

The Fundamental Objectives of Engineering Instructional Laboratories

- **Lyle D. Feisel** and George D. Peterson, "A Colloquy on Learning Objectives For Engineering Education Laboratories", Proceedings of the American Society for Engineering Education, p. 12, 2002.
- **Lyle D. Feisel** and Albert J. Rosa, "[The Role of the Laboratory in Undergraduate Engineering Education](#)," Journal of Engineering Education, pp. 121-130, January 2005.



The (thirteen) Fundamental Objectives of Engineering Instructional Laboratories

Objective 1: Instrumentation

Apply appropriate sensors, instrumentation, and/or software tools to make measurements of physical quantities.

Objective 2: Models

Identify the strengths and limitations of theoretical models as predictors of real-world behaviours. This may include evaluating whether a theory adequately describes a physical event and establishing or validating a relationship between measured data and underlying physical principles.

Remote Labs as Teaching and Learning Environments

[Hands-on, simulated, and remote labs: A literature review](#)

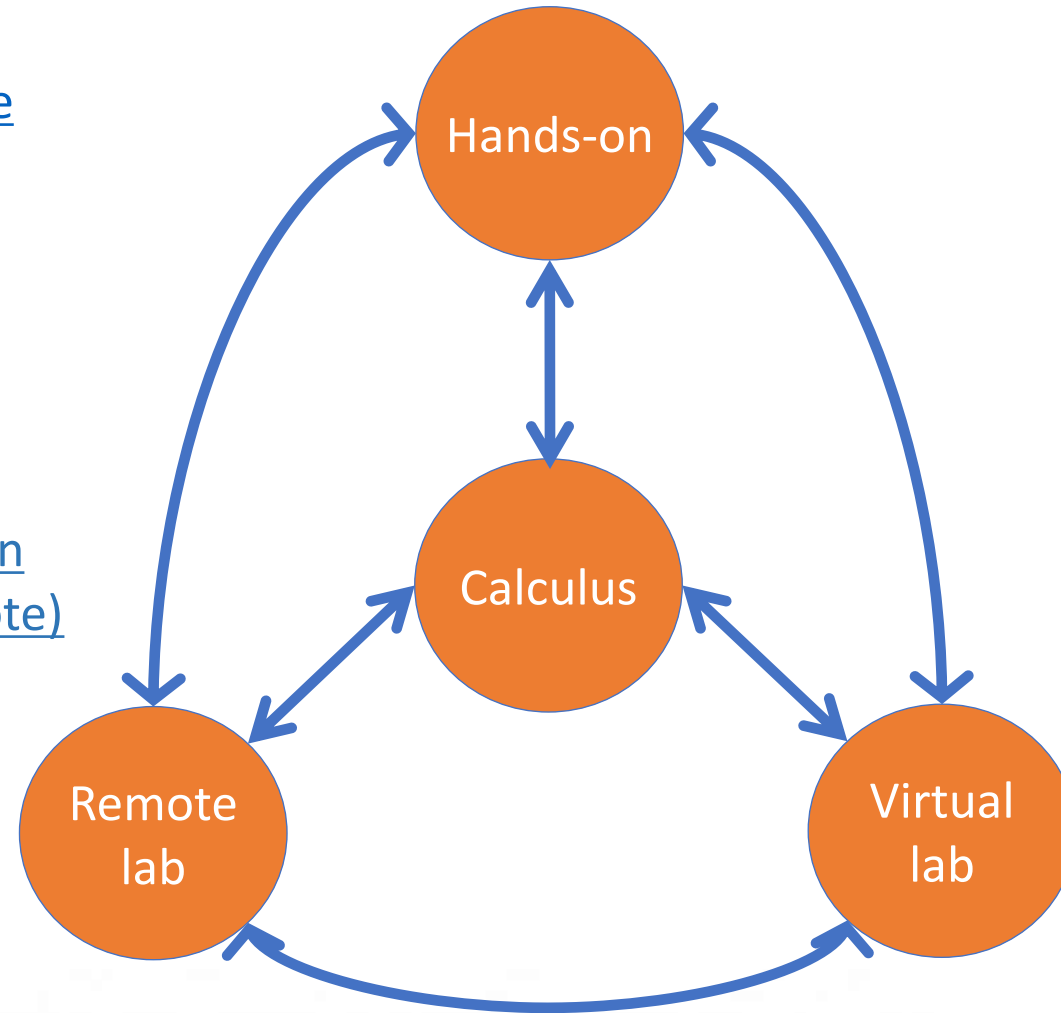
Ma and Nickerson (2006)

[Developing the TriLab](#)

Abdulwahed and Nagy (2010)

[Learning outcome achievement in non-traditional \(virtual and remote\) versus traditional \(hands-on\) laboratories: A review of the empirical research](#)

Brinson (2015)



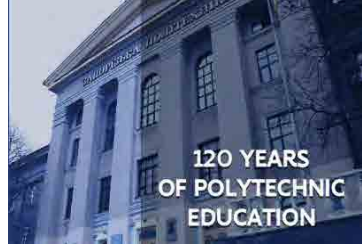
[The Impact of Remote and Virtual Access to Hardware upon the Learning Outcomes of Undergraduate Engineering Laboratory Classes](#)

Euan Lindsay's PhD (2005)

[Weighting and sequence of use of different lab environments in the teaching-learning process](#)

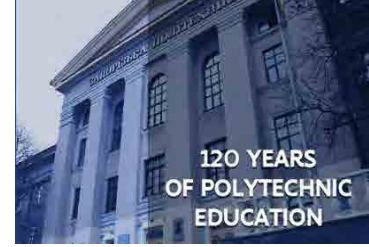
Alves et al. (2008)

Teaching & Learning methodologies based on remote & virtual labs



- Aspects to have in mind:
 - Course syllabus | instructional plan: learning goals | outcomes!
 - See e.g.: <https://www.youtube.com/watch?v=ZgDegfWqkj0>
 - Available resources (materials, infrastructure, tools, environments, etc.)
 - Consider time to adapt to new teaching & learning environments | tools
 - Learning styles | teaching methodologies
 - Diversity!
 - Regular and quick feedback.
 - Assessment
 - Combine individual and group assessment. Equal opportunities and difficulty level.
 - Promote collaborative work during training and independence of results during (individual) assessment

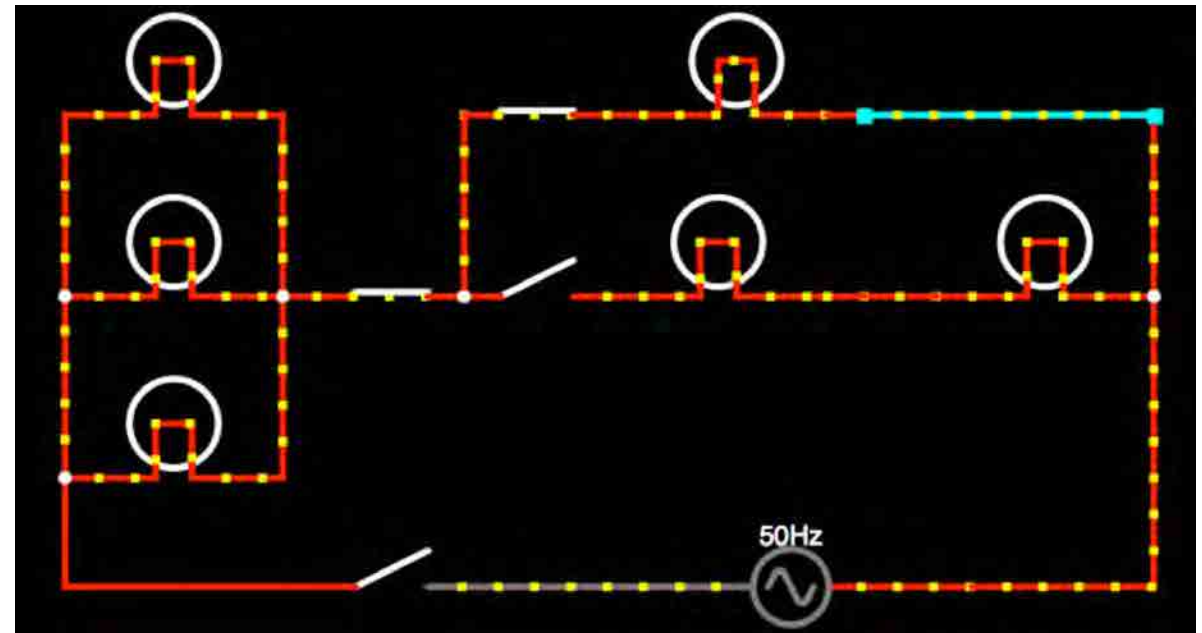
Teaching & Learning methodologies based on remote & virtual labs



- An example in the area of Electricity: a circuit with light bulbs

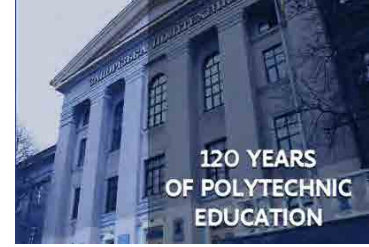


RexLab: UFSC: <http://relle.ufsc.br/labs/2>

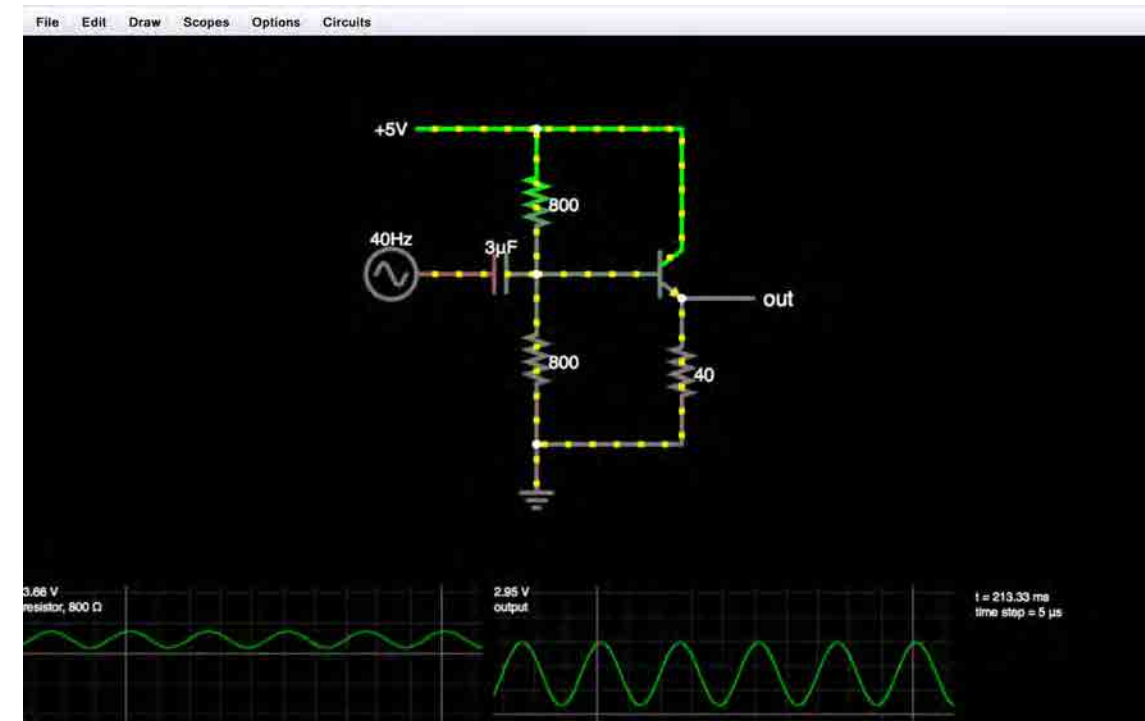
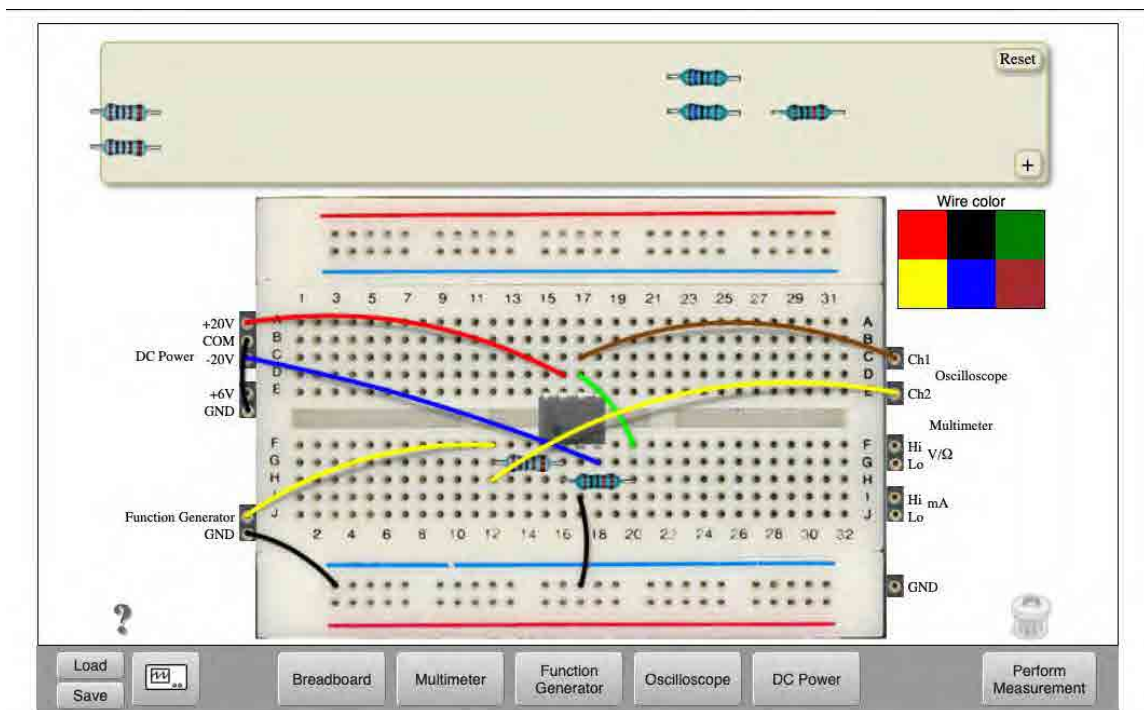


Falstad: circuit simulator: <http://www.falstad.com/circuit/circuitjs.html>
<http://tinyurl.com/yb324g47>

Teaching & Learning methodologies based on remote & virtual labs



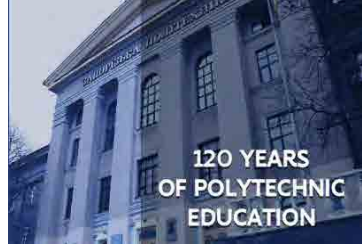
- Example in Electrical Engineering: electric and electronic circuits



VISIR@BTH: <http://openlabs.bth.se>

Falstad: <http://www.falstad.com/circuit/circuitjs.html>

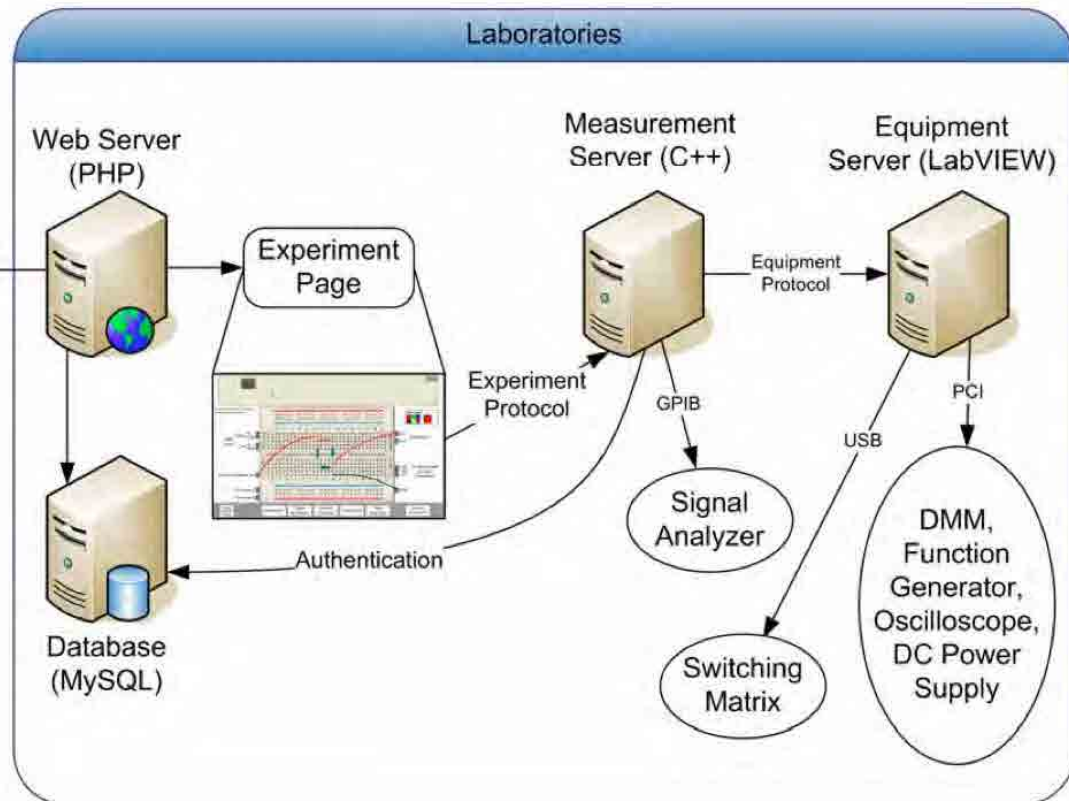
Virtual Instrument Systems in Reality (VISIR)



- Ingvar Gustavsson (inspired in Max Planck):

*“Experimenting could be compared to a conversation with nature. The experimenter asks and nature answers. The tricky thing is formulating a useful question and above all interpreting the answer. The only way to learn the language of nature is performing many experiments in laboratories that can be hands-on **or remote.**”*

Virtual Instrument Systems in Reality (VISIR)



OpenLabs Electronics Laboratory

Login

MAIN MENU

- Start
- About
- Demo
- FAQ

Welcome

Welcome to the distance electronics laboratory.

Here you will find the resources needed to experiment in electronics via the internet. We have developed a system where you can make electronic experiments, right here in your browser. We supply basic equipment, such as oscilloscope, multimeter, function generator and power supply. With these and a number of electronic components you can build circuits on our virtual breadboard. None of the measurements are simulated. The circuits you build will be formed and measured on, and the real measurement results will be displayed.

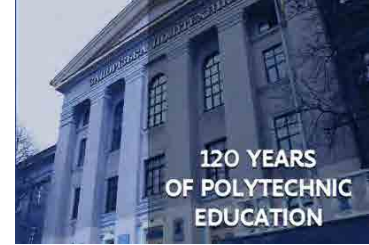
Interested? Go to our [demo page](#).



The measurement hardware

If you have any questions about this page or the laboratory, contact the [administrator](#).

Virtual Instrument Systems in Reality (VISIR)



Hold down and press 'F' to
Use delete to remove wires

Reset

Wire color

DC Power Supply

Function Generator

Ch1 Oscilloscope

Ch2

DMM

Volts

mA

GND

Save

Load

Breadboard

Multimeter

Function Generator

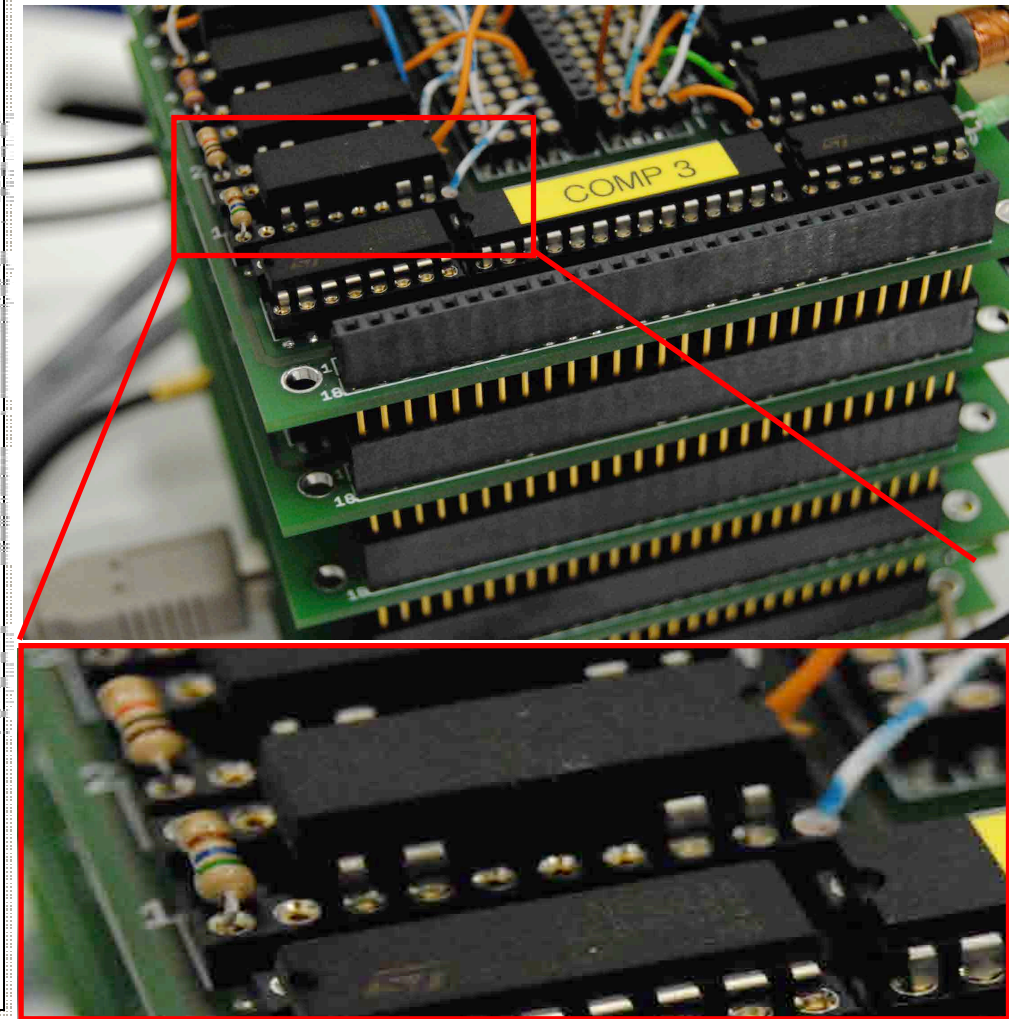
Oscilloscope

DC Power

Perform Experiment

Help

Prepared experiments:
Guest Experiment
Operational amplifier



Sharing and Authoring Platform

Find the largest collection of online labs, try-out interactive inquiry apps, combine labs and apps into Inquiry Learning Spaces, and share these with your students and colleagues.



Thousands of schools all over the world remain closed for the next weeks or even months due to the SARS-CoV-2 (COVID-19) pandemic. In order to support them in delivering online education, we invite all schools and teachers to use the Go-Lab Ecosystem for online STEM teaching. The platform and all tools (including premium labs and apps) are available free of charge. Find more information [here](#).

LAB

Electrical Circuit Lab

In the Electrical Circuit Lab students can create their own electrical circuits...

APP

Hypothesis Scratchpad

The Hypothesis Scratchpad helps learners formulate hypotheses.

LAB

Gravity Force Labs

There are two similar labs that you can see if you create a spa

LAB

Acid-Base Solutions

How do strong and weak acids differ? Use lab tools on your computer to find out!

<https://www.golabz.eu/>

Virtual Labs VIRTUAL LABS

An Initiative of Ministry of Human Resource Development (MHRD) Under the National Mission on Education through ICT

Name of Lab Broad Area Any Search

PARTICIPATING INSTITUTES

- IIT DELHI
- IIT BOMBAY
- IIT KANPUR
- IIT KHARAGPUR
- IIT MADRAS
- IIT ROORKEE
- IIT GUWAHATI
- IIIT HYDERABAD
- AMRITA UNIVERSITY
- DAYALBAGH UNIVERSITY
- NIT KARNATAKA
- COE PUNE

Objectives of the Virtual Labs:

- To provide remote-access to Labs in various disciplines of Science and Engineering. These Virtual Labs would cater to students at the undergraduate level, post graduate level as well as to research scholars.
- To enthuse students to conduct experiments by arousing their curiosity. This would help them in learning basic and advanced concepts through remote experimentation.
- To provide a complete Learning Management System around the Virtual Labs where the students can avail the various tools for learning, including additional web-resources, video-lectures, animated demonstrations and self evaluation.
- To share costly equipment and resources, which are otherwise available to limited number of users due to constraints on time and geographical distances.

The Philosophy

Salient Features

Labs Ready For Use [Click here](#)

Broad Areas of Virtual Labs

- Electronics & Communications
- Computer Science & Engineering
- Electrical Engineering
- Mechanical Engineering
- Chemical Engineering
- Biotechnology and Biomedical Engineering
- Civil Engineering
- Physical Sciences
- Chemical Sciences

Labs developed by Nodal Centers

NODAL CENTERS

Announcements

- University, Amrta has been successfully completed on August 27, 2016.
- State-level workshop on Virtual Labs at Global Institute of Management & Emerging Technologies, Amrta has been successfully completed on Feb 21, 2017.
- State-level

LAB FEEDBACK FORM

LAB ASSESSMENT FORM

FAQ

SHAKSHAT PORTAL

Contact Us
support@vlab.co.in

Laboratórios

Todos | Física | Biologia | Robótica



Painel Elétrico CA

Estudo das associações em série, paralela e mista em redes de corrente alternada.

[Acessar](#)



Ambiente para Desenvolvimento em Arduino

Ambiente que permite verificar, carregar códigos e controlar sensores e atuadores em Arduino

[Acessar](#)



Meios de Propagação de Calor

Estudo dos meios de propagação de calor por convecção e irradiação

[Acessar](#)



Microscópio Remoto

Microscopia de pigmentação foliar

[Acessar](#)



Plano Inclinado

Estudo da segunda lei de Newton do movimento e decomposição de forças em vetores

[Acessar](#)



Disco de Newton

Estudo da composição das cores

[Acessar](#)



COVID-19 announcement

If you are a high school, college or university that has been affected by COVID-19, you can qualify to have a **free subscription** until summer 2020.

[View more information](#)

Labs Land

Real laboratories, on the Internet



Remote Labs



Try the labs



For your educational center

<http://relle.ufsc.br/labs>

<https://labsland.com/en>