PT. Halia Teknologi Nusantara

Academic Solution

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About

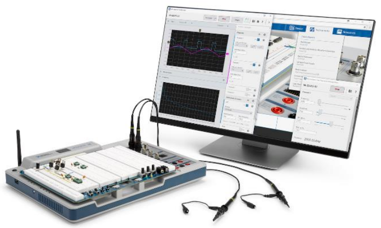
This course covers the fundamental concepts of measurement and signal acquisition. Through theory and experimentation, students will be introduced through the four main components of taking a measurement: converting physical phenomena to a measurable signal, conditioning the signal, acquiring the signal, and analyzing the signal. Students will learn about the fundamental theory and explore what actually goes on when you use a device to measure a physical phenomena. Upon completion, students will know how to design a measurement system to measure real-world phenomena and the trade-offs involved in designing such a system.

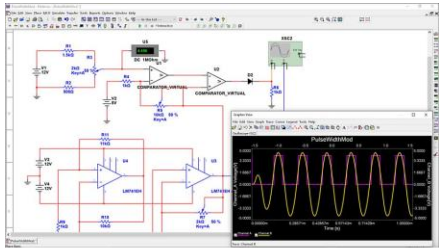
Learning Objectives

1. Students will be able to describe the stages of the signal chain, identify the result of each stage, and implement a measurement system.
2. Students will be able to identify types of electrical signals (currents, voltages, and resistances) and configure a measurement system to measure these signals
3. Students will be able to define th epurpose of signal conditioning circuits, identify needed signal conditioning, and implement signal conditioning within a measurement.
4. Students will be able to measure physical phenomena, digitizing an electrical signal
5.Students will be able to analyze measurements, process data, and display results

Learning Curriculum

1. Signal Chain
2. Voltage Measurements
3. Voltage Measurements Part II
4. Current
5. Resistance
6. Amplifiers
7. Filters
8. Analog-To-Digital Converters
9. Error, Noise, Precision, and Accuracy
10. Measurement Software Analysis - Frequency and Min/Max-Ima
11. Measurement Software Analysis II - Calibration and Curve Fitting
12. Temperature Sensors
13. Strain and Force
14. Vibration, Hall Effect, & Light Intensity
15. Getting Started With Iot Using Systemlink Cloud
16. Measurement System Design With the NI Automated Measurements Board





Analog Circuits Labs

About

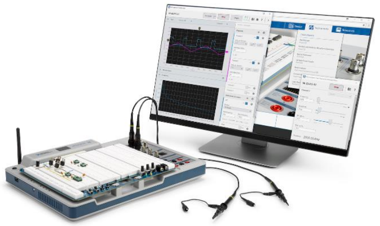
This course covers the fundamental concepts of circuit theory and analysis. Through calculation, simulation in Multisim Live, and real-life circuit-building using the NI ELVIS III, students will explore and confirm the behavior of common components and configurations. Starting with elementary principles such as Ohm's law and Kirchoff's circuit laws, the course also covers equivalent circuits, voltage dividers and resistance bridges, capacitor and inductors circuits, and transformers. The circuits course culminates with a project lab in which students apply their learning in the context of a real-world electronic device, a radio. By completing this course, students will prepare themselves for future study in electronics.

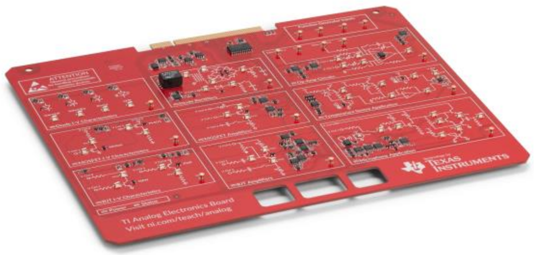
Learning Objectives

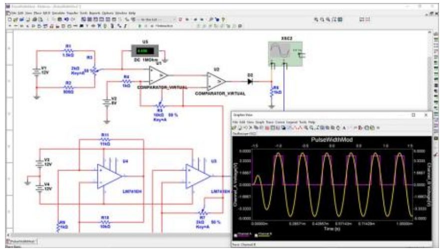
1. Differentiate among voltage, current, and power, and perform calculations based on their relationships.
2. Discuss the functions, characteristics, and applications of resistors, capacitors, inductors, and transformers, and predict the output of RC, RL, and RLC circuits.
3. Develop and analyze a circuit simulation, build a circuit on a breadboard, and measure it using common instrumentation.
4. Apply fundamental techniques, including Ohm’s law, Kirchhoff’s Laws, nodal analysis, mesh analysis, superposition, Thevenin’s theorem, and Norton’s theorem to analyze a given circuit, and design a circuit to specification.

Learning Curriculum

1. Ohm’s Law
2. Kirchoff’s Voltage Law
3. Kirchoff’s Current Law
4. Elvis III.
5. Thevenin and Norton Equivalent Circuits
6. Voltage Dividers and Resistance Bridges
7. Series and Parallel Capacitors
8. RC Circuits
9. RLC Circuits
10. Transformers and Turn Relationships
11. Project - FM Radio Tuner







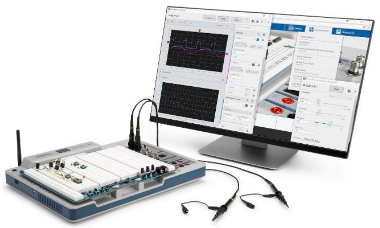
Digital Electronics Labs

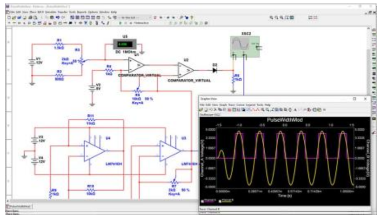
About

This lab covers both combinational and sequential digital electronics topics. Students begin by simulating logic gates in NI Multisim, and then build and deploy PLD circuits to an FPGA target. The lab manual also offers project-based applications that combine and reinforce skills students learn throughout the course.

Learning Objectives

1. Build combinational and sequential circuits using simulation software
2. Discuss the behavior, characteristics, and applications of digital circuit components such as logic gates, adders, encoders and decoders, multiplexers and demultiplexers, latches, and flip-flops
3. Analyze and predict the behavior of built digital electronic circuits
4. Design and test digital application circuits





Learning Curriculum

1. Multisim Circuit Simulation
2. Truth Tables and Basic Logic Gates
3. Logic Gates Explored and Boolean Algebra
4. Binary Conversion and Adders
5. Karnaugh Maps
6. Encoders and Decoders
7. Multiplexers and Demultiplexers
8. Comparators
9. Latches and Sequential Logic Circuits
10. Flip Flops
11. Counters
12. Finite State Machines
13. Shift Registers
14. Semiconductor Memory
15. Digital Dice Project
16. Digital Clock Project
17. Electronic Safe Project
18. Digital Communications Project

Power Electronics Labs

About

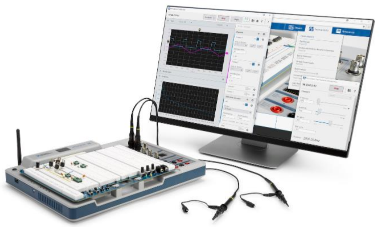
This labs provides guidance for a comprehensive hands-on learning experience covering the fundamentals of Power Electronics, designed for Electrical and Computer Engineering undergraduate programs. The labs form four groups: DC-DC linear regulators, DC-DC buck regulators, DC-AC inverters, and AC-DC rectifiers. Each group of labs is performed by means of dedicated Multisim Live circuit schematics for simulations, and a dedicated section of the TI Power Electronics Board for experimental measurements.

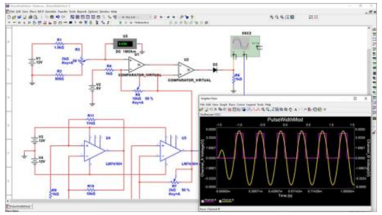
Learning Objectives

1. Given a linear regulator, with specified components characteristics, the student will be able to analyze and predict its behavior, under DC and AC operating conditions, in open-loop and closed-loop operation, by determining the values of voltages and currents of interest to evaluate static and dynamic performances, with specified units and accuracy.
2. Given a buck regulator, with specified components characteristics, the student will be able to analyze and predict its behavior, under DC and AC operating conditions, in open-loop and closed-loop operation, in continuous and discontinuous mode, by determining the values of voltages and currents of interest to evaluate the static and dynamic performances, with specified units and accuracy.
3. Given a DC-AC pulse width modulated inverter, with specified components characteristics and modulation signals, the student will be able to analyze and predict its behavior, under different load impedance conditions, by determining the amplitude of output current and voltage AC components, with specified units and accuracy.

Learning Curriculum

1. Linear Regulator in Open Loop DC Operation
2. Linear Regulator in Open Loop AC Operation
3. Linear Regulator Error Amplifier Operation
4. Linear Regulator in Closed Loop Operation
5. Buck Regulator Half-Bridge Pwm Operation
6. Buck Regulator in L-C Filter Operation
7. Buck Regulator in Discontinuous Mode Operation
8. Buck Regulator in Closed Loop Operation
9. DC-AC Pwm Inverter Operation
10. High-Frequency Transformer Operation
11. AC-DC Rectifier Operation
12. Post Regulators





Energy System Labs

About

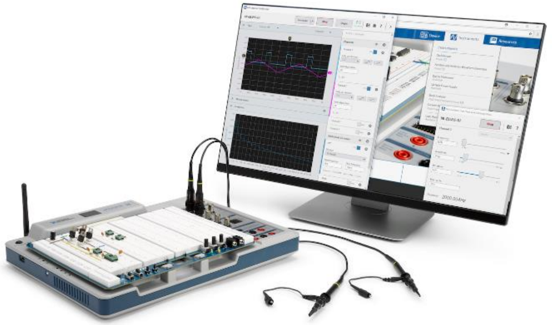
In this lab manual, students complete hands-on activities to investigate the essential functionality and behavior of energy conversion systems from AC-DC, DC-DC, DC-AC, and AC-AC. Further consideration is then given to some of the most common power systems that are found in everything from computers to modern electric cars and wind generators.

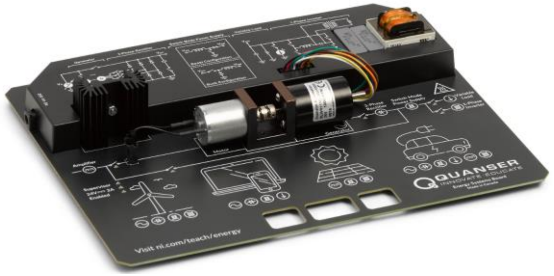
Learning Objectives

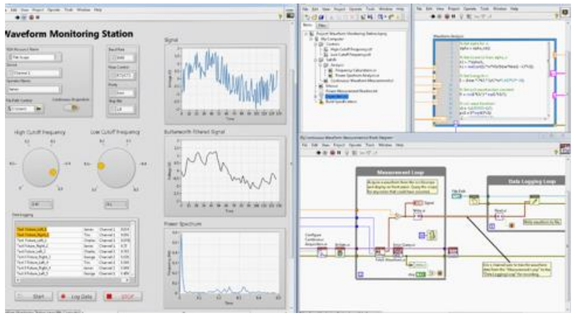
1. Identify the role of Switch Mode Power Supplies, Rectifiers, Inverters, AC Generators, and Transformers in a larger power system.
2. Describe the design and function of Buck and Boost SMPS.
3. Model the theoretical operation of idealized energy conversion devices.
4. Analyze the real-world operation and efficiency of power systems.

Learning Curriculum

1. DC Power
2. AC Power
3. Converting Between AC and DC Power
4. Power Systems







Controls Labs

About

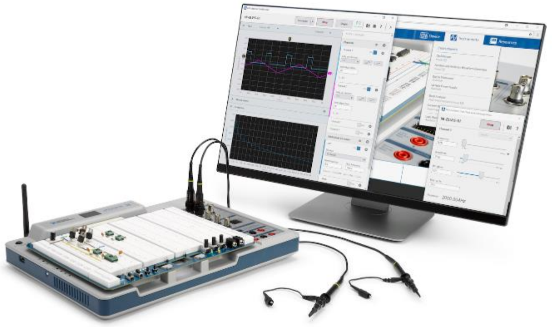
As automation and connected devices move from industry to commercial products and the home, an understanding of the design and implementation of control systems on hardware is essential. The lab progression that accompanies the Quanser Controls Board begins with a grounding in the basics of modeling and control. Topics then transition into more complex topics, including optimal control, hybrid control, and digital control. The skills and hands on experiences gained using the Controls Board are directly applicable to the challenges engineers face creating the complex systems that dominate the world today.

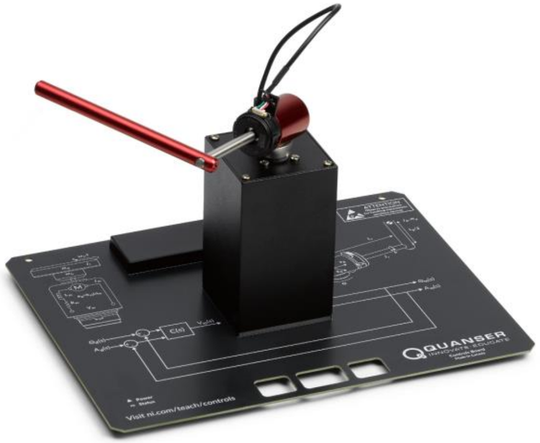
Learning Objectives

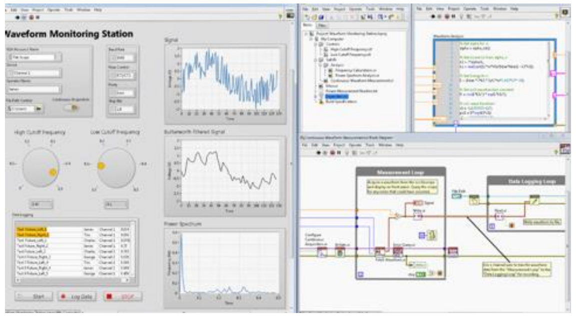
1. Model a first-order system both experimentally and theoretically.
2. Create a control system to meet a set of desired specifications.
3. Determine the stability of a system.
4. Create a controller to control an unstable system.
5. Create an optimal controller to govern the behavior of a complex coupled system.
6. Control a digital system with a limited sampling rate.

Learning Curriculum

1. DC Motor Modeling
2. DC Motor Speed Control
3. DC Motor Position Control
4. Inverted Pendulum Control
5. Stability Analysis
6. Digital Control







About

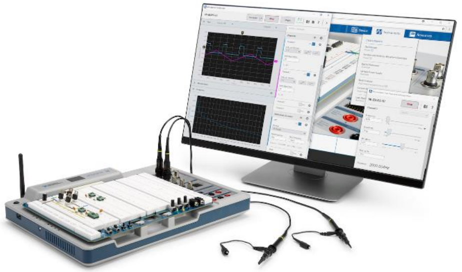
This course introduces students to mechatronic system design. Students begin by taking on an open-ended mechatronics design project, such as a solar tracker, rotational to linear motion controller, or a drawing robotic arm. As they work on their projects, they complete fundamentals and component labs to gain skills required for their projects. Fundamental labs cover electrical interfacing theory, such as AIO, DIO, and PWM. Students learn about each interface, explore it through simulation and instrumentation, and learn how to apply it. Component labs cover the various sensors and actuators students will use in their projects. Students learn how each component works and how to interact with it using the NI ELVIS and the NI ELVIS RIO Control Module. These resources are hosted on the online, interactive learning platform, Thinkscape.

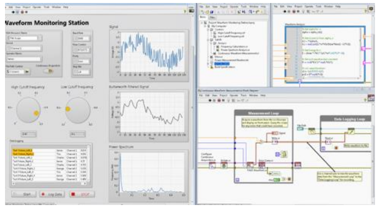
Learning Objectives

1. Students learn fundamental electrical interfacing theory through simulation, instrumentation, and application.
2. Students learn the principles of operation, interface theory, and application of common mechatronic sensors, actuators, and components.
3. Students complete open-ended, real-world mechtraonics projects, including a solar tracker, rotational to linear motion controller, and a drawing robotic arm.

Learning Curriculum

1. Solar Tracker Project
2. Ambient Light Sensor
3. Servo Motor
4. Leds
5. Seven Segment Display
6. Rotational to Linear Motion Project
7. DC Motor
8. Hall Effect Sensor
9. Encoder
10. Drawing Robot Arm Project
11. Potentiometer
12. LCD Display
13. Fundamentals of Digital Input and Output
14. Fundamentals of Analog Input and Output
15. Fundamentals of PWM
16. Fundamentals of Encoders
17. Fundamentals of Digital Communications Protocols





About

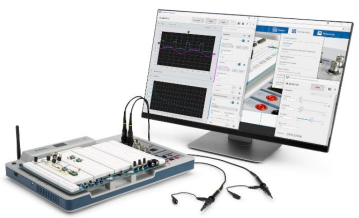
The Communications Principles Lab Manual covers a broad range of introductory digital and analog telecommunications topics through a series of hands-on laboratory experiments. Each experiment supports the theoretical concepts introduced in a first course in modern telecommunications. In each experiment, the student is challenged to build, measure, and consider concepts using the Emona Communications Board and NI ELVIS III instrumentation.

Learning Objectives

1.Discuss the use of amplitude, frequency, and phase in transmitting information in a signal.
2.Describe how the time and frequency domain expressions of a signal are related, and discuss how and why signals are shifted in frequency.
3.Describe the differences between continuous signals and discrete time (sampled) signals.
4.Explain the relationship between analog and digital signals in a communications context, as well as describe the use of Fourier analysis.
5.Describe the concept of the transmission model of a communications system.
6.Construct various communications systems from their fundamental blocks.
7.Improvise solutions to be able to process signals using the available blocks.
8.Create new signals and systems using LabVIEW code, both as a generator and receiver of signals.

Learning Curriculum

1. Introduction to the Emona Communications Board
2. Modeling Equations
3. FFT and Spectra
4. Amplitude Modulation (AM)
5. Amplitude Demodulation
6. Double Sideband Modulation and Demodulation (DSBSC)
7. SSB Modulation and Demodulation
8. FM Modulation
9. FM Demodulation
10. FSK
11. Binary Phase Shift Keying (BPSK)
12. Introduction to DSSS (Spread Spectrum)
13. Principles of OFDM
14. Sampling and Reconstruction
15. Carrier Regeneration With Costas Loop
16. ASK Modulation & Demodulation
17. Principles of Superheterodyne
18. AM & FM via SDR Using IQ Signals
19. BPSK, DPSK, & QPSK via SDR Using IQ Signals
20. OFDM via SDR Using IQ Signals



Communications Labs - USRP

About

The twelve lab exercises presented in this package are intended to accompany an introductory course in communication systems offered at the junior or senior level in an electrical or computer engineering program. The lab exercises use the NI USRP software defined radio platform; no additional laboratory equipment is needed, other than a computer to run LabVIEW Communications and to interface with the USRP.

Learning Objectives

1. These labs are intended to accompany and enhance an introductory course in communication systems at the junior or senior level (year 3 or 4) in an electrical or computer engineering program.
2. After completing this course, students will be capable of building a variety of analog and digital communications systems comprising of a complete transmitter and receiver usng LabVIEW Communications and NI USRP software defined radios.
3. With the knowledge built up through this course students will be able to identy common modulation schemes, diagnose impairments and use simple tools such as the Eye Diagram and Bit Error Rate to determine the quality of a communication system.

Learning Curriculum

1. Introduction to the Usrp
2. Amplitude Modulation
3. Frequency-Division Multiplexing
4. Image Rejection
5. Double-Sideband Suppressed-Carrier
6. Frequency Modulation
7. Amplitude-Shift Keying
8. Frequency-Shift Keying
9. Binary Phase-Shift Keying
10. The Eye Diagram
11. Equalization
12. Quadrature Phase-Shift Keying

About

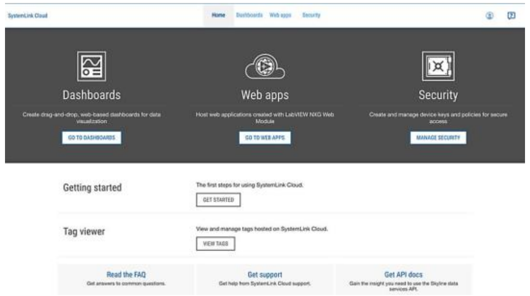
The purpose of the IIoT kit is to provide software and hardware platform for learning the concepts of the IIoT. This IIoT kit is based on National Instrument’s myRIO embedded device & Kunbus’s RevPi. As a cloud technology the IIoT lab is using Azure platforms. The training kit includes comprehensive user manual describing creation of things in different cloud platforms, as well as detailed instructions for the hands-on labs

Learning Objectives

1. Fully understand IoT/IIoT workflow.
2. Gain knowledge in cloud computing & IoT dashboards.
3. Understand the crucial points in IIoT.
4. Strengthen fundamental knowledge for Electrical Engineering, Computer Science and Business Administration specializations.

Learning Curriculum

1. Introduction to LabVIEW Graphical Programming
2. Introduction to Embedded System
3. Introduction to Sensors & Actuators
4. Introduction to Data Acquisition
5. Introduction to Control System
6. Communication to outside world
7. Project-based Lab



Microsoft Azure

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