DEPARTMENT OF PHYSICS

RV COLLEGE OF ENGINEERING®

(AUTONOMOUS INSTITUTION AFFILIATED TO VTU, BELAGAVI)

ENGINEERING PHYSICS

EXPERIENTIAL LEARNING REPORT (2021-2022)

COURSE CODE: 21PH12/22

For the First / Second Semester B.E

Name of the students **USN**	**1.** **2.** **3.** **4.**	**1.** **2.** **3.** **4.**
Section, Batch		
Program		
Faculty In-charge	**1.**	
	2.	

RV COLLEGE OF ENGINEERING®

(An Autonomous Institution, Affiliated to V.T.U, Belagavi)

Mysuru Road, Bengaluru – 560059

DEPARTMENT OF PHYSICS

CERTIFICATE

This is to certify that

1. Mr./Ms.....
2. Mr./Ms.....
3. Mr./Ms.....
4. Mr./Ms.....

havesuccessfully carried out experiential learning in Physics lab for the I/II semester of BE graduate programme during the year 2021 - 2022.

Signature of the
faculty in-charge

20

Signature of Head of the Department

LIST OF EXPERIMENTS

Sl.No	**Exp Eyes experiment and execution**	**Xcos simulation and execution**	**Group assigned.**
01	LED experiment	RC Circuit (DC)	Group 1 & 2
02	LCR series (AC)	LCR Series (DC)	Group 3 & 4
03	Transistor characteristics	Damped Harmonic oscillator using mathematical model	Group 5 & 6

Each group should execute two experiments in 2hours 30 minutes.

EVALUATION:

Marks obtained (Score sheet)(CIE: 15 marks)

Sl. No	**Name of the Student**	**Conduction and analysis (5)+ Report writing (5)+ viva(5) = 15 marks**
01		
02		
03		
04		

Signature of the supervisor in-charge HOD

Procedure to be followed:

1. There should be four students in a group.
2. Students should perform all six experiments.
3. Cyclic order is followed in performing experiments by students.
4. Every student should involve in conduction and execution of the experiment.
5. Team work in their performance is mandatory.
6. Each group of students should perform two experiments in a given stipulated week.

Write up format / Report making.

Title of the Experiment

(Bold letter times new roman, 16 size and centre to page)

Objective of the experiment:

(Bold letter times new roman, 16 size and centre to page)

Principle / Theory of the experiment:

Minimum of 500 words (about half a page, 13 size, times new roman)

Methodology:

Minimum of 750 words (about ¾ of page, 13 size, times new roman)

With circuit diagram, label diagram (¼ of a page)

Observation and Discussion:

Minimum of 1000 words (about a page, 13 size, times new roman)

Tabular column (about a page)

Conclusions/ Inference:

Minimum of 500 words (about half a page, 13 size, times new roman)

Acknowledgement:

Two lines not more than 50 words

References:

Minimum of five references.

Note: Each experiment report should be minimum of 4 pages. (Total will be 25-30 pages including first 4 pages for a final report in spiral binding format)

INNOVATIVE EXPERIMENTS
Computer Interfaced Physics Experiments
expEYES (expEriments for Young Engineers & Scientists)

INTRODUCTION:

Science is the study of the physical world by systematic observations and experiments. However, almost everywhere science is mostly taught from the text books without giving importance to experiments, partly due to lack of equipment. As a result, most of the students fail to correlate their classroom experience to problems encountered in daily life. To some extent this can be corrected by learning science based on exploration and experimenting. The advent of personal computers and their easy availability has opened up a new path for making laboratory equipment. Addition of some hardware to an ordinary computer can convert it into a science laboratory.

The simple and open architecture of expEYES (see thefigure given below) allows the users to develop new experiments, without getting into the details of electronics or computer programming.

1. About the device:

ExpEYES-17 is interfaced and powered by the USB port of the computer, and it is programmable in Python. expEYES can run on any computer having a Python Interpreter and required modules. The USB interface is handled by device driver program that presents the USB port as a Serial port to the Python programs.It can function as a low frequency oscilloscope, function generator, programmable voltage source, frequency counter and data logger etc.

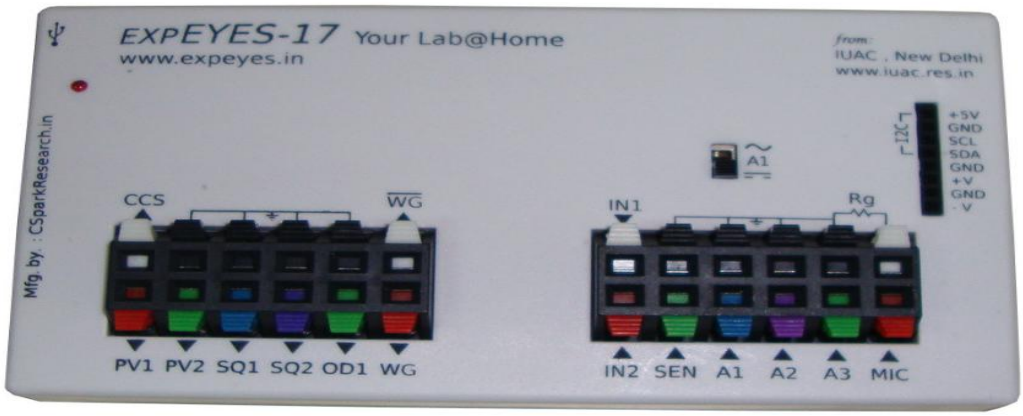


Figure:ExpEyes-17

External connections:

The functions of the external connections briefly explained below. All the black coloured terminals are at ground potential, all other voltages are measured with respect to it.

Outputs:

Constant Current Source (CCS):

The constant current source can be switched ON and OFF under software control. The nominal value is 1.1 mA but may vary from unit to unit, due to component tolerances.

Programmable Voltage (PV1):

Can be set, from software, to any value in the -5V to +5V range. The resolution is 12 bits, implies a minimum voltage step of around 2.5 mill volts.

Programmable Voltage (PV2):

Can be set, from software, to any value in the -3.3V to +3.3V range. The resolution is 12 bits.

Square Wave SQ1:

Output swings from 0 to 5 volts and frequency can be varied 4Hz to 100 kHz. The duty cycle of the output is programmable. Setting frequency to 0Hz will make the output HIGH and setting it to −1 will make it LOW, in both cases the wave generation is disabled. SQR1 output has a 100Ω series resistor inside so that it can drive LEDs directly.

Square Wave SQ2:

Output swings from 0 to 5 volts and frequency can be varied 4Hz to 100 kHz. All intermediate values of frequency are not possible. The duty cycle of the output is programmable. SQR2 is not available when WG is active.

Digital Output (OD1):

The voltage at OD1 can be set to 0 or 5 volts, using software.

Sine/Triangular Wave WG:

Frequency can be varied from 5Hz to 5 kHz. The peak value of the amplitude can be set to 3 volts, 1.0 volt or 80 mV. Shape of the output waveform is programmable. Using the GUI sine or triangular can be selected. WG bar is inverted WG.

Inputs:

Capacitance meter IN1:

Capacitance connected between IN1 and Ground can be measured. It works better for lower capacitance values, up to 10 nano Farads, results may not be very accurate beyond that.

Frequency Counter IN2:

It is capable of measuring frequency up to several MHz.

Resistive Sensor Input (SEN):

This is mainly meant for sensors like Light Dependent Resistor, Thermistor, Photo-transistor etc. SEN is internally connected to 3.3 volts through a 5.1kΩ resistor.

±16V Analog Inputs, A1 & A2:

It can measure the voltage within the range of ±16 volts. The input voltage range can be selected from 0.5V to 16V full scale. Voltage at these terminals can be displayed as a function of time, giving the functionality of a low frequency oscilloscope. The maximum sampling rate is 1 Msps /channel. Both have an input impedance of 1M Ω.

±3.3V Analog Input A3:

It can measure voltage within the ±3.3 volts range. The input can be amplified by connecting a resistor from Rg to Ground, $gain = 1 + \frac{1}{10000}$. This enables displaying very small amplitude signals. The input impedance of A3 is 10M Ω.

±6V /10mA Power supply:

The VR+ and VR- are regulated power outputs. They can supply very little current, but good enough to power an Op-Amp.

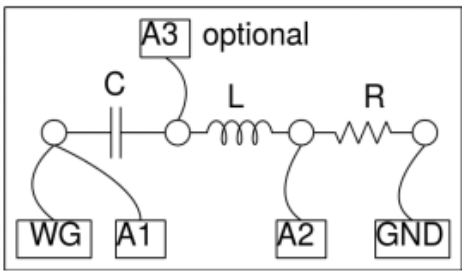
How to Use expEYES-17:

Connect the device through a USB port and start the expEYES-17 program from the menu. The default window shows**Series LCR screen**. Graphical User Interface for various experiments can be selected from the pull down menu. The user should browse the RVCE tab on the screenthen select the Physics 1st year experiments.

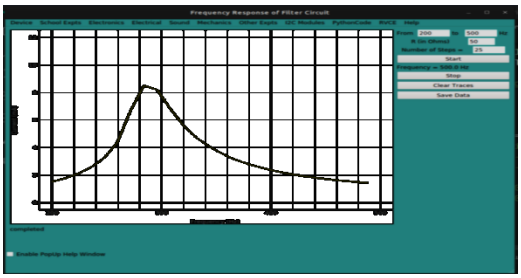
SERIES L-C-R CIRCUIT

Aim: To study the frequency response of LCR circuit and determination of a) Self-inductance of the given coil, b) Quality factor (Q- value) and c) Band-width

Apparatus: expEyes kit, Resistor (1 Ω), Capacitor (447 nf), Inductor (1 H)



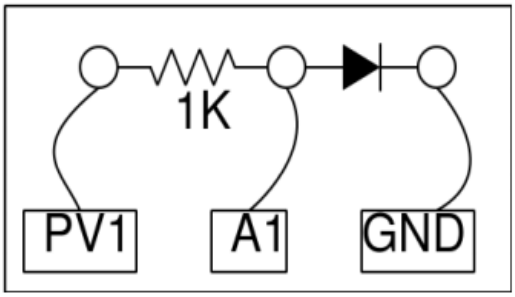
Circuit diagram:



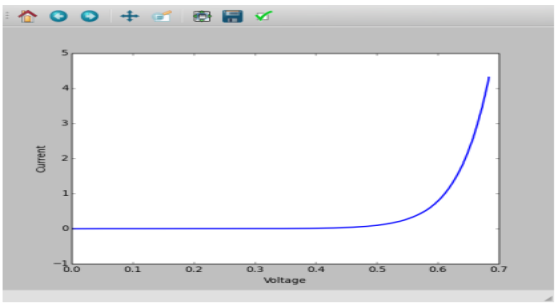
Model Graph:

WAVELENGTH OF LIGHT EMITTING DIODES:

Aim: To study the I-V Characteristics of a diode and determine the wavelengths of the given LED's



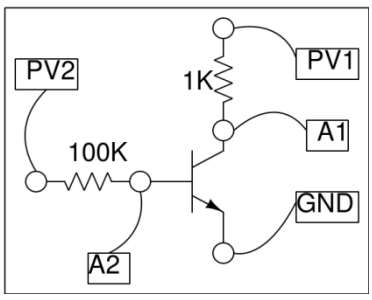
Circuit diagram:



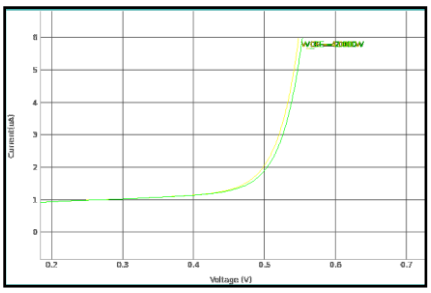
Model Graph:

TRANSISTOR CHARACTERISTICS (CE):

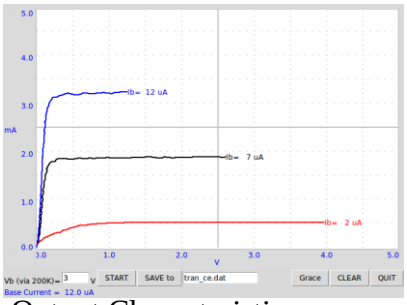
Aim: Study the input and output characteristics of a transistor and calculate current gain.
Apparatus: expEyes kit, Transistor, Resistor 1KΩ, 100KΩ



Circuit diagram



Input Characteristics



Output Characteristics

SCILAB

Open source software for numerical computation

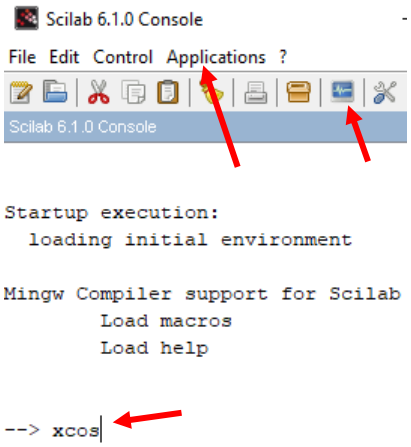
Scilab includes hundreds of mathematical functions.

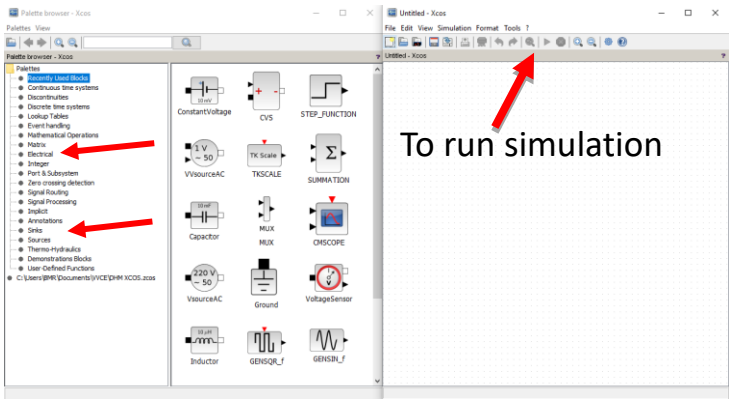
1. Maths & Simulation
2. 2-D & 3-D Visualization
3. Statistics
4. Signal Processing
5. Xcos - Dynamic systems modelling

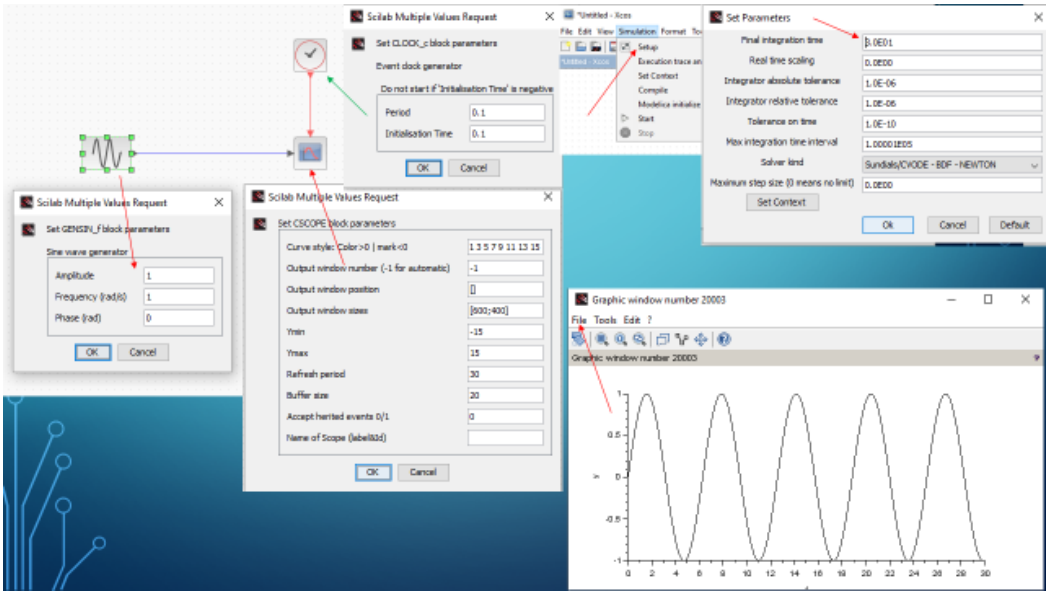
Xcos: It is a graphical editor to design hybrid dynamical systems models.

1. Standard Palettes & Blocks
2. Model building & edition
3. Simulation

Launching Xcos in Scilab console:







RC Transient Response

Aim: To study the transient response of a series RC circuit and understand the time constant.

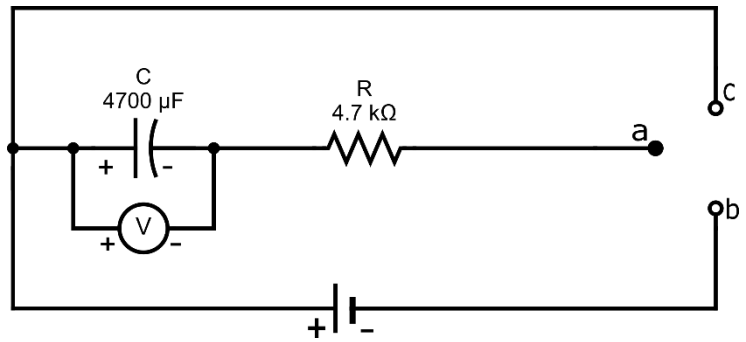


Figure. RC circuit

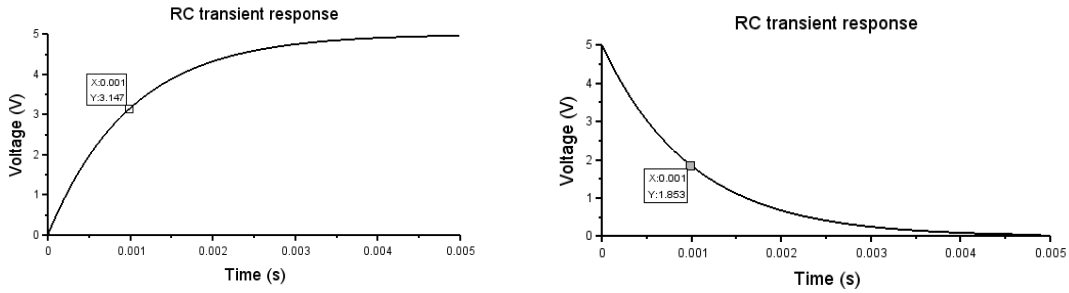


Figure. RC transient response of XCOS simulation

RLC TransientResponse

Aim: Study of RLC Transient Response and Oscillations.

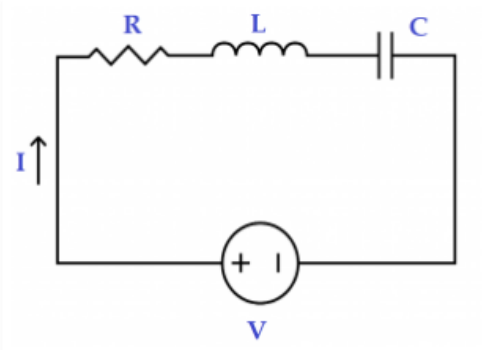


Figure. Series RLC circuit

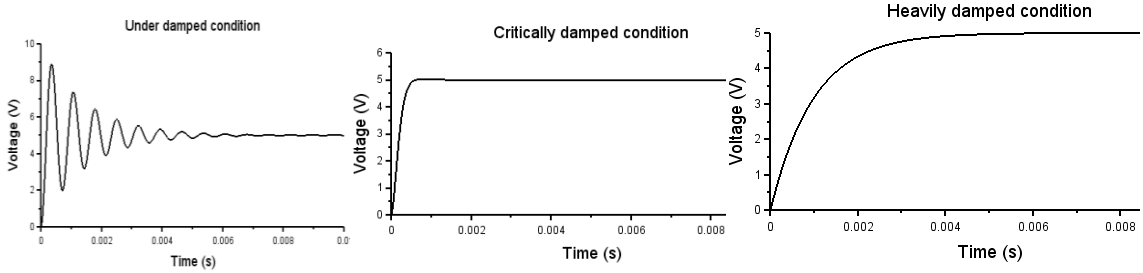
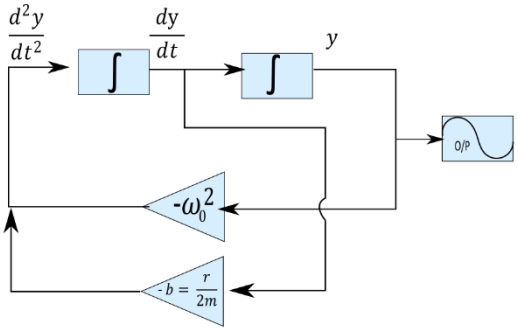


Figure. Transient charging response of RLC circuit using XCOS simulation

Damped harmonic Oscillator: Second order linear differentialequation in Xcos

Aim: Damped harmonic oscillator and its behaviour of under damped, critical damped and over damped harmonic oscillation.

$$m\frac{d^2y}{dt^2} + r\frac{dy}{dt} + ky = 0$$



Model: Second order differential equation