

Remote Labs – Electrical Engineering Experiments

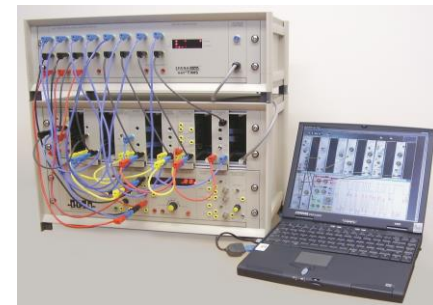
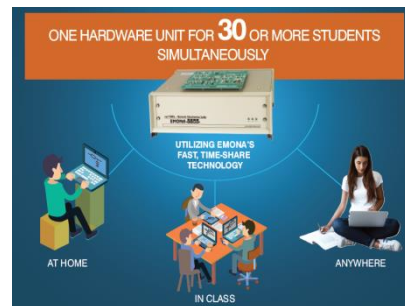
In the next 8 slides you will learn:

What are “Remote Engineering Labs”?

How do they work?

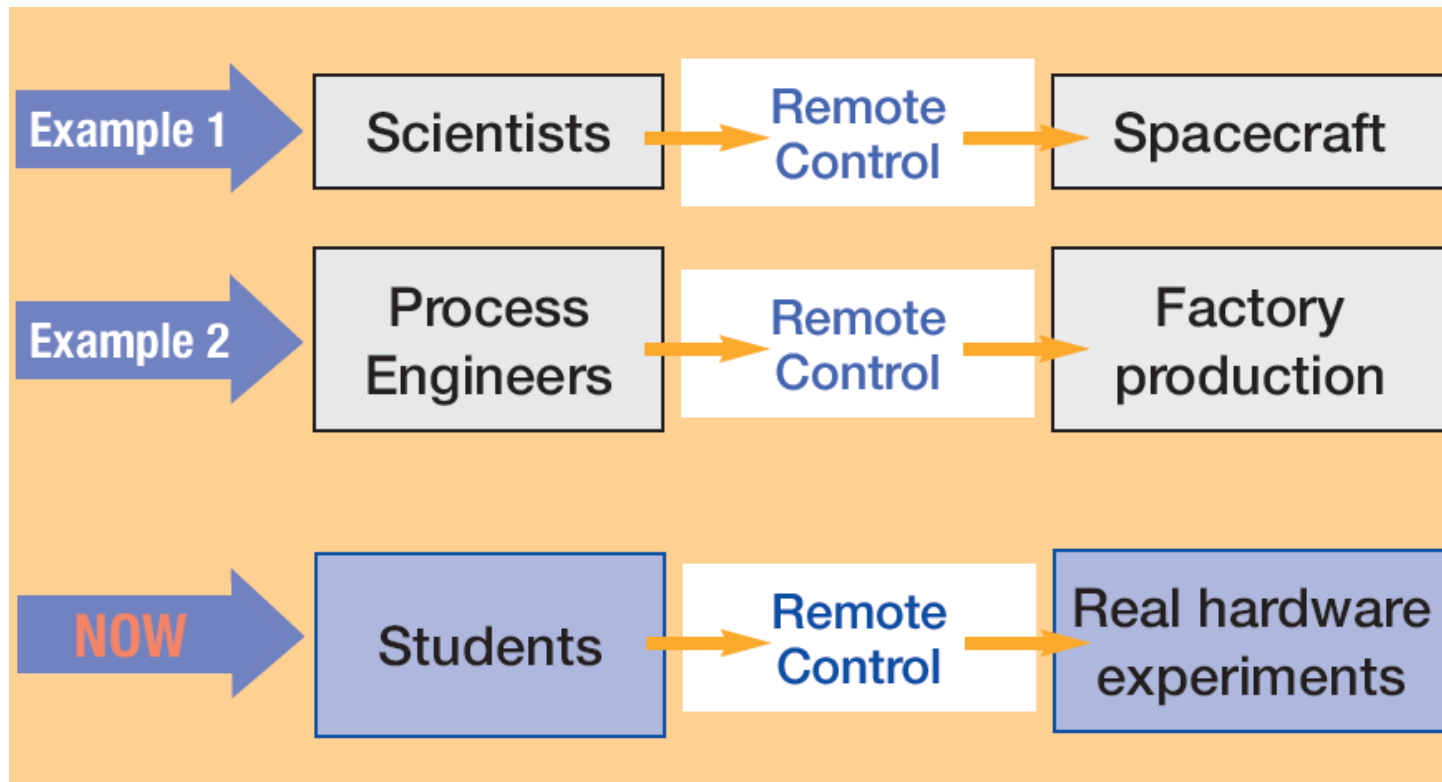
and

You can try them out for yourself.



With Remote Labs, students control real hardware...

in the same way as scientists and engineers control spacecraft and factory processes



Remote Labs provide a third alternative and enhancement to traditional hardware experiments and simulation experiments

TRADITIONAL

practical experience with real parts, real signals in realtime

Hands-on hardware experiments

Simulation software

CONVENIENT

on-screen experience with ideal parts, ideal waveforms, a valuable design tool

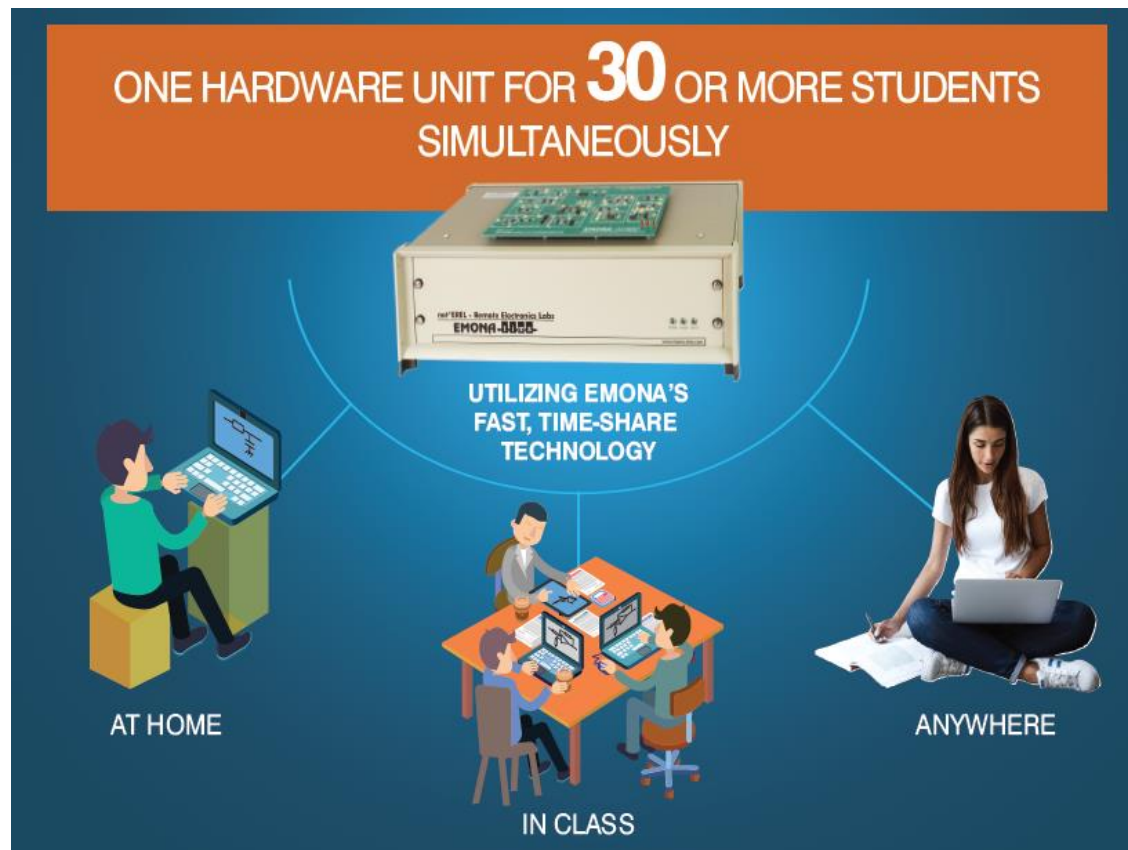
Remote controlled experiments

netCIRCUITlabs - A NEW LAB RESOURCE

- ◆ 24/7 hands-on experiments
- ◆ 30+ users AT THE SAME TIME
- ◆ Simple INTERNET BROWSER access and control
- ◆ Analog & digital electronic circuits

Remote Labs offer

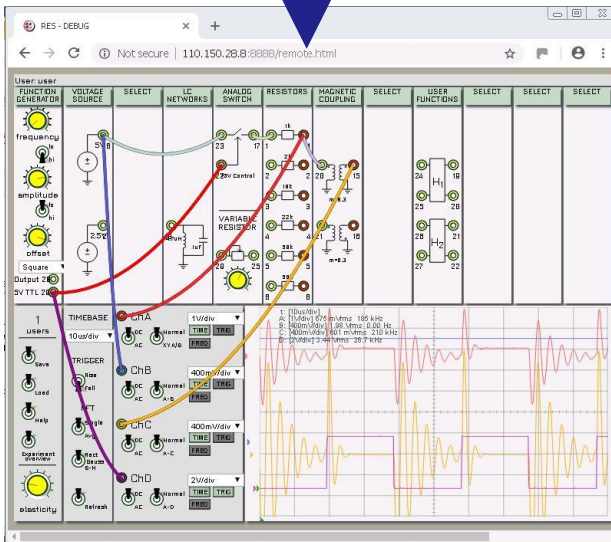
- Lab programs for multiple classes, with one piece of hardware
- Providing hands-on hardware experiments
- 24/7 access to experiments for up to 70 students AT A TIME



Remote Lab Attributes



INTERNET



- 1 – DIRECT EXTENSION OF THE PHYSICAL LAB
- 2 – FAST RESPONSE
- 3 – REAL “non-ideal” PARTS
- 4 – MULTIPLE EXPERIMENTS: all students can do the same OR different experiments, AT THE SAME TIME

Student transition from a traditional lab to a remote lab is seamless

Student experiment access via web browser

RES - DEBUG
Not secure | 110.150.28.8:8888/remote.html

User: user

FUNCTION GENERATOR: frequency, amplitude, offset, Square, Output 20, 5V TTL 20

VOLTAGE SOURCE: 5V, 2.5V

SELECT

LC NETWORKS

ANALOG SWITCH: 23, 17, 2, 3, 4

RESISTORS: 1k, 18k, 22k, 33k

MAGNETIC COUPLING: 2B, 15, 3, 4, 18

SELECT

USER FUNCTIONS: H1, H2

SELECT

SELECT

SELECT

SELECT

10us/div

TRIGGER: Rise, Fall, Edge, Single, Rect, Freeze

TIMEBASE: 1V/div, 400mV/div, 400mV/div

CH A: 10us/div, 1V/div, Normal, FREQ

CH B: 400mV/div, 1.88 Vrms, 0.00 Hz

CH C: 400mV/div, 601 mVrms, 210 kHz

CH D: [2V/div] 3.44 Vrms, 26.7 kHz

REAL-TIME EXPERIMENT PATCHING & CONTROL

LIVE INSTRUMENT CONTROL AND DISPLAY

netCIRCUITlabs includes a webcam so students can see the hardware



Two EMONA TIMS – Remote Lab Experiment Platforms

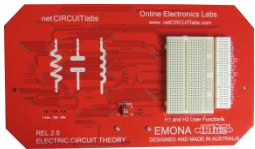
1. ELECTRONICS CIRCUITS EXPERIMENTS:

netCIRCUITlabs Control Unit:



The **experiment board** plugged-in, contains a number of experiments.

netCIRCUITlabs Experiment Boards:



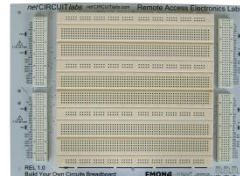
CIRCUIT THEORY



DIGITAL LOGIC



TRANSISTORS



CUSTOM CIRCUITS

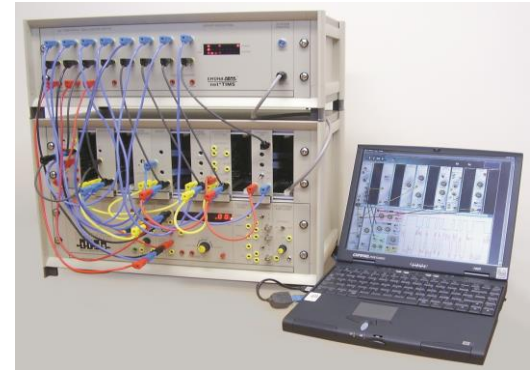
Professor built, analog or digital custom circuits for students to control remotely.



OP-AMPS

2. TELECOMS EXPERIMENTS:

netTIMS-System:



net*TIMS for ADVANCED Telecoms and signals & Systems experiments.

netTIMS-FreeWire:



netTIMS-FreeWire for FUNDAMENTAL Telecoms experiments.

Recapping - the Benefit for Institutions:

- **With one piece of equipment**

30 students at one time carrying out multiple experiments.

- **24 x 7, 365 days**

Extreme flexibility for students, teachers and course schedules.

- **Savings**

Save cost, save storage space, increase lab time.

TEST DRIVE REMOTE LABS TODAY

Go to **www.emona-tims.com** and
click on **"IoT BASED HARDWARE LABS"**

The screenshot shows a web browser window with the URL www.emona-tims.com. The website header includes the Emona Tims logo (Wireless Signals Lab Equipment) and navigation links: HOME, ABOUT TIMS, BLOG, CONTACT US, and FAQ. A user login/register button is also present. A main navigation bar contains: PRODUCTS & SOLUTIONS, CURRICULUM, EXPERIMENTS LIST, SAMPLE MANUALS, WATCH VIDEO, and NEW FROM TIMS. A dropdown menu under PRODUCTS & SOLUTIONS lists: TIMS-301 ADVANCED LAB TEACHING, BISKIT COMPACT EXPERIMENTER, IOT BASED HARDWARE LABS (highlighted with a red arrow), TUTORTIMS PREPARE BEFORE LAB, and NI ELVIS BOARDS & MYDAQ. A secondary dropdown menu under IOT BASED HARDWARE LABS lists: NET CIRCUIT LABS - ANALOG & DIGITAL ELECTRONICS (highlighted with a red arrow), TELECOMS ONLINE LABS - NET*TIMS, and NETTIMS FREEWIRE. The main content area features a banner for "SER Hardware labs" with images of equipment and the text "One piece of equipment for 30+ students simultaneously!". A video player section at the bottom promotes a "Quick 2 minute TIMS Video" with a "WATCH VIDEO" button. The URL at the bottom of the browser is <https://www.emona-tims.com/emona-product/emona-online-labs/distance-learning-labs/>.