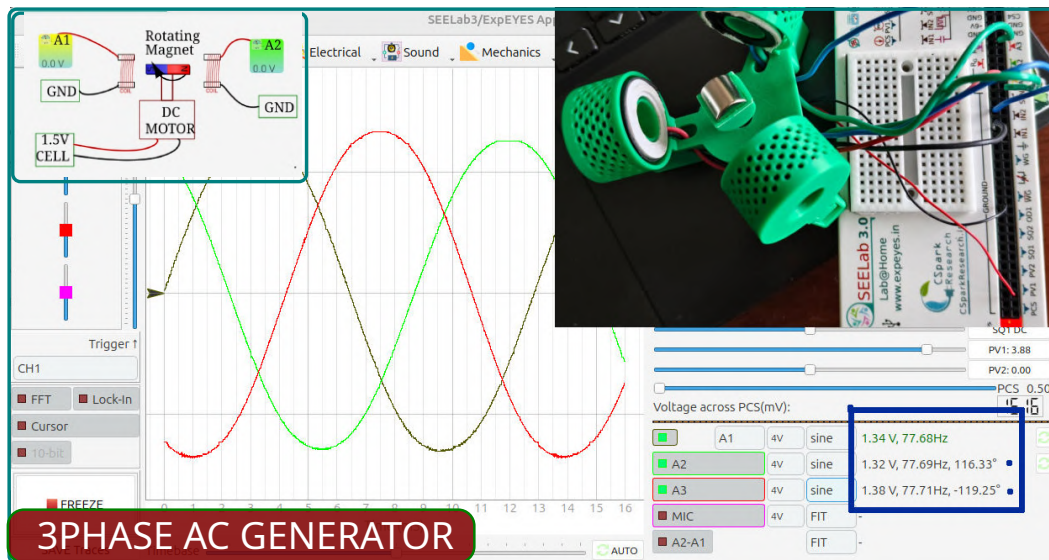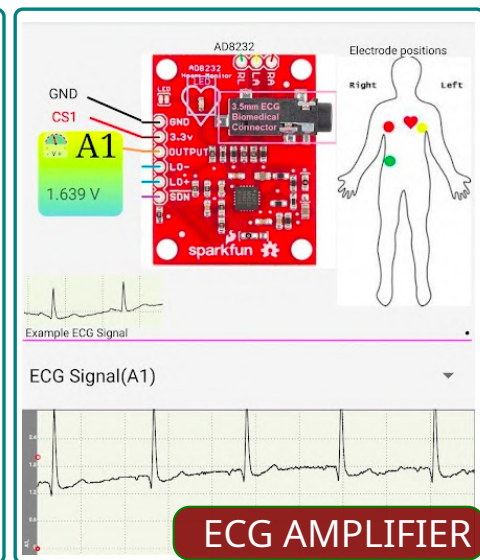# GOVERNMENT FIRST GRADE COLLEGE
MALLESWARAM

Training program on
Computer Interfaced Science Experiments

26 NOVEMBER 2025
The Future of Hands-On Science

3PHASE AC GENERATOR

ECG AMPLIFIER

Transform your approach to teaching science with this intensive two day workshop, designed to equip you with the skills to facilitate genuine discovery and exploration in the classroom. We shall focus on crucial learning takeaways such as real-time data acquisition and analysis, critical thinking through experimental design, and advanced graphical interpretation of physical phenomena. Leveraging the incredible computing power of modern mobile phones alongside affordable, multi-functional instruments for measurement and signal generation, such as the SEELab 3.0, this workshop will equip teachers, students, and citizen science enthusiasts to augment their experimental research !

GOVERNMENT FIRST GRADE COLLEGE
18th Cross, Malleshwaram, Bangalore - 560012

TARGETED PARTICIPANTS

Faculty and students of Science/ Engineering disciplines

Familiarisation with test and measurement tools and software

SEELab3 : YOUR LAB @ HOME
⚙ 100+ SCIENCE EXPERIMENTS

WAVEGEN — WG , W̄G
The WG Pin outputs a 3 volt amplitude sine/triangle wave signal with adjustable frequency from 4Hz to 5kHz. The amplitude can also be adjusted down to 80mV , and a 180 phase shifted signal is available on W̄G

2MSPS OSCILLOSCOPE
A1 , A2, A3, MIC, SEN, IN1
4 Input channels to record up to a million voltage readings within one second. Useful for studying voltage fluctuations, and calculating frequencies and phase shifts of periodic signal inputs. A1/A2 +/-16Volts, A3: +/-3V, MICrophone Input, and an internally pulled up SEN input. Also used as 12 bit voltmeters

VOLTAGE SOURCES
PV1 PV2 OD1 5V +/-6V
12 bit programmable outputs PV1: +/-5V, PV2: +/-3 V. 5V Direct USB power. +6V and -6V for powering Op-Amp circuits. OD1 digital output

SQUARE WAVE — SQ1 SQ2
0 to 5V Square wave outputs with adjustable frequency and duty cycle. 0.015Hz to 1MHz. Output Impedance 100Ohm.
Measure digital signal timings on IN2/SEN

RC METER — SEN IN1
Measure resistance and capacitance
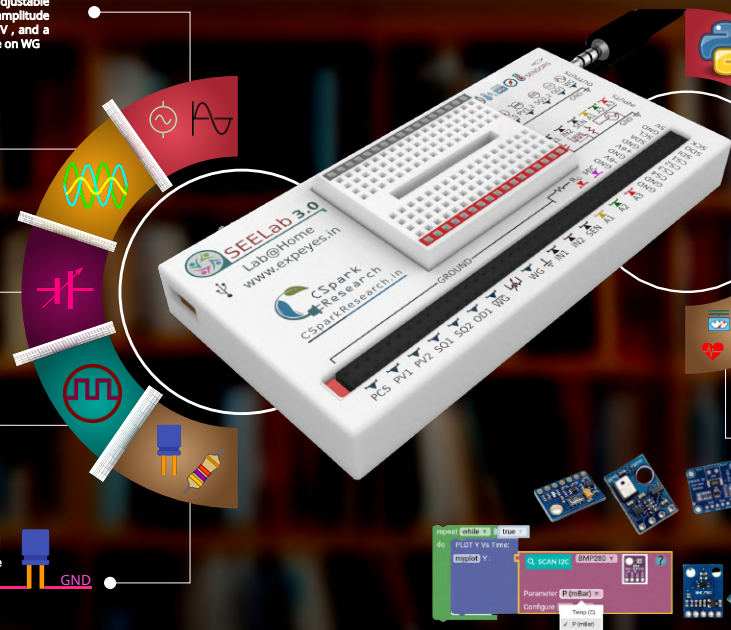SEN   GND   IN1   GND

⚙ PIN DIAGRAMS AND FEATURES

PYTHON PROGRAMMABLE
Access all control and measurement tools via the Python library or the PyQt based graphical software for Ubuntu/Windows
dev=eyes17.open(); print(dev.get_voltage('A1'))

VISUAL PROGRAMS
Connect easy drag and drop blocks to create programs which can collect, visualize, and analyze data

CROSS PLATFORM
Supported on Ubuntu/Windows/Android. Plug and play via USB.

DATA ANALYSIS TOOLS
Implements feature extraction tools such as curve fitting for sinusoidal and exponential decay data. Precisely determines frequencies, phase shifts, decay factors, offsets and amplitudes.

ADD-ON SENSORS   SPI / I2C
USE the SPI (SCK,SDI,SDO,CS1-4), or I2C(SCL,SDA pins) buses to enhance experiments. Plug and play over a dozen sensors for physical parameters such as pressure, magnetism, luminosity, humidity, distance etc. control precision waveform generators, servo motors, and robotic arms

SEELab 3.0
Lab@Home
www.expeyes.in

CSpark Research
CSparkResearch.in

OUTLINE
Basic Circuits
Mechanics
Electrical
Electronics
Acoustics
Sensors
Programming

DAY 1
+ Introduction to test and measurement tools
+ Electronic characterisation and plotting
+ RC/LC Transient and Steady State Response
+ Digitization of a simple pendulum
+ EM Induction & AC generator. 3Phase demo
+ Acoustics : Measurement of Speed of sound, interference, and fourier transforms.
+ Add-on Sensors: Pressure, T, rH, Magnetism

+ Introduction to KiCAD EDA circuit design
+ Designing 3D printable parts with FreeCAD

DAY 2
+ Measure Gravity from time of flight
  (create your own setup)
+ Modification of Flywheel experiment
  Plot S,V,A !
+ Introduction to Programming :
  Python & Visual
+ Introduction to Opamps: Amplifiers
+ Using you phone's sensors for science experiments : acoustic stopwatch, gyro, luminosity sensor.
+Design and development of products!

Introduction : Plug and Play Modules

Low cost add-ons : Simply plug 'n play
I2C/SPI communication interfaces, and software support for several common sensors

- BMP280 : Pressure and temperature Sensor
- BME280: Humidity measurement
- TSL2561/BH1750: Light intensity sensor
- MPU6050: Gyroscope, accelerometer
- MPU9250 : Accel/Gyro/Magnetic Fields
- VL53L0X : Distance measurement (LIDAR)
- MLX90614: Passive IR temperature sensor
- AD8232 : ECG instrumentation amplifier
- AD9833: Precision Sine Wave generator
- Servo Motors via SQ1, SQ2, or PCA9685
- AHT10: Humidity Sensor
- MAX44009: Visible Spectrum Luminosity sensor
- QMC5883L/HMC5883L : 3 Axis Magnetometer
- ML8511 : UV sensor
- MAX30100: Heart rate and pulse oximetry
- INA219 : High Side Current Sensing
- ADS1115 : 16 bit , 4 channel voltmeter
- TCS34725 : RGB Color sensor
- ADXL345: 3 axis accelerometer
- SR04 : Distance sensor (Sound based)

MAX30100 PULSE OXIMETER

Accessories
Super Magnets   Assorted Resistors, Capacitors, Diodes , Transistors & Inductors   multi color LEDs & LDR

Piezo buzzers, 2000 Turn Solenoid , assorted wires.   Echo Module, DC motor   170 point bread -board

LEMON CELL IN SERIES

GND 1K Zn Cu Zn Cu A1

Pressure Temperature

I2C VCC GND SCL SDA

1) Measure a battery's voltage
2) Measure Voltage for 2 batteries in series -

10 kΩ 1 kΩ 6V -6V GND

Rotating Magnet DC MOTOR

A1 0.16V A2 2.67V GND 1.5V CELL

RESISTANCE RES >200kΩ GND Light Dependent Resistor(LDR)

FILTER CHARACTERISTICS
Bode Plots
C filter R
WG 654.45 Hz
A1 -1.88 V
A2 2.9 V
A2(input) and A1(output)
WG = 1.5 kHz,
Starting Value 200
Stopping Value 2000
Step Size 20.0
WG : 1.5 kHz AMPRATIO : 151.04 m
START STOP CLEAR I/O

ExPEYES17 SEELab 3.0
EXPERIMENTS OSCILLOSCOPE DATA LOGGER
VISUAL CODING CYCLIC VOLTAMMETRY
NEW PROGRAM PID CONTROL AUDIO STOPWATCH

HMC5883L-X output
Perturbation with a permanent magnet
PID Controlled Magnetic Field
Solenoid
Sensor
Setpoint

FULL WAVE RECTIFIER
C filter
WG A2 -195.05 mV
Rload(1K)
WG A1 1000 Hz GND
A1,A2(inputs) and A3(output)

Help | Diode IV | Measurement and Controls | Saved plots
Parameters
Start Voltage: 0.00
Stop Voltage: 4.00
Steps: 200
acquisition time: 5 S
Initialize
Start Logging
Stop Logging
Trace List
White LED 2 px Color X
Blue LED 2 px Color X
Green LED 2 px Color X
Red LED 2 px Color X
4148 diode 2 px Color X
SAVE DATA
White LED / Blue LED / Green LED / Red LED / 4148 diode
DIODE IV Characteristics

NPN Output Characteristics
Vbase (via 100kOhm) 2.6 V
Start
Stop
Clear Traces
Save Data to tran-VI.txt
Ib = 19.640 uA
Ib = 17.672 uA
Ib = 15.707 uA
Ib = 13.744 uA
Ib = 11.786 uA
Ib = 9.835 uA
Ib = 5.976 uA
Ib = 4.0? uA
Current (mA)
Voltage (V)
Completed plotting I-V
Show PopUp Help Window

Software PID temperature control

Induced Voltage (A1)
Sound Beats

Magnetometer

BOYLE'S LAW
Pressure(mBar)
1292

Amplify miniscule currents(nA) to a few volts range !
Shine a light on the LED and observe the output

Government First Grade College, Malleshwaram