



Sparking Innovation in the Engineer of Tomorrow

Dave Wilson

Vice President, Product Marketing for Software,
Academics, Customer Education

NATIONAL INSTRUMENTS



Big Physics



Clean Energy



5G



IOT



Driverless Cars

WORLD ECONOMIC FORUM

65% of Children Entering Primary School Today Will
Ultimately End Up Working in Job Types that Don't Yet Exist



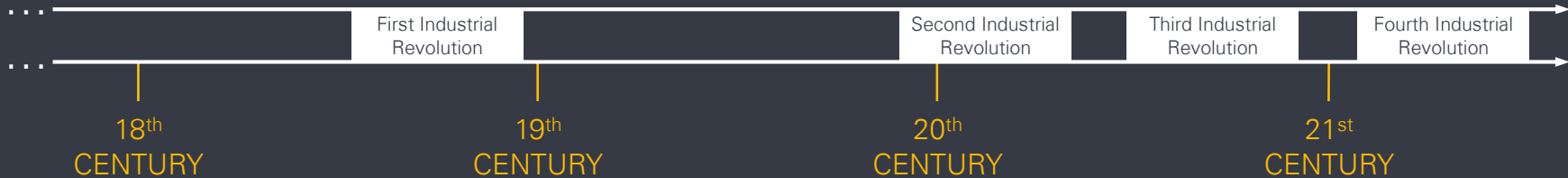


"Electronics used to seem so cryptic to me, but using NI tools in the new labs made everything so much more understandable. It's given me the confidence to experiment with electric circuits and try out some of my own projects."

—Joshua Elijah, Second-Year Student, The University of Manchester

67% to 98%

INCREASED STUDENT SATISFACTION
RATING FOR HANDS-ON EDUCATION





“The 21st century will be equivalent to 20,000 years of progress at today’s rate.”

Ray Kurzweil



IEEE SPECTRUM

2020 Will Be the Year When 5G Goes From Theory to Reality



CISCO

50 Billion Devices Globally Will Be Connected to the Internet by 2020



UNITED NATIONS

The World's Population is Projected to Reach 8.5 Billion by 2030

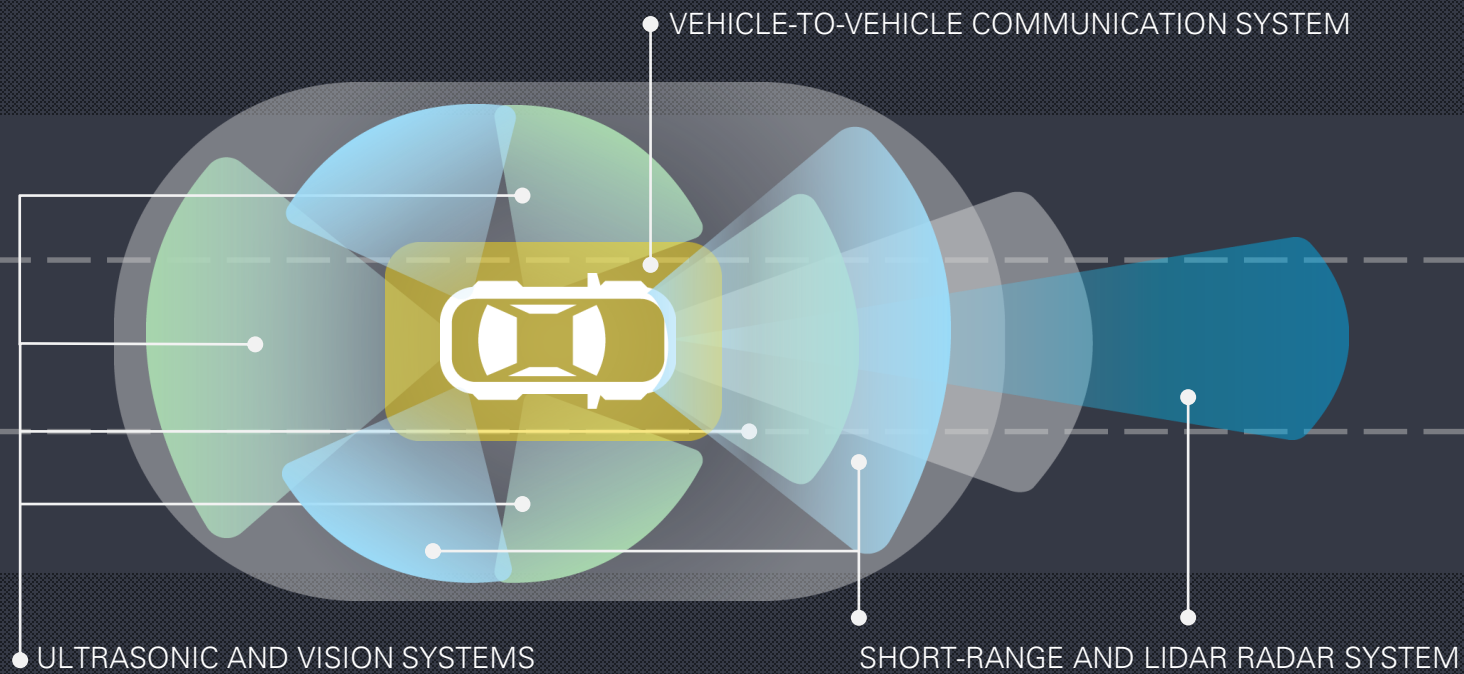


Prepare Our Students for the Challenges of 2020 and Beyond

Desired Skills for Employability

- Good Communication Skills
- **Understanding of Engineering Fundamentals ***
- Ability to Problem Solve
- **Critical Thinking ***
- Ability to Prioritize
- **Teamwork Skills & Ability to Function in Multidisciplinary Teams ***
- **Ability to Apply Engineering Knowledge ***
- Data Interpretation and Visualization
- Leadership
- Creativity
- Systems Thinking
- Flexibility and Ability to Adapt
- Innovation
- Understanding of Design
- **Ability to Deal with Complex Problems ***
- **Innovation ***
- Technical Intuition
- Project Management

* Areas in which Academia takes the lead role in skill development

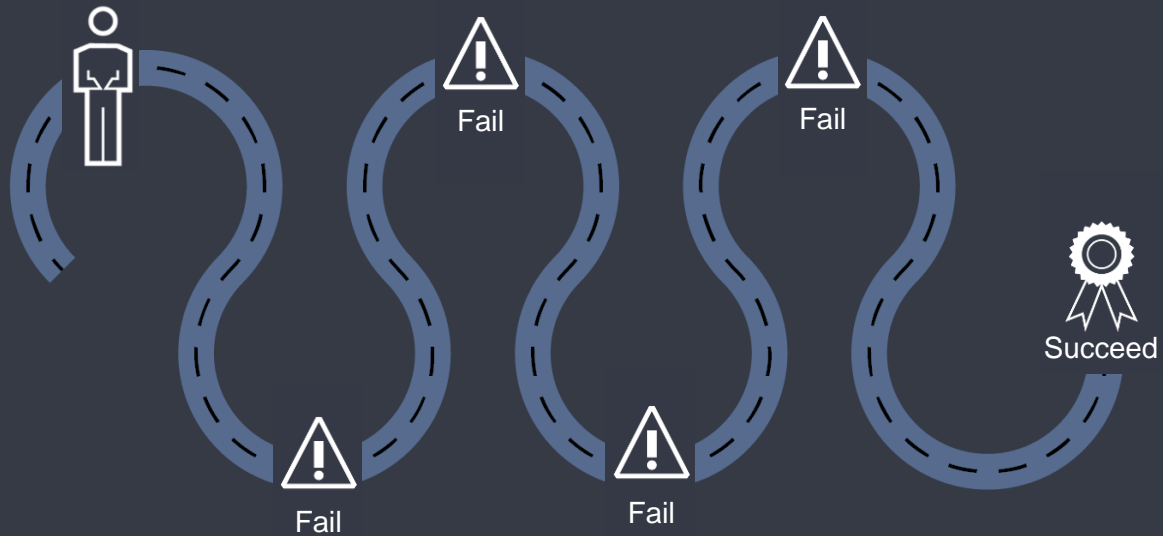


I have not failed. I've just found
10,000 ways that won't work.

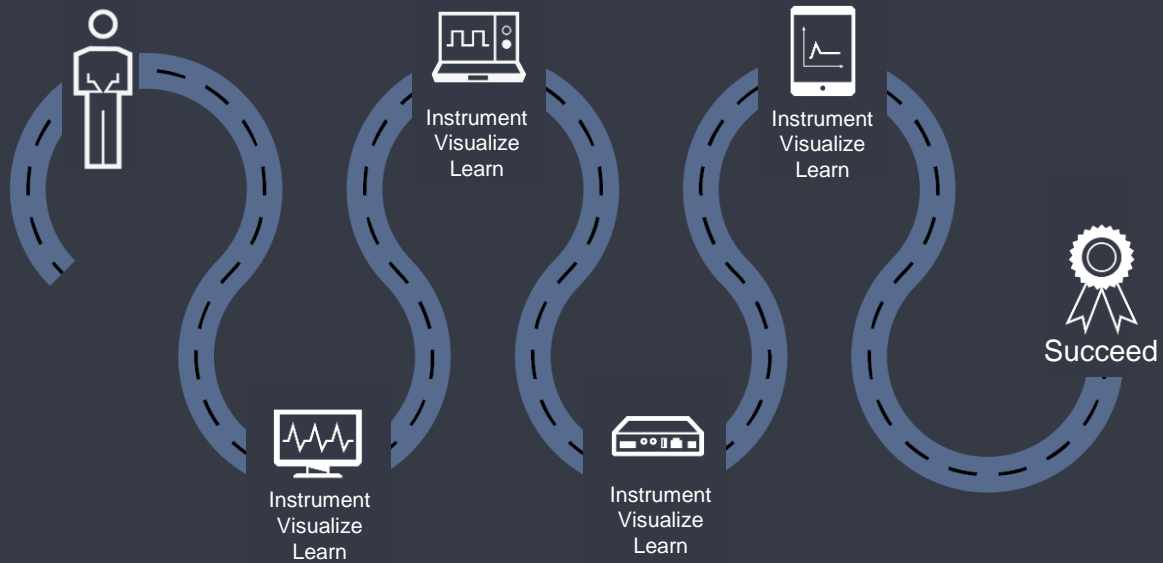
—Thomas A. Edison



True Path to Success



Instrumented Path to Discovery

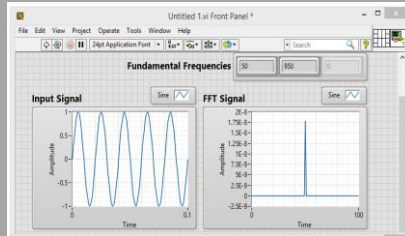


Accelerating Engineering System Design

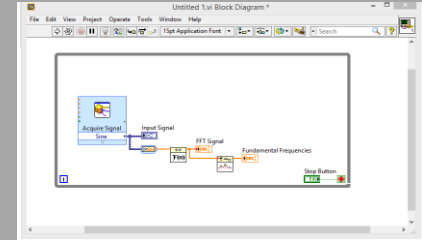
Rapid assembly of system
through modular IO



Instant insight at every step
through virtual instrumentation



Software at a schematic level
overview to integrate system





Intuitive Engineering Workflows

Take Your First Measurement Faster



Iterative Data Exploration

Instantly Explore Your Engineering Data



Productive System Customization

Accelerate Your Development with an Enhanced Editor



Interactive Learning and Help Content

Learn What's Needed to Build the Project at Hand

ni.com/labviewnxg

HOW DO WE PREPARE

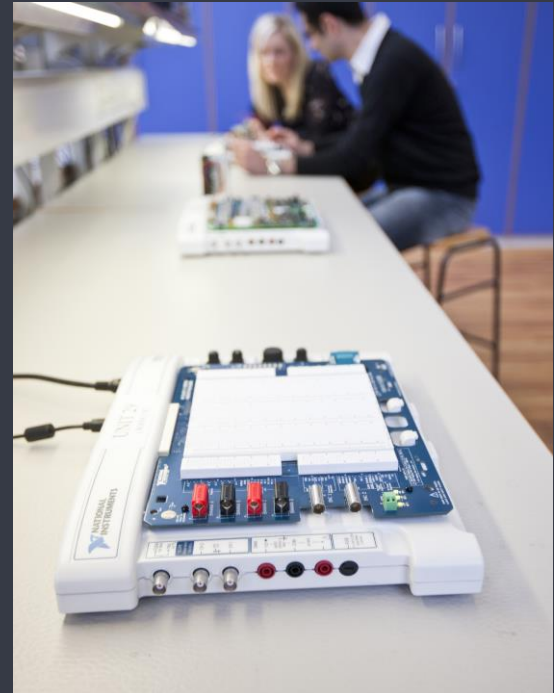
Students for Engineering System Design?



STUDIO LEARNING



REMOTE CLASSROOMS



HANDS-ON DESIGN

Curriculum Change and Course Mapping

DEPARTMENTS



MECHANICAL &
MECHATRONICS
ENGINEERING



ELECTRICAL &
COMPUTER
ENGINEERING



BIOMEDICAL
ENGINEERING



CIVIL
ENGINEERING



CHEMICAL
ENGINEERING



SYSTEM DESIGN
ENGINEERING

APPLICATIONS

ANALOG, DIGITAL & POWER ELECTRONICS

INTRODUCTION & ADVANCED CONTROLS

MECHATRONICS ACTUATORS, SENSORS & SYSTEMS

BASEBAND AND WIRELESS COMMUNICATIONS

INTRODUCTION TO ENGINEERING, MEASUREMENTS & INSTRUMENTATION

Curriculum Change and Course Mapping

DEPARTMENTS



MECHANICAL &
MECHATRONICS
ENGINEERING



ELECTRICAL &
COMPUTER
ENGINEERING



BIOMEDICAL
ENGINEERING



CIVIL
ENGINEERING



CHEMICAL
ENGINEERING



SYSTEM DESIGN
ENGINEERING

APPLICATIONS

Student
Devices



Laboratory
Platforms



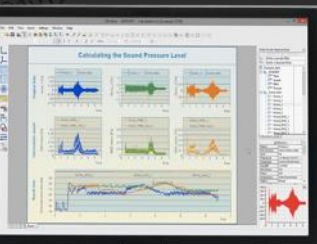
Industrial
Platforms



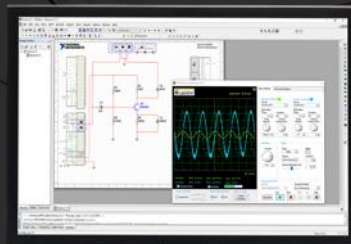


ACADEMIC SITE LICENSE

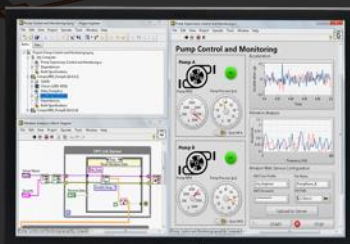
Comprehensive Suite of Over \$100,000 of NI Software



DIAdem



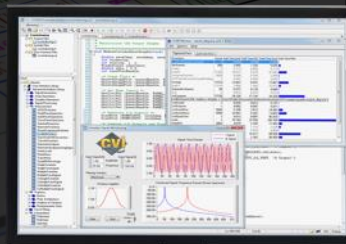
Multisim



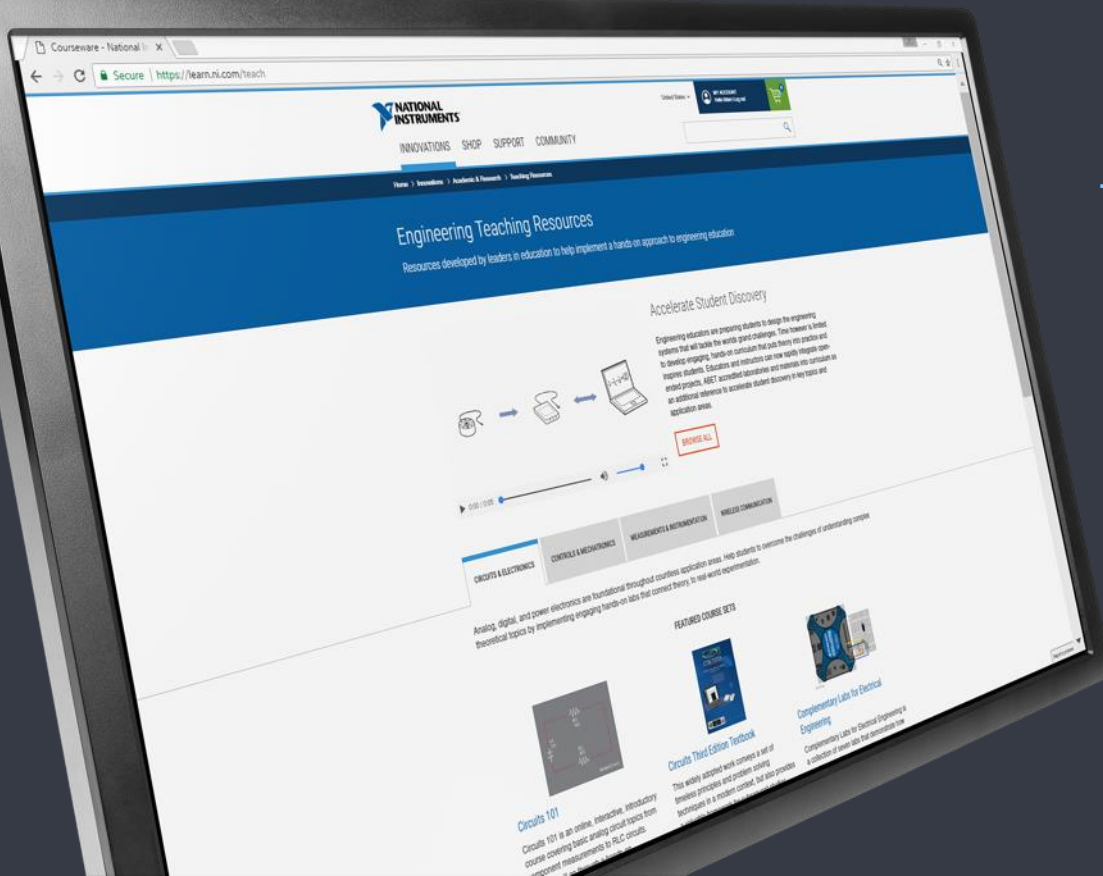
LabVIEW



LabVIEW Communications



LabWindows™/CVI



Teaching Resources Portal

Materials to Engage Today's
Engineering Student



MIT TECHNOLOGY REVIEW

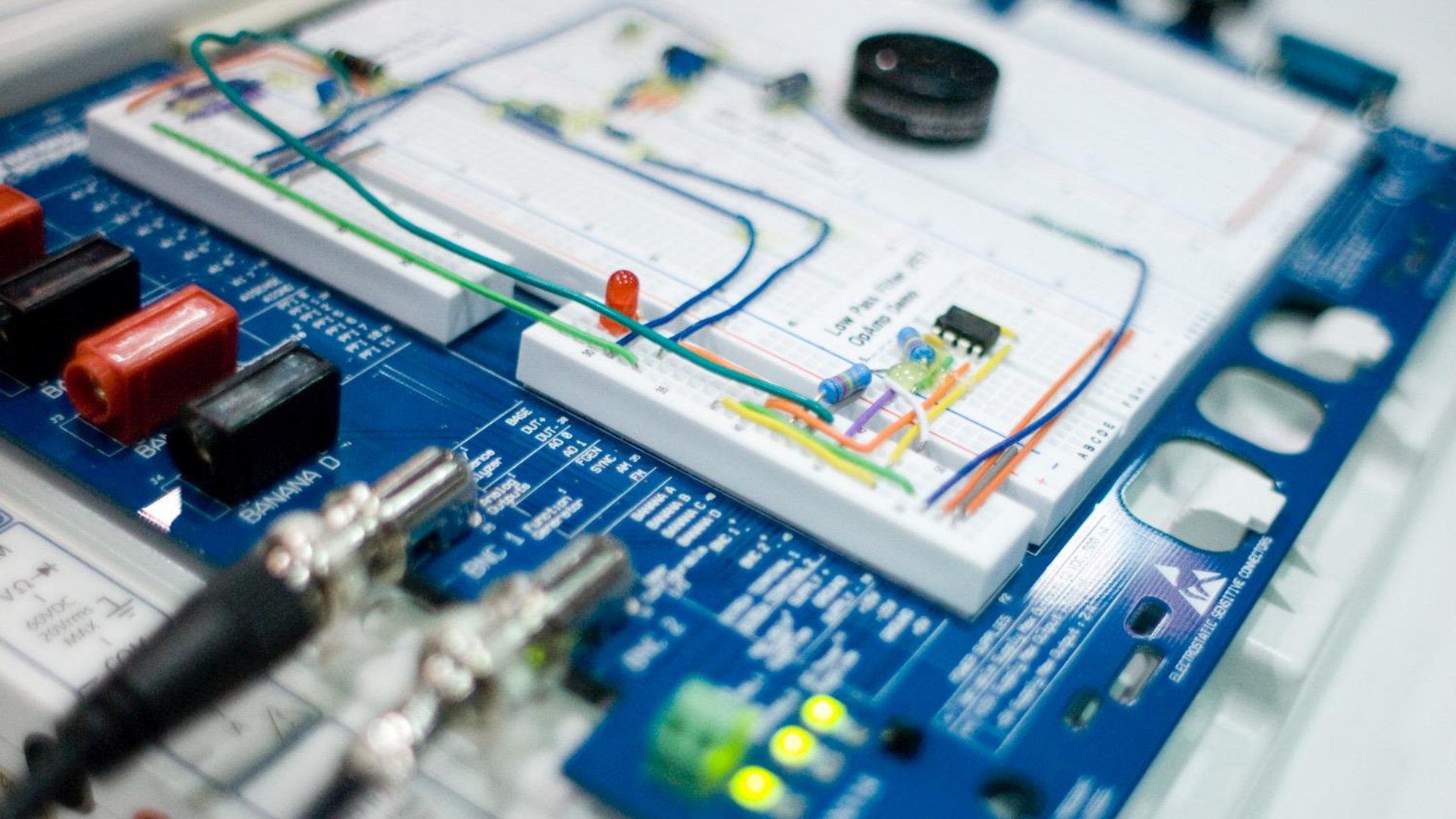
2021 May Be the Year of the Fully Autonomous Car





NATIONAL RENEWABLE ENERGY LABORATORY

80% of US Energy from Renewable Sources by
2050





First engineering school in the south, 1819
#2 public university in the United States
2,700 undergraduate engineering students



The Electrical Engineering Department's National Ranking Has
IMPROVED BY 16 POSITIONS



SUBSYSTEMS

Mechatronics

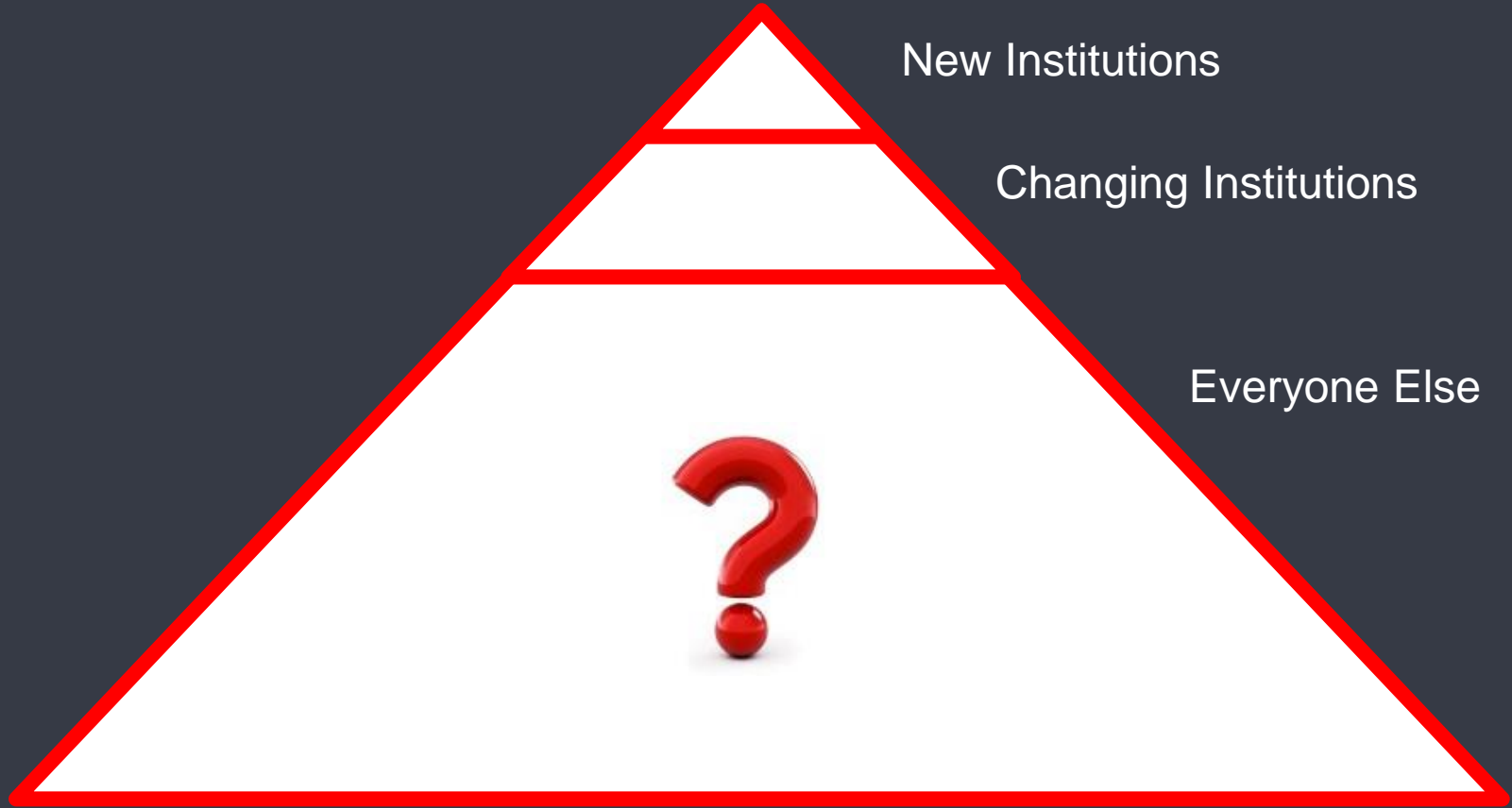
 **QUANSER** = Question + Answer

How do we prepare our students to meet the engineering challenges of Industri 4.0 and IoT?

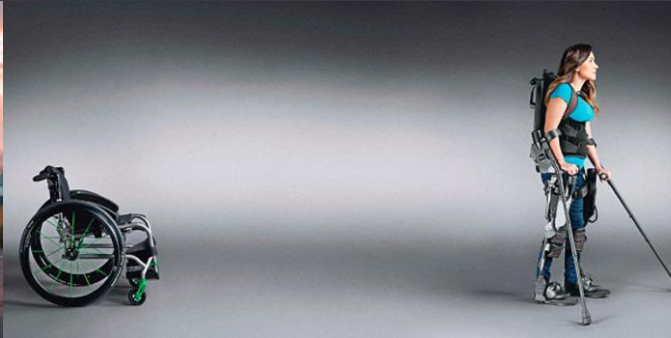
Demographic Trends



Pace of Academic Change



A Golden Age of Engineering ... Built on Mechatronics



MECHATRONICS COURSE SEQUENCE

INTRODUCTORY



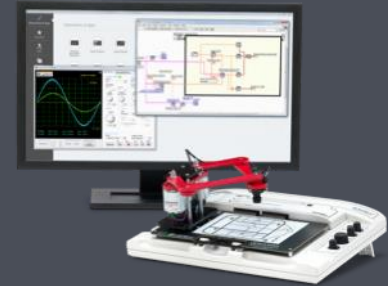
Measurements and Analysis
Introduction to Controls
Thermodynamics and
Fluid Dynamics

FUNDAMENTALS



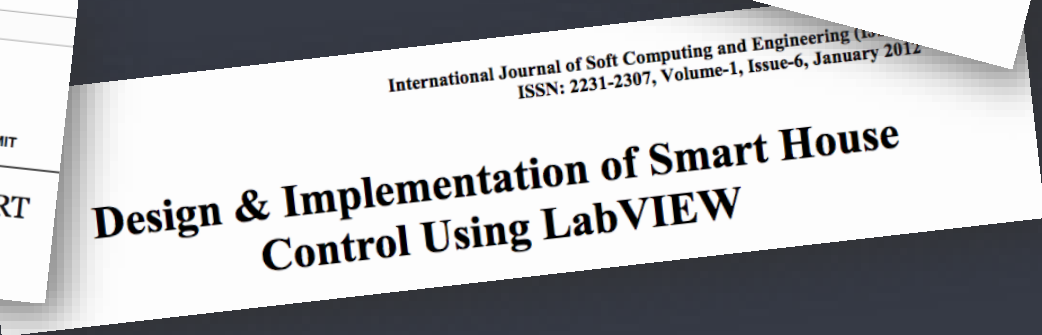
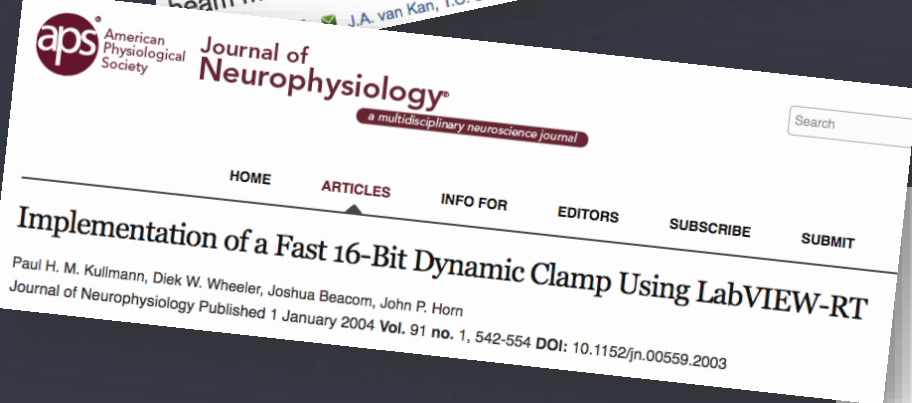
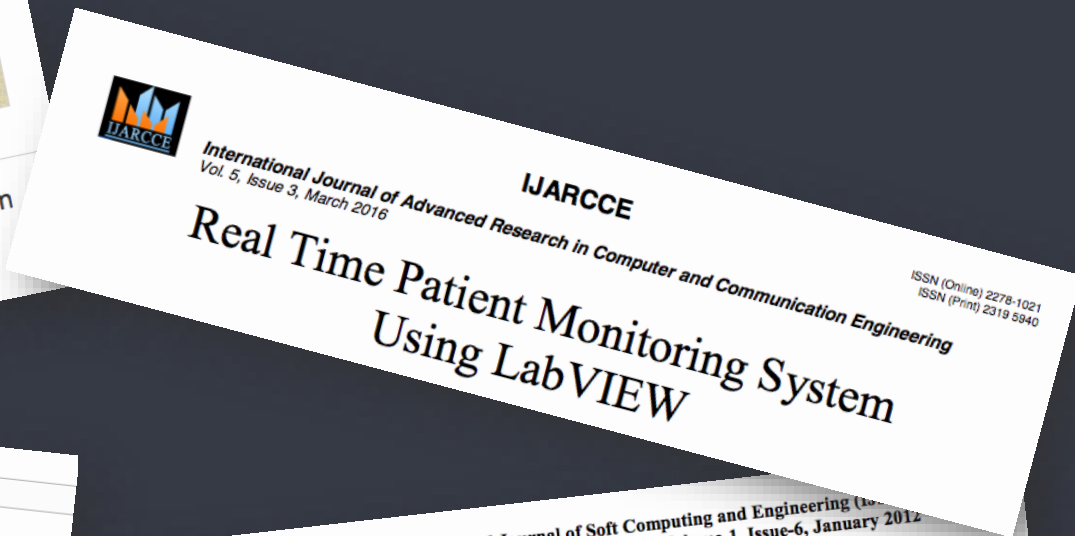
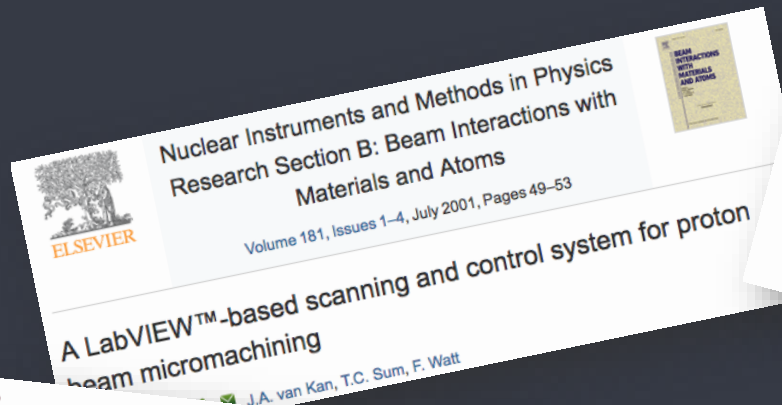
Classical Controls
Sensors and Instrumentation
Actuators and Power Electronics
Interfacing and Microcontrollers

SYSTEMS



Mechatronics Systems
Advanced Control Systems
Mechatronics Systems

LabVIEW in Mechatronics



High Fidelity Mechatronic Control of Physical Systems



QUANSER QUBE 2.0

Compact and integrated rotary servo system

Built-in voltage amplifier with integrated current

User-controllable tri-color LED

Motivating Contemporary Applications



QUANSER AERO

High-efficiency cordless DC motors

Pitch and yaw axes and DC motors/rotors
speed measurements through digital tachometer

Easy-connect cables and connectors



A close-up photograph of a Quanser Aero mechatronics platform. The device features a black base with a glowing green LED strip along its front edge. A black, 3D-printed cylindrical component is mounted on the base. Above this, a black metal frame with horizontal bars is visible. The background is a solid red surface.

QUANSER
INNOVATE · EDUCATE
Quanser AERO
MECHATRONICS EXPLORATION
AND CONTROL PLATFORM
WWW.QUANSER.COM
MADE IN CANADA

Adapting to Smart Systems

Cyberphysical Systems

Industri 4.0

Smart Energy



Internet of Things: IoT

Smart Factories

Advanced Manufacturing

Academic Abstraction for Smart Systems

Cloud server and communication

Cloud intelligence

Security

Smart Devices



Actuators

Sensors

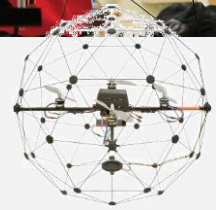
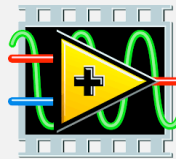
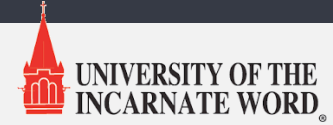
Device intelligence



IoT-Ready Intelligent Physical Systems



Transformational Labs for Today's Institutions

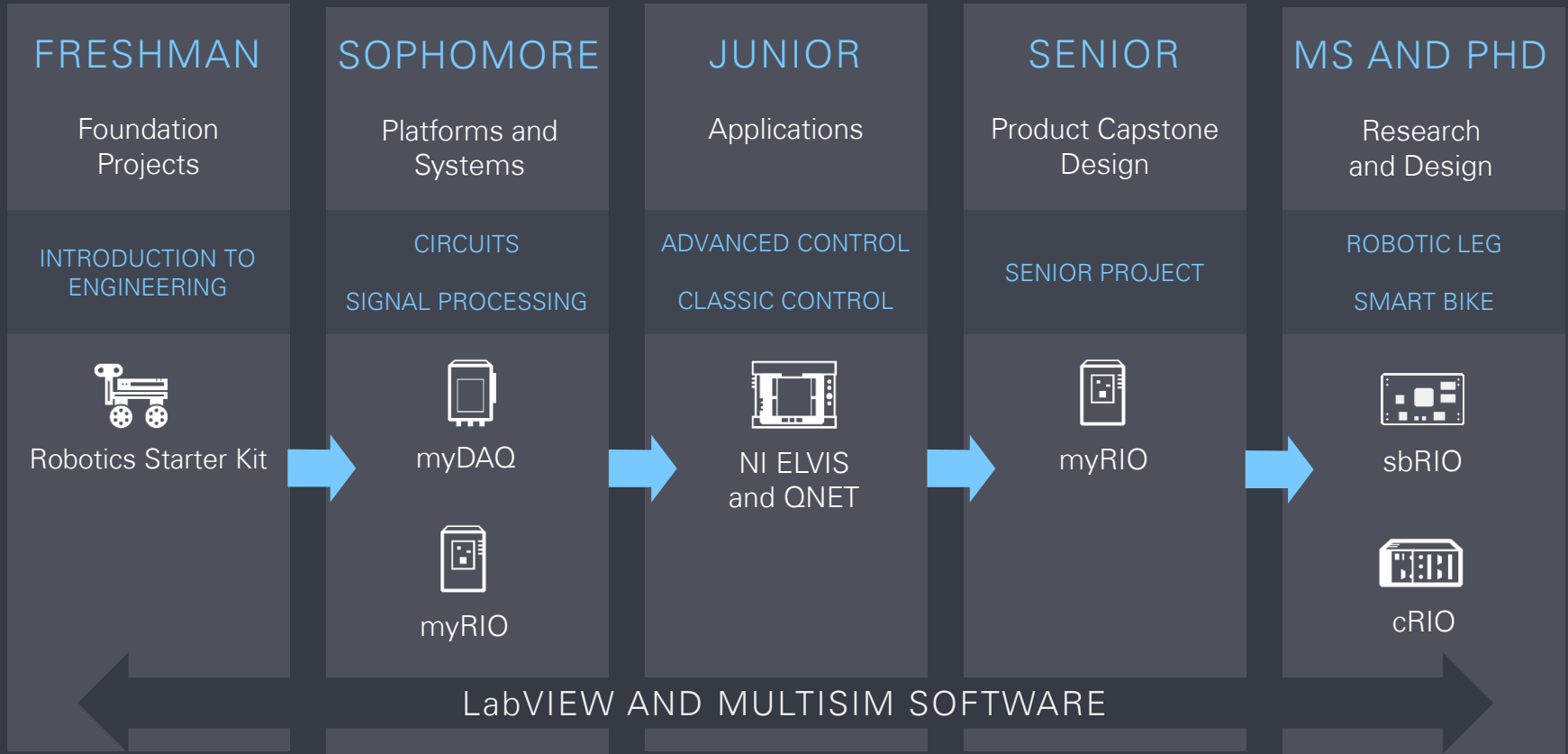


Retooling the modern teaching lab



Founded in 1911 in Beijing China
41,000 students enrolled
Globally ranked #1 engineering
university







Tsinghua University

Building a Comprehensive Mechatronics/Automation Program

Delivering on students capable of
building innovative robotics
projects

Creating a holistic approach from
first year to graduation with the
NI platform



NI Partnership Models for Academic Institutions



Enhance Student
Retention &
Engagement through
Curriculum Change



Collaborate to
Increase Research
Funding



Deliver Student
Engagement &
Employment

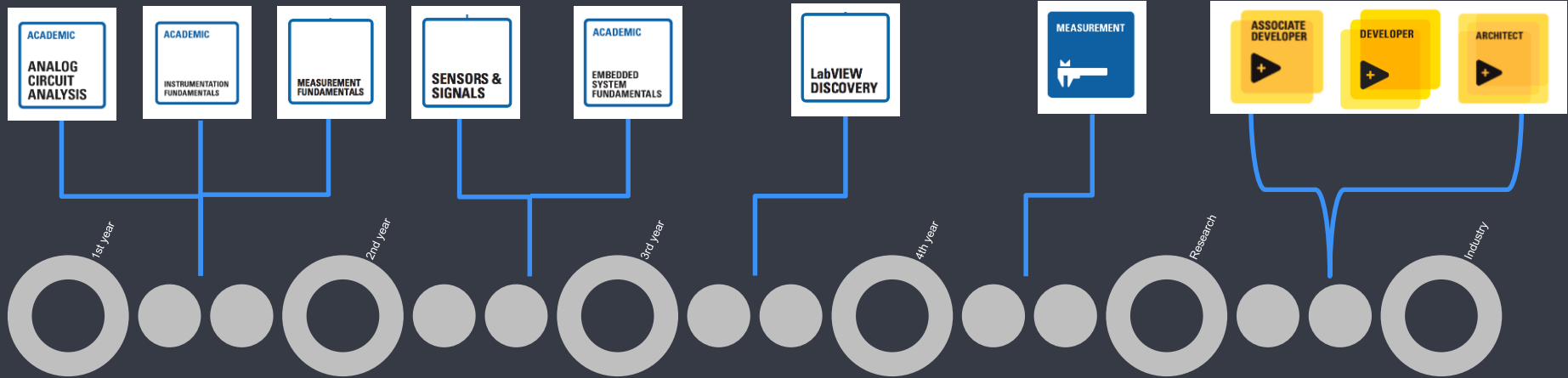


Support Global
Societal Impact



Increase Relevancy to
Industry with Center
of Excellence and
Certification

Enabling Students to Build Knowledge and Skills



Introductory Theory

- Introduction to Engineering
- Measurements & Instrumentation
- Analog Circuits
- Physics

Fundamentals of Engineering

- Signals and Systems
- Microelectronics
- Digital Electronics
- Embedded Systems
- Process Controls

Understanding Complex Theory

- Advanced Controls
- Power Electronics
- Sensors & Actuators
- Introduction to Communications
- Capstone Preparation
- Aerospace Controls

Application to Systems

- Robotics
- Energy Systems
- Power Systems
- Mechatronics Systems
- Communication Systems
- Capstone Design

Advanced Research

- mmWave, Massive MIMO, 5G
- Autonomous Vehicles
- Internet of Things
- Renewable/Energy
- Semiconductor
- Aerospace
- Structural Health Monitoring
- Medical Imaging
- Big Physics



Big Physics



Clean Energy



5G



IOT



Driverless Cars



ni.com/teach