

RAMONA OROS , ANDREAS PESTER CARINTHIA UNIVERSITY OF APPLIED SCIENCES

Online labs and current trends

10 April 2017

Rio de Janeiro - Brazil



AGENDA OF THE MEETING

10. April. 2017

13:30 – 14:45

- Welcome and short presentation CUAS
- What means Online labs? How we can use Online labs in education?
- VISIR experience in international projects
- VISIR developed by students

14:45 – 15:00 Short break

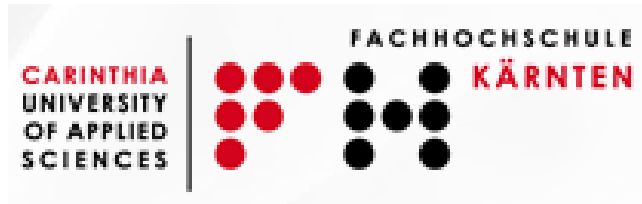
15:00 – 16:00

- VISIR@CUAS

16:00 – 16:30 Wrap up/ Discussions

AGENDA

1. Introduction
2. CUAS team
3. Online labs
4. VISIR@CUAS
5. Wrap up/ Discussions

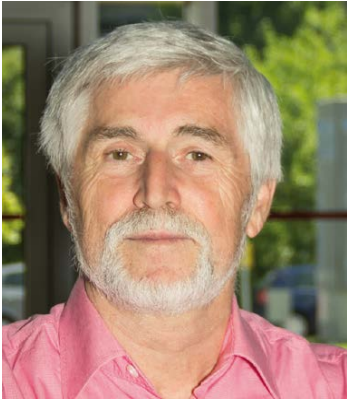


Internationality @ CUAS in numbers

- 140 Partner Higher Education Institution
- 140 Outgoing Exchange Students per year
- 60 Incoming Exchange Students per year
- 6 Master Degree Programs in English



WORKING TEAM @ CUAS - VILLACH



**Professor Dr.
Andreas Pester**



**Professor Dr.
Thomas Klinger**



**Professor Dr.
Michael Auer**



PhD. Ramona G. Oros



MSc. Christian Kreiter



MSc. Danilo G. Zutin

WORKING EXPERIENCE

- We are working in the area of internationalization and online learning since 2004. Since that time we participated and are participating on 2 FP 7 projects, 1 Socrates, 3 Minerva and 4 Tempus projects, 2 Erasmus+, several national projects, dedicated to that topic. The target groups for the application had been universities, schools and SME's.
- We have a worldwide network with partners from all Europe, USA, Latina America, Australia and Asia in this area.

WORKING EXPERIENCE

Our compences are

- Adaptive Interfaces for Online Labs <http://www.fh-kaernten.at/projekte/projekthp.php?feoid=4300787437>
- Labs in the Cloud from the user and from the lab provider perspectives.
- Inquiry learning environments with online labs
- Distributed architectures for Online Laboratories and Remote Lab Management Systems (RLMS), like ISA (iLab Shared Architecture) <http://ilabs.cti.ac.at/iLabServiceBroker/>
- Pocket lab environments on myDAQ and Raspberry PI basis

IAOE AND GOLC

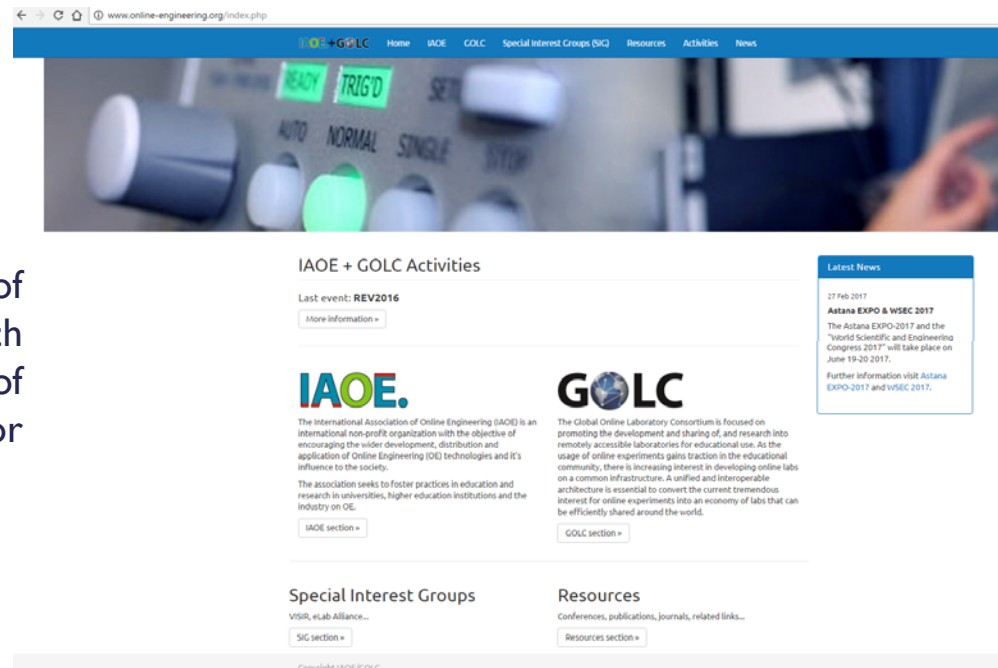
<http://www.online-engineering.org/>

IAOE – international Association of Online Engineering

- the annual "International Conference on Remote Engineering and Virtual Instrumentation" (REV)
- Promotion of scientific and technical events in the field of Online Engineering
- Publication of International Journals
- Organization of seminars, courses etc.

GOLC – Global Online Laboratory Consortium

“The mission of the consortium is the creation of sharable, online experimental environments which increase the educational and scientific value of learning which may not be accessible, scalable or efficient through traditional methods.”



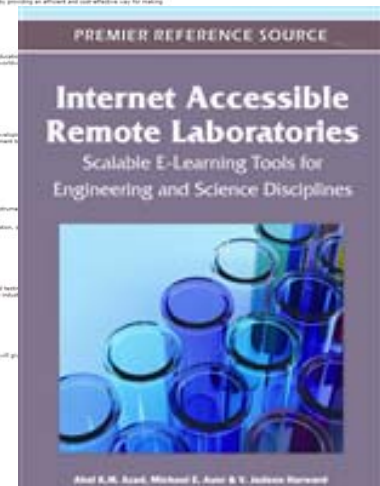
IJOE AND OTHER PUBLICATIONS

<http://online-journals.org/>

The objective of the journal is to publish and discuss fundamentals, applications and experiences in the field of remote engineering, cyber-physical systems, virtual instrumentation and online simulations. The use of virtual and remote controlled devices and remote laboratories is one of the future trend developments for advanced teleworking/e-working environments.

Last volume was published in March

<http://online-journals.org/i-joe>



REV CONFERENCES (SINCE 2004)

<http://www.rev-conference.org/>



REV International Conference on Remote Engineering and Virtual Instrumentation

[Home](#) [Steering Committee](#) [Past Conferences](#) [Publication Ethics](#) [Proceedings/Indexing](#)

International Conference on Remote Engineering and Virtual Instrumentation (REV)

REV is a series of annual events concerning the area of remote engineering and virtual instrumentation. The REV conferences are the annual conferences of the International Association of Online Engineering (IAOE, www.online-engineering.org).

The general objective of this conference is to demonstrate and discuss fundamentals, applications and experiences in the field of remote engineering and virtual instrumentation. With the globalization of education the interest in and need of teleworking, remote services and collaborative working environments now increases rapidly. Another objective of the symposium is to discuss guidelines for education in university level courses for these topics.

Scope of the Conference

Remote Engineering and Virtual Instrumentation are very future trends in engineering and science. Due to:

- the growing complexity of engineering tasks,
- more and more specialized and expensive equipments well as software tools and simulators,
- the necessary use of expensive equipment and software tools/simulators in short time projects,
- the application of high tech equipment also in SMEs,
- the need of high qualified staff to control recent equipment,
- the demands of globalization and division of labour,

it is increasingly necessary to allow and organize a shared use of equipment, but also specialized software as for example simulators. Organizers especially encourage people from industry to present their experience and applications of remote engineering and virtual instruments.

Topics of interest include (but are not limited to)

- Virtual and remote laboratories
- Remote process visualization and virtual instrumentation
- Remote control and measurement technologies
- Online engineering
- Networking and grid technologies
- Mixed Reality environments for education and training
- Demands in education and training, e-learning, b-learning, m-learning and ODL
- Open educational resources (OER)
- Teleservice and telediagnosis
- Telerobotics and telepresence
- Support of collaborative work in virtual engineering environments
- Teleworking environments
- Telecommunities and their social impacts
- Present and future trends, including social and educational aspects
- Human computer interfaces, usability, reusability, accessibility
- Applications and experiences
- Standards and standardization proposals
- Innovative organizational and educational concepts for remote engineering
- Products

REV2017

14th International Conference on Remote Engineering and Virtual Instrumentation

Date and Venue

15-17 March 2017, Columbia University, New York, USA

Overview

The REV conference is the annual conference of the International Association of Online Engineering (IAOE) and the Global Online Laboratory Consortium (GOLC).

REV 2017 is the 14th in a series of annual events concerning the area of Remote Engineering and Virtual Instrumentation. The general objective of this conference is to contribute and discuss fundamentals, applications and experiences in the field of Remote Engineering, Virtual Instrumentation and related new technologies like Internet of Things, Industry 4.0, Cyber Security, M2M and Smart Objects. Another objective of the conference is to discuss guidelines and new concepts for education at different levels for above mentioned topics including emerging technologies in learning, MOOCs & MOOLs, Open Resources and STEM pre-university education. REV2017 will offer an exciting technical program as well as networking opportunities.

Co-Organizers



Sponsors



Supported by



Important Dates

Date	Event
10 Oct 2016	Submission of structured abstracts for full and short papers. Submission of proposals for special sessions.
17 Oct 2016	Invitation to submit a full paper or short paper.
28 Nov 2016	Submission deadline for complete full and short papers and all other submissions. (Official sessions papers, Work in Progress, Demos, Poster, Tutorials, Workshops).
12 Dec 2016	Notification of Acceptance.
23 Jan 2017	Author registration and camera-ready due.
15 Mar 2017	Conference Opening.

Contact

REV Closing house
info@rev-conference.org
phone: +43-5-90500-215
phone: +4-202-470-0551

REV 2018 – Düsseldorf

REMOTE ENGINEERING EDUCATIONAL PROGRAMS

- Master level – CUAS, Uporto, University of Technology Bratislava
- Phd – Deusto/Bilbao, Uporto, UNED ,University of Technology Ilmenau

RESEARCH GROUP

ONLINE AND POCKET LABS

Main interest in the actual technical context

- Provide scientific exchange platform on Online and Pocket Labs on our university
- Representation of university at national & international Conferences in these fields
- Research on new platforms and software frameworks to assist and simplify the development of Online Labs
- Development of a scientific general concepts of "Non-classical laboratories" in STEM education
- Scientific and organizational support of the conferences REV, ICL, IMCL and EDUCON

VISIR AND ONLINE LABS IN PROJECTS

- E-pragmatic
- OLAREX
- GoLab
- iCo-op
- eScience
- OnlineLabs4All

E-PRAGMATIC

Project goals

- Implementation of the multi-language e-learning portal to deliver the e-materials and tools for the distance training with remote experiments/remote workstations
- To trigger and sustain the learning motivation of training participants by providing the necessary tools for discuss of the training contents and job related engineering problems.
- Offering new business opportunities by stating the needs, describing the products and activities of the participant institutions and companies.

<http://www.e-pragmatic.eu/>

E-PRAGMATIC

Project outputs

- Educational approach suitable for distance education in industry was developed. It is based on classical andragogy theory but it takes into account new technical possibilities/tools available in distance learning and results of needs analysis.
- The modules include case studies, concrete problems from industry and practical exercises.
- Half of training modules include remote experiments or remote working stations to facilitate acquisition of practical experience and skills, which weren't used in industrial training before.

OLAREX

Project goals

- To define the school/academia ICT needs for knowledge and skills in STEM;
- To build teachers', students', and museum employees' e-didactic competences in STEM;
- To develop practically-oriented learning modules with remote experiments and integrate contents and functionality in e-learning portal;
- To enhance and modernize the teaching/learning tools and methods for formal and non-formal lifelong learning institutions;
- To initiate the school-enterprises linkage.

www.olarex.eu

OLAREX

Project outputs

- The main output of the OLAREX project was the online training for secondary school teachers that took place in all six consortium countries.
- OLAREX created a pool of trained national representatives of secondary schools in STEM education

The screenshot shows a Moodle course page for 'Analogue circuits measurements' on the OLAREX platform. The browser address bar shows 'www.olarex.eu/moodle/mod/scorm/player.php'. The user is logged in as 'Ramona Oros'. The page features a navigation menu on the left with links to 'Home', 'My home', 'Site pages', 'My profile', 'My courses', 'STUD', 'OLAREX Instruments', 'OLAREX Remote Labs', 'Optics', 'Logic Gates', 'Circuits', 'Participants', 'Reports', and 'General'. The main content area is titled 'Analogue circuits measurements' and contains a list of activities including 'VLSIR', 'How it works?', 'How to start an experiment?', 'Where can be used', 'Advantages of analog circuits', 'Exercises', 'Resistor', 'Practical characteristics', 'Interesting and fun!', 'Exercises', 'Experiments on VLSIR', 'Serial Circuits', 'Theoretical application', 'Interesting and fun!', 'Experiments on VLSIR', 'Parallel Circuits', 'Theoretical application', 'Interesting and fun!', 'Experiments on VLSIR', 'Series Parallel Circuits', 'Theoretical application', 'Interesting and fun!', 'Experiments on VLSIR', 'Diode', 'General view', 'Current-voltage characteristics', 'Interesting and fun!', 'Exercises', 'LED - Light Emitting Diode', 'General view', 'Characteristics', 'Interesting and fun!', 'Exercises', and 'Final Project'. The right sidebar contains a section titled 'Analogue circuits measurements' with a description of the module, its objectives, requirements, and the required minimum hours for finishing the course.

Analogue circuits measurements

This module is dedicated to teachers in the use of students. Here they can find an alternative way of teaching about analog circuits using a remote control system, VISIR.

During 4 units it will be presented theoretical aspect about analog circuit measurements and their components, but also some exercises and experiments. The presentation will start from general aspects and then going to particular. At the end of each subject will be a part where to test the knowledge or to make some experiments.

Using this kind of remote labs teachers can provide their students a new and innovative way of learning without breaking down anything and without being in danger if they are not using appropriate equipment.

Objectives

To get knowledge and experience to work with remote laboratory. To develop using VISIR electrical circuits.

To introduce real laboratory equipment such as multimeter, direct current (DC) Power, Oscilloscope, and Function Generator into remote world and to use them as they are meant to be used in the lab.

Requirements

- 1. Internet Connection
- 2. Flash player.
- 3. Any web browser (e.g. Chrome, Firefox, Internet Explorer). Now VISIR remote experiment is available also over Smartphone with Android OS

Required minimum hours for finishing the course

The minimum number of hours for finishing the Analog circuits measurements training course is 20 hours.

GO-LAB

Project goals

- Creating a pedagogical framework for inquiry learning with online labs that encompass an inquiry processes structure, and for each inquiry process a selection and specification of cognitive scaffolds,
- Building of the Go-Lab federation of online labs to create a pool of online labs, providing one-click access to online labs and personalization facilities with services to easily plug-in and share online labs by the lab-owners, as well as services to integrate additional features.

www.golabz.eu

GO-LAB



The screenshot shows the GO-LAB website interface. At the top, there's a navigation bar with links: Home, Project, Online Labs (active), Teachers, Research, Partners, and Keep in touch. The main content area is titled 'Online Labs' and contains a paragraph about the project's goals and a list of filters on the right. The filters include 'Filter by lab type' (Data Set & Resource (9), Virtual Experiment (5), Remote Lab (6), Analysis Tool (3)), 'Filter by subject(s)' (Physics (1), Astronomy (14), Engineering (7), Mathematics (7), Technology (7), Biology (6), Chemistry (6), Earth Sciences (6), Environmental Science (6), Electronics (1), Materials Science (1)), and 'Filter by language(s)' (English (20), French (1)).

FW Fachhochschule Kärnten x Online Labs | Go-Lab x
www.go-lab-project.eu/online-labs?page=4&f[0]=field_subject%3A217

GO-LAB
GLOBAL ONLINE SCIENCE LABS
INQUIRY LEARNING AT SCHOOL

Home Project **Online Labs** Teachers Research Partners Keep in touch

Online Labs

The online labs aim at supporting inquiry-based learning and providing the possibility to conduct scientific experiments in a virtual environment. Importantly, the inquiry process should be well structured and scaffold to achieve optimal learning results. Scaffolding refers to support (dedicated software tools) that helps students with tasks that they cannot complete on their own. For example, they can help students to create hypotheses, design experiments, make predictions, and formulate interpretations of the data.

Online laboratories can be of two kinds. *Remotely-operated* educational labs (remote labs) provide students with the opportunity to collect data from a real physical laboratory setup, including real equipment, from remote locations. As an alternative there are *virtual labs* that simulate the real equipment. Remote and virtual labs both have specific advantages for learning and can be combined to support specific learning activities. Additionally, the Go-Lab project offers access to *scientific databases*, tools, and resources supporting inquiry learning activities of the students.

Please use the filters on the right to find appropriate online labs and resources for your class.

VISIR

Subject(s): Physics, Electronics
Lab Type: Remote Lab
Weblink: [Link](#)
Language(s): English
Grade Level(s): Secondary Education (12-15 years old), Secondary Education (15-18 years old), Higher Education Bachelor, Higher Education Master
Booking Required: Yes

The VISIR system provides an extraordinarily flexible environment in which students can construct and test different circuits. The modularity of the VISIR hardware permits students to construct and test circuits. Beyond this, the VISIR platform is remarkable in the interactivity it presents to students. Electronic circuits can be built and tested by students with a degree of freedom normally associated with

Filter by lab type:

- [Data Set & Resource \(9\)](#)
- [Virtual Experiment \(5\)](#)
- [Remote Lab \(6\)](#)
- [Analysis Tool \(3\)](#)

Filter by subject(s):

- [Physics \(1\)](#)
- [Astronomy \(14\)](#)
- [Engineering \(7\)](#)
- [Mathematics \(7\)](#)
- [Technology \(7\)](#)
- [Biology \(6\)](#)
- [Chemistry \(6\)](#)
- [Earth Sciences \(6\)](#)
- [Environmental Science \(6\)](#)
- [Electronics \(1\)](#)
- [Materials Science \(1\)](#)

Filter by language(s):

- [English \(20\)](#)
- [French \(1\)](#)

www.golabz.eu/lab/visir

ICO-OP

Project goals

- Establish methodology for identification and monitoring of demand for knowledge and skills in industry;
- Deliver learning programs incorporating transversal and using remote laboratories/virtual instrumentation knowledge and competences;
- Build mutually beneficial, sustainable partnerships between academia and enterprises by offering internship programs and up-to-date industry training programs.

www.ico-op.eu

ICO-OP

Project outputs

- Summary book: “Creative Engineering for University, and Vocational Education and Training: Europe, Armenia, Georgia, and Ukraine case studies”
- 24 learning modules that enrich the curricula of partners universities will be delivered:
 - 6 modules with remote experiments have been developed/adapted according to the needs of TC HEI/IND partners,
 - 5 of them offer basic electronics knowledge and alternative/emerging technologies and
 - 3 modules, such as risk management, corporate social responsibility, HR management for transversal knowledge and skills will be developed.
- CUAS developed a knowledge structured pyramid for Remote Laboratories and Virtual Instrumentation from which partners could connect to market solutions.

eScience

Project goals

- Adaptation of content to the development in science and technology
- Creation of three remote laboratory platforms in the Maghreb with iLab
- Creation of a repository for French speaking countries
- Implementation of practical courses for on-distance education
- Creating teaching units in the e-learning format
- Accreditation by ECTS in accordance with the Bologna process
- Diffusion at national level in partner countries and at international level

www.esience.org

eScience

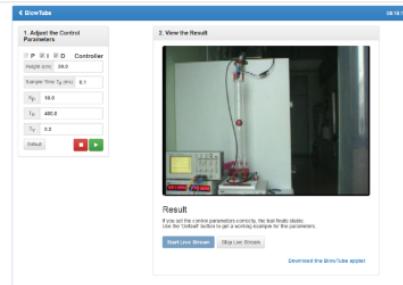
Project goals

- A network of three iLab Service Brokers with experiments related to the market needs will be available by the end of the project in maghrebian countries.
- 15 teaching units will be developed; the content of the different teaching units will be approved by the industrial partners involved in the project.



Project goals

This research project aims at developing adaptive and reusable software components that facilitate the integration of laboratory equipment to the Internet by considering teachers' and students' requirements.



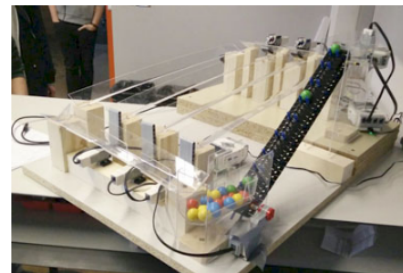
The remote lab of HTL Mössingerstrasse consists of several experiments. The so-called "BlowTube" is an experiment from the field of control systems, in which a styrofoam ball is levitating with the help of a fan. Furthermore, there are two measurement circuits (a Chebyshev-filter and a RC-Oscillator) which are selected by a self-developed switching matrix. Additionally, a circuit for the measurement of line reflections is planned.

Loaded Beam Experiment (HTBLuVA Villach)



In this remote lab a test-bench will be constructed to measure the elasticity of a construction material. In this experimental setup a beam is fixed to a test frame. A defined force is applied on this beam during an experiment. The position along the beam where the force is applied can be selected by the user. The bending grade is measured with pressure sensors and the data is sent to the user. Additionally, the experiment is recorded with a webcam.

Automated Warehouse System with LEGO EV3 (HTL Wolfsberg)



The goal is the development of an automated warehouse system, in which components are sorted from one storage to another. Therefore, LEGO EV3 robots, programmed with LabVIEW, are used. Drawings of the storage and the components are done with ProE and Catia. The components are manufactured directly in school with CnC, lathe and milling machines. Plastic parts are created with injection moulding.

OnlineLabs4All



Young Citizen Science Macht mit!

Project outputs

- Participating on Awards sessions 2015/ 2016 organized by the BMWFW
- Get involved in the Austrian Open Innovation strategy

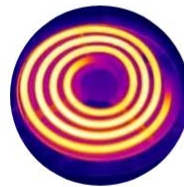
Was ist Young Citizen Science?

Im Rahmen von Young Citizen Science werden insbesondere Schülerinnen und Schüler sowie andere interessierte Jugendliche in aktuelle Forschungsprojekte eingebunden. In Österreich starteten die ersten vom BMWFW geförderten Young Citizen Science-Projekte Anfang 2015. Dabei wurden einzelne Projekte des erfolgreichen Forschungsförderprogramms "Sparkling Science" um die Möglichkeit einer direkten Teilnahme der Bevölkerung erweitert. Die ersten Pilotprojekte bieten ab Frühjahr 2015 Möglichkeiten zur direkten Beteiligung!

Was sind Online Labore?

Online Labore ermöglichen selbst-gesteuertes, erkundendes Lernen und sind weltweit rund um die Uhr einsatzbereit. Die SchülerInnen müssen nicht in einem Labor persönlich anwesend sein, sondern können von überall aus Laborexperimente durchführen und somit theoretische Konzepte erproben. Online Labore bieten darüber hinaus eine neuartige Umgebung für kollaboratives Arbeiten und eine Möglichkeit Erfahrungen mit anderen Institutionen auszutauschen. Das Projekt OnlineLabs4All hat zum Ziel, auf der Basis der entwickelten neuartigen Interfaces, Laborversuche in eine globale Cloud einzubinden und deren Nutzung zu evaluieren. Ein wichtiger Aspekt ist dabei die gründliche Erprobung und Rückmeldungen über Bedienbarkeit der Labore. Wir rufen daher SchülerInnen und LehrerInnen auf, unsere Online Labore zu erproben und uns über ein elektronisches Formular Hinweise und Anregungen zu geben. Jedes vollständig ausgefüllte Formular nimmt am Wettbewerb teil. Sieger ist die Schule mit dem meisten konstruktiven Feedback!

Folgende Labore stehen zur Auswahl



Schwarzkörper-Strahlungslabor
FH-Kärnten, Austria



VISIR Labor
FH-Kärnten, Austria



VISIR @ MASTER LEVEL

In the framework of digitalizing laboratory experiments for the standard bachelor courses at CUAS students form Master program – Systems Design/Remote Systems developed works in the field of electronics

- Resonance and frequency responses
- Rectifier circuit
- Bipolar-Transistor, MOSFET, J-FET; characteristic lines and applications

VISIR EXPERIMENTS DEVELOPED BY STUDENTS

Resonance and frequency responses

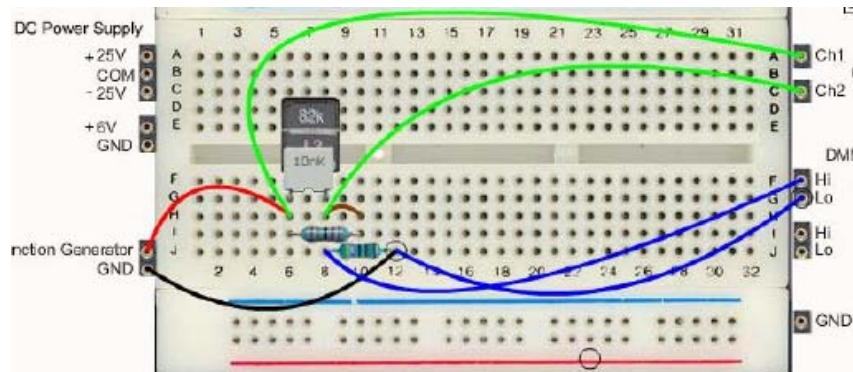
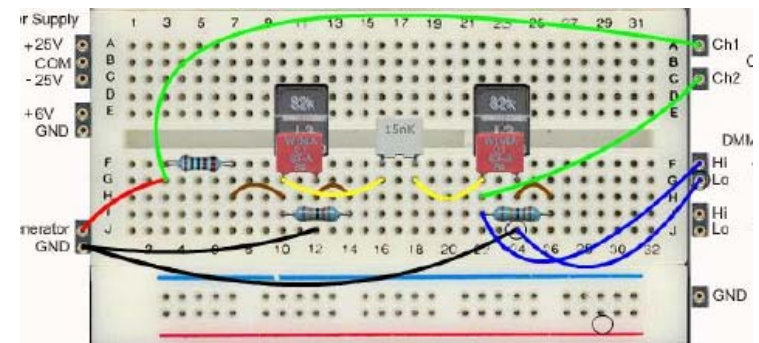
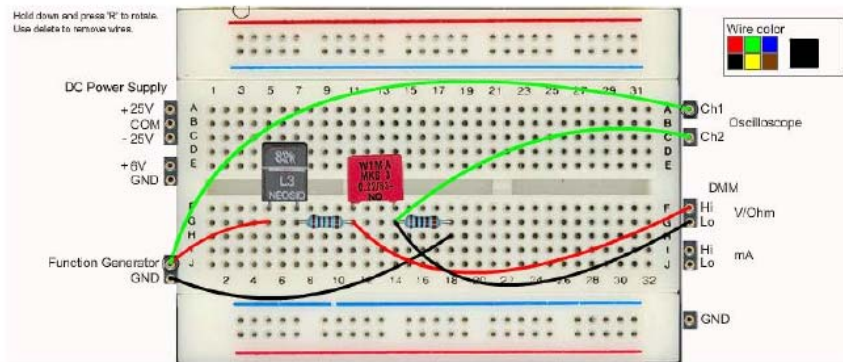
Goal of the experiments:

- Consolidating and deepening the knowledge of frequency characteristics of AC circuits.
- Developing skills with regard to the effective investigation of frequency characteristic of electronic circuits.
- Practical and appropriate presentation of frequency responses

Experiments:

- Resonance Circuit
- Band stop circuit
- Dual circuit band filter

VISIR EXPERIMENTS DEVELOPED BY STUDENTS



VISIR EXPERIMENTS DEVELOPED BY STUDENTS

Rectifier circuit

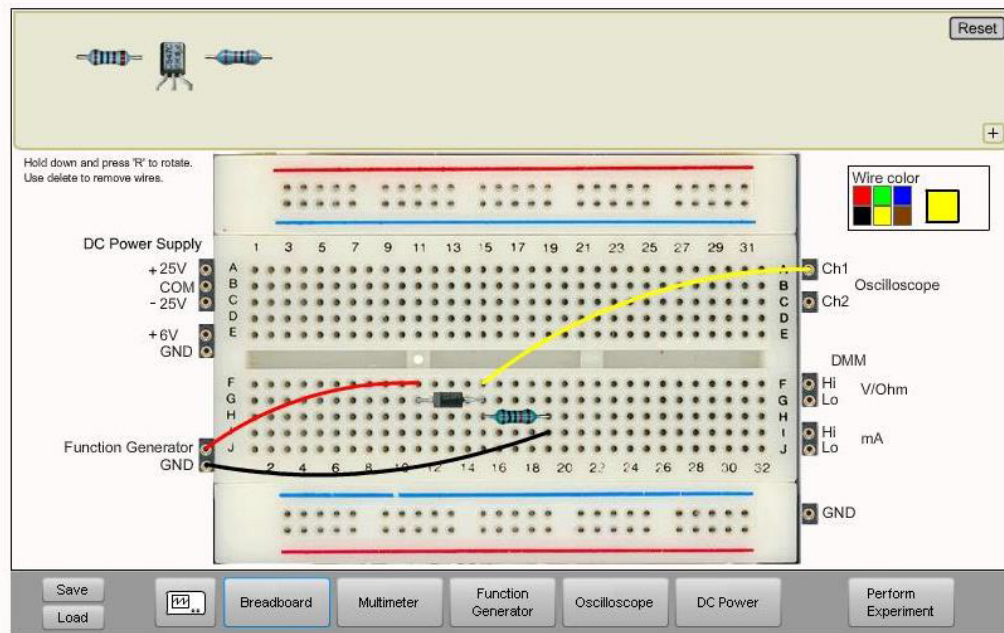
The goals of this remote lab experiments are

- To get information about rectifier
- To learn more about the usage of rectifier
- To build up a rectifier circuit and see the behavior of the system

Experiments:

- Half-wave circuit and the full-wave circuit
- Half-wave circuit with additional capacitor and the full-wave circuit with additional capacitor

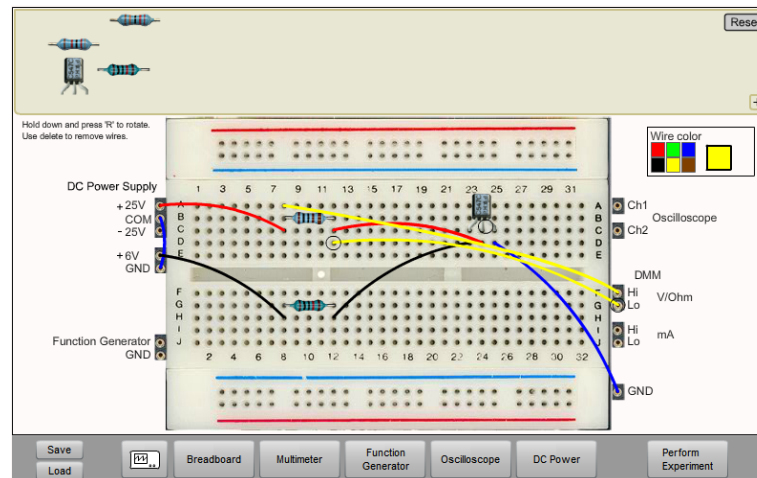
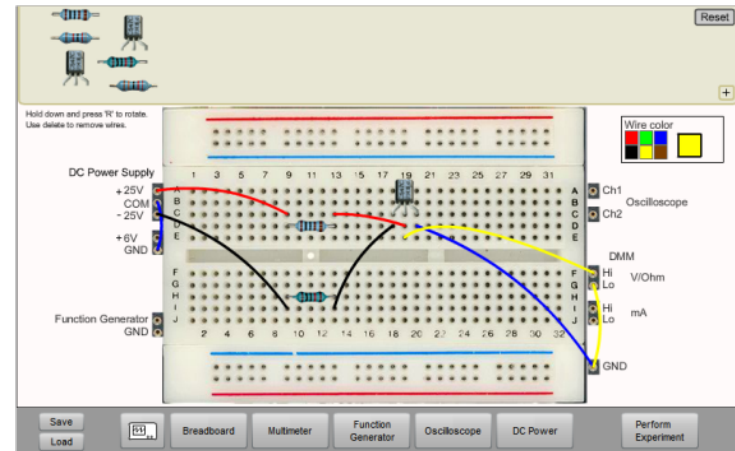
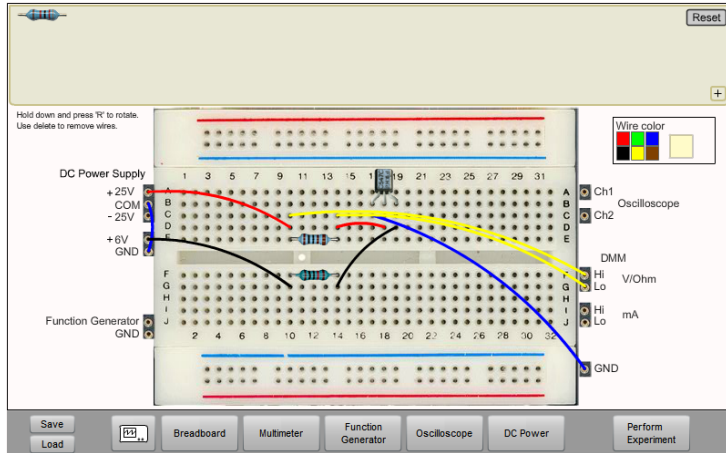
VISIR EXPERIMENTS DEVELOPED BY STUDENTS



VISIR EXPERIMENTS DEVELOPED BY STUDENTS

- Bipolar-Transistor, MOSFET, J-FET; characteristic lines and applications
- Goals:
 - Getting used to the characteristic behaviour of the components
- Experiments:
 - Bipolar Transistor and MOSFET as switches
 - J-FET as controllable resistor

VISIR EXPERIMENTS DEVELOPED BY STUDENTS





THANK YOU FOR YOUR ATTENTION!

QUESTIONS?

OPEN DISCUSSIONS