach/digital



NI ELVIS III

NI ELVIS III provides a simple, interactive interface to learn digital logic using discrete gates or small Digilent FPGAs. With seven powerful benchtop instruments including a 16-channel logic analyzer/pattern generator and 40 digital I/O pins programmable in LabVIEW or Python, NI ELVIS III is the perfect solution to implementing a custom microprocessors course.

LEARN MORE
ni.com/ni-elvis

myRIO

With the myRIO reconfigurable, portable, embedded controller, students learn to design and implement various digital patterns and control. They can explore the fundamentals of computer architecture and examine the role of memory, interfacing, and protocols in the smooth operation of mechatronic systems. Though myRIO has fewer features than NI ELVIS III, it is the perfect solution for courses that require portability and at-home labs.

LEARN MORE
ni.com/myrio

Solutions for Engineering Curricula

SYSTEM DYNAMICS

OBJECTIVE

Teach students to build on concepts they learned in linear control systems and apply them to systems with greater complexity. This enables them to model electrical, electromechanical, thermal, and fluid systems, among others.

CONCEPTS

- Mathematical Modeling
- Nonlinear Systems
- Linearization
- I/O Stability and Transient Response
- Multiple Degree of Freedom Systems
- Modeling Electromechanical Systems
- Superposition Theory
- State Space Models
- Linear Dynamic Systems

SYSTEM DYNAMICS SOLUTIONS FROM EXPERTS IN INDUSTRY AND ACADEMIA

NI ELVIS III

WITH THE QUANSER CONTROLS BOARD

With NI ELVIS and the Quanser Controls Board, students accurately match dynamic models based on both physical principles and experimental tests. The onboard servo system and pendulum module provide students with a convenient experimental platform to test fundamental control theory and nonlinear control theory.

LEARN MORE

ni.com/teach/controls

NI ELVIS III

WITH THE MEASUREMENTS KIT

The Measurements Kit with NI ELVIS III enables the teaching of concepts in measurements and instrumentation by giving students complete access to seven benchtop instruments and every component they need for a measurements class. Students learn about making noise considerations, sensor integration, acquiring appropriate measurements, and interpreting signal characteristics to advance their design ideas.

LEARN MORE

ni.com/teach/measurementskit

myRIO

With the myRIO reconfigurable, portable, embedded controller, students learn to design and implement control systems. They can program systems with actuators, sensors, and multiple degrees of freedom into myRIO and control them over Wi-Fi. Though myRIO has fewer features than NI ELVIS III, it is the perfect solution for a course where portability and at-home labs are important.

LEARN MORE

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Give labs and students immediate access to the vast majority of NI software all managed centrally at a fraction of the full cost. Explore whether the Academic Site License is the right option for you at ni.com/academic/software.

Hardware-Software Integration

Integrate NI hardware with Python, Multisim Live, C, or MathWorks Simulink®. Start out by learning how you can customize NI ELVIS III to quickly fit into existing labs and programs by visiting ni.com/ni-elvis/software.

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Visit ni.com/badges to start learning.