Dept of Physics

Semester	Paper Name	Paper Code
CBCS 3rd Sem	Physics Workshop Skills	PHY-SE-3014
CBCS 4th Sem	Basic Instrumentation Skills	PHY-SE-4014
CBCS 5th Sem	Applied Optics	PHY-SE-5024
CBCS 6th Sem	Radiation Safety	PHY-SE-6014

Syllabus

Skill Enhancement Papers
[Choose One]

PHY-SE-3014
Physics Workshop Skills
Credits: 4 (Theory: 2, Lab: 2)
Theory: 30 Lectures

Preferred minimum qualifications of the teacher/instructor: Assistant Professor of Physics or a B.E/B.Tech in Mechanical Engineering

The aim of this course is to enable the students to familiar and experience with various mechanical and electrical tools through hands-on mode

Unit I: Introduction (4 Lectures)
Measuring units. conversion to SI and CGS. Familiarization with meter scale, Vernier calliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc.

Unit II: Mechanical Skill (10 Lectures)
Concept of workshop practice. Overview of manufacturing methods: casting, foundry, machining, forming and welding. Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood. Concept of machine processing, introduction to common machine tools like lathe, shaper, drilling, milling and surface machines. Cutting tools, lubricating oils. Cutting of a metal sheet using blade. Smoothening of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block. Use of bench vice and tools for fitting. Make funnel using metal sheet.

Unit III : Electrical and Electronic Skill (10 Lectures)
Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope. Making regulated power supply. Timer circuit, Electronic switch using transistor and relay.

Unit III : Introduction to prime movers: (6 Lectures)
Mechanism, gear system, wheel, Fixing of gears with motor axel. Lever mechanism, Lifting of heavy weight using lever. braking systems, pulleys, working principle of power generation systems. Demonstration of pulley experiment.

Lab

1. Study the use of meter scale, Vernier caliper, Screw Gauge.
2. To measure dimension of solid block, volume of cylindrical beaker/ glass, diameter of thin wire, thickness of metal sheet.
3. To measure height of building, mountain using Sextant
4. To join metals using welding.
5. To prepare nut, bolts etc. using lathe machine and other tools.
6. To Cut a metal sheet and smoothening of the cutting edge using file.
7. Study the use of multimeter and Oscilloscope.
8. To use soldering of electrical circuit having discrete components on PCB.
9. To construct a regulated power supply
10. Demonstration of lifting of heavy weight using lever

The test of lab skills will be of the following test items:

1. Use of an oscilloscope.
2. CRO as a versatile measuring device.
3. Circuit tracing of Laboratory electronic equipment,
4. Use of Digital multimeter/VTVM for measuring voltages
5. Circuit tracing of Laboratory electronic equipment,
6. Winding a coil / transformer.
7. Study the layout of receiver circuit.
8. Trouble shooting a circuit
9. Balancing of bridges

Lab

1. To observe the loading effect of a multimeter while measuring voltage across a low resistanc resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltage and current
3. To measure Q of a coil and its dependence on frequency, using a Q- meter.
4. Measurement of voltage, frequency, time period and phase angle using CRO.
5. Measurement of time period, frequency, average period using universal counter/ frequency c
6. Measurement of rise, fall and delay times using a CRO.
7. Measurement of distortion of a RF signal generator using distortion factor meter.
8. Measurement of R, L and C using a LCR bridge/ universal bridge.

Open Ended Experiments:

2. Using a Dual Trace Oscilloscope
3. Converting the range of a given measuring instrument (voltmeter, ammeter)

PHY-SE-5024
APPLIED OPTICS
Credits: 4 (Theory: 2, Lab: 2)
THEORY: 30 Lectures

Preferred minimum qualification of the teacher/instructor: Asst. Professor of Physics with PhD in Experimental Spectroscopy/Optics.

Theory includes only qualitative explanation. Minimum five experiments should be performed covering minimum three sections.

Theory

Unit I: Sources and Detectors (Lectures 10)

Lasers, Spontaneous and stimulated emissions, Theory of laser action, Einstein's coefficients, Light amplification, Characterization of laser beam, He-Ne laser, Semiconductor lasers.

Experiments on Lasers:

(b) Determination of the grating radial spacing of the Compact Disc (CD) by reflection using He-Ne or solid state laser.

(c) To find the width of the wire or width of the slit using diffraction pattern obtained by a He-Ne or solid state laser.

(d) To find the polarization angle of laser light using polarizer and analyzer

Experiments on Semiconductor Sources and Detectors:

(a) V-I characteristics of LED

(b) Study the characteristics of solid state laser

(c) Study the characteristics of LDR

(d) Photovoltaic Cell

Unit II: Holography (Lectures 8)

Basic principle and theory: coherence, resolution, Types of holograms, white light reflection hologram, application of holography in microscopy, interferometry, and character recognition.

Experiments on Holography and interferometry:

(a) Recording and reconstructing holograms

(b) Constructing a Michelson interferometer or a Fabry Perot interferometer

(c) Measuring the refractive index of air

(d) White light Hologram

Unit III: Photonics: Fibre Optics (Lectures 12)

Optical fibres and their properties, Principal of light propagation through a fibre, The numerical aperture, Attenuation in optical fibre and attenuation limit, Single mode and multimode fibres, Fibre optic sensors: Fibre Bragg Grating

Experiments on Photonics: Fibre Optics

(a) To measure the numerical aperture of an optical fibre

(b) To study the variation of the bending loss in a multimode fibre

Radiation hazard of Tomographic machine, Safety measurement to be followed.

Unit VI: MRI (Lectures 3)

Magnetic Resonance imaging – Basic principle– Imaging methods – Slice section, Image contrast, Bi effects of MRI. Safety measurements. Counting statistics, errors in counting.

Lab

1. Measurement of alpha track density due to environmental (air) Radon (and its daughter) using SSNTD
2. Taking X-ray of a pen/pencil
3. Visit to a CT scan and MRI laboratory.
4. Study the background radiation levels using Radiation meter

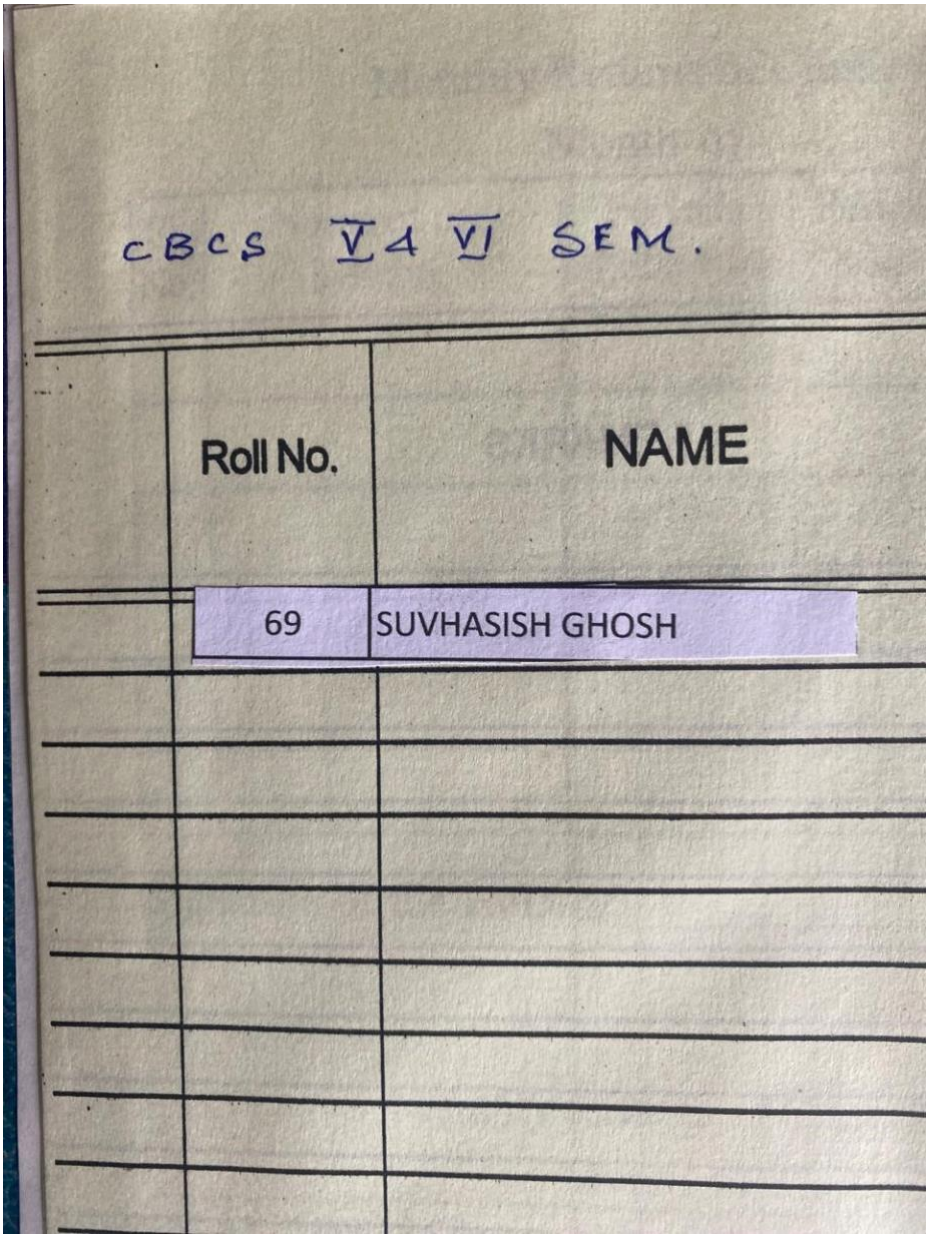
Characteristics of Geiger Muller (GM) Counter:

5. Study of characteristics of GM tube and determination of operating voltage and plateau length using background radiation as source (without commercial source).
6. Study of counting statistics using background radiation using GM counter.
7. Study of radiation in various materials (e.g. KSO_4 etc.). Investigation of possible radiation in different routine materials by operating GM at operating voltage.
8. Study of absorption of beta particles in Aluminum using GM counter.
9. Detection of α particles using reference source & determining its half life using spark counter
10. Gamma spectrum of Gas Light mantle (Source of Thorium)
11. Studying α particles in air using SSNTDs technique

Students Enrollment in different semester

CBCS – III & IV SEM.

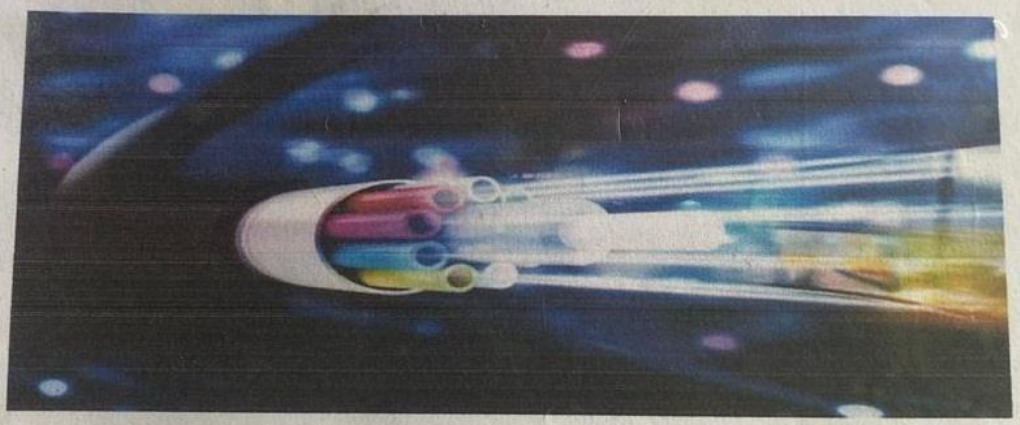
	Roll No.	NAME	Marks of
	43	Deep Sarma	
	31	Subham Chowdhury	
	39	Chetan Ch. Das	
	64	Pallabi Das	



Picture of the Project Report

LUMDING COLLEGE

PROJECT ON OPTICAL FIBER



SUBMITTED BY

SUPRIYA SEN

B.SC SEMESTER-6

ROLL: S-16304 NO:0155

OPTICAL FIBER

A project report submitted for partial fulfillment of the requirement for the bachelor of science (physics)

Submitted by –

SUPRIYA SEN

ROLL: S-16304 NO.0155

INTRODUCTION –

Fibre-optic communication is a method of transmitting information from one place to another by sending pulses of light through an optical fibre. The light forms an electromagnetic carrier wave that is modulated to carry information.

OPTICAL FIBRE –

An optical fibre is a dielectric wave guide that operates at optical frequencies. The fibre wave guide is normally cylindrical in form.

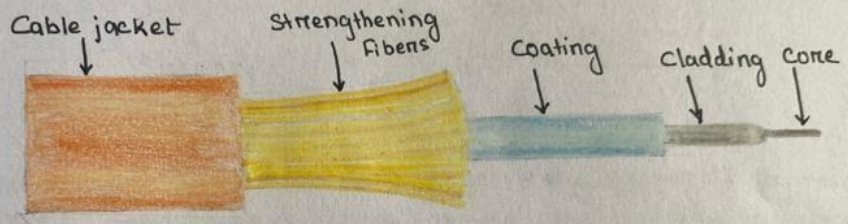
FUNCTION –

It confines electromagnetic energy in the form of light to within its surfaces and guides the light in a direction parallel to its axis.

THEORY

Construction of Optical Fiber

A main purpose of a fiber optic cable is to protect the fiber core inside the cable that carries the light signal transmission. The following diagram shows the construction of a fiber optic cable.



Core

The fiber core is made of silica glass and is the central part of the fiber Optic cable that carries the light signal. They are hair thin in size and the diameter of the fiber core is typically 8m for single mode fiber and 50m or 62.5m for multi mode fiber.

Cladding

The cladding is also made of glass, and is the layer that surrounds the fiber core. Together, they form a single solid fiber of glass that is used for the light transmission. The diameter of the cladding is typically 125 m.

Primary Coating

After the cladding, there is the primary coating that is also known as the primary buffer. This layer provides protection to the fiber core and cladding. They are made of plastic and only provide mechanical protection. They do not interfere with the light transmission of the core and the cladding.

Strength Members

The next layer strength members. They are strands of Kevlar. They are added to the fiber optic cable to prevent the breakage of the fiber glass during installation.

Cable Jacket

The last layer is the cable jacket, like the primary coating, they serve only as a mechanical protection to the fiber core and cladding inside. Most fiber optic cables have an orange jacket, although some types can have black, yellow, aqua or other color jackets. Various colors can be used to designate different applications within a network.

$C = 3 \times 10^8 \, ms^{-1}$

$E = mc^2$

$\sin\theta$

$\cos\theta$

PHYSICS

ASSIGNMENT

$F = ma$

ϕ

π

η

λ

NAME :- Amardeep Naha

B.Sc. 1st Semester

PHYSICS MAJOR

CLASS ROLL NO. 111

Some Important features of S.H.M

(i) The motion of the particle is periodic

(ii) It is the oscillatory motion of simplest kind in which the particle oscillates back and forth about its mean position with constant amplitude and fixed frequency.

(iii) Restoring force acting on the particle is proportional to its displacement from the mean position.

(iv) The force acting on the particle always opposes the increase in its displacement.

(v) A simple harmonic motion can always be expressed in terms of a simple harmonic function of sine or cosine.

Introduction

A particle is said to be execute simple harmonic motion if it moves to and fro about a mean position under the action of a restoring force which is directly proportional to its displacement from the mean position and is always directed towards the mean position.

If the displacement of the oscillating body from the mean position is small, then

Restoring force $\propto$ Displacement

$$F \propto x$$

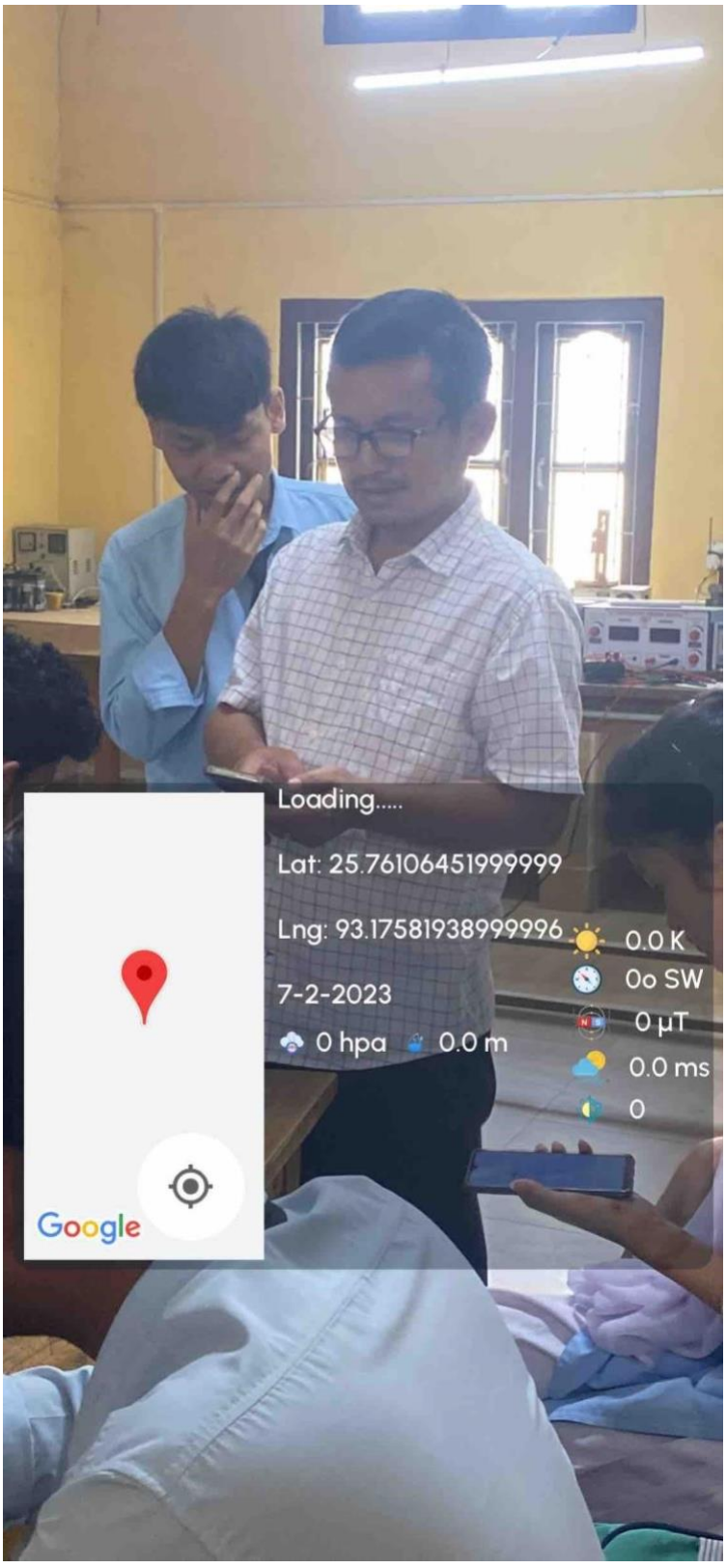
$$[\, F = -Kx \,]$$

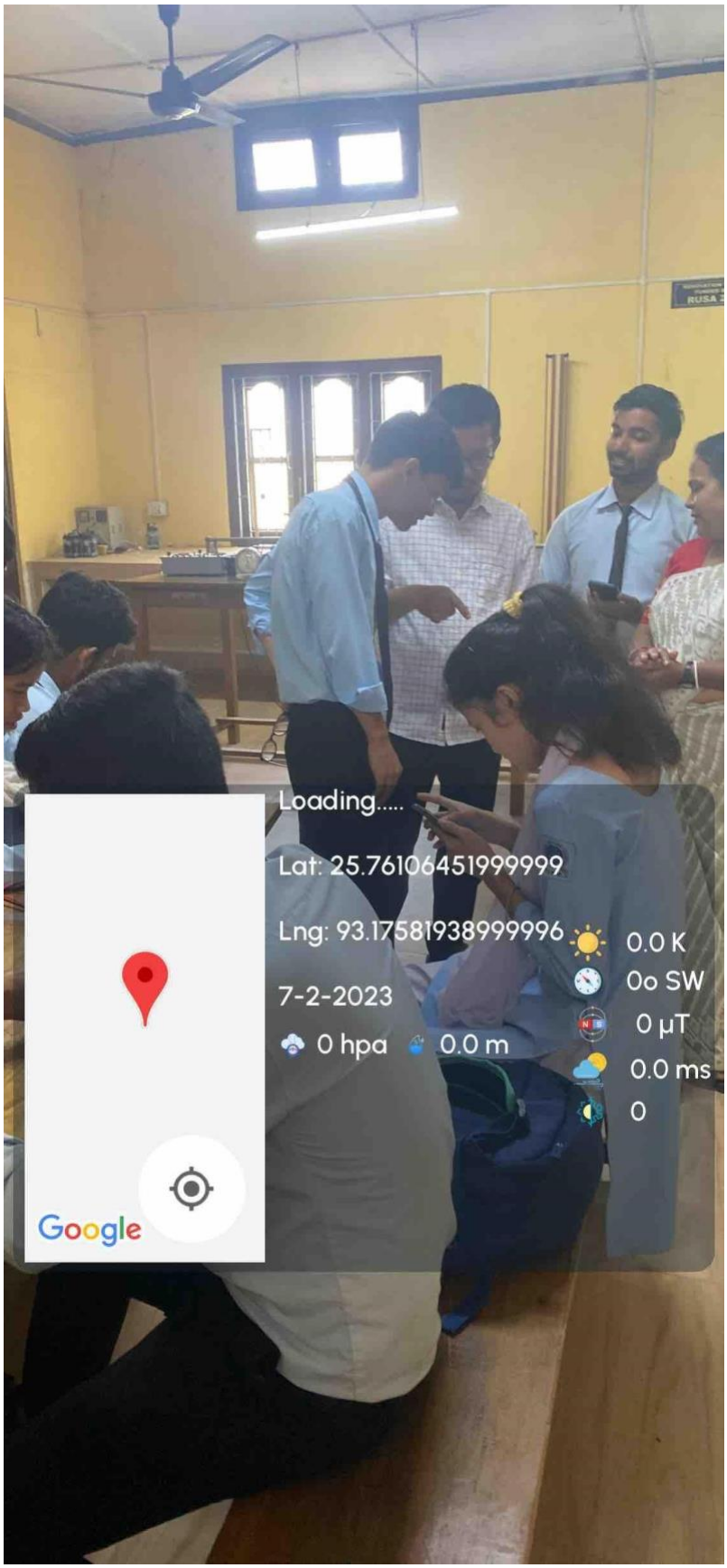
where, K = force constant / spring factor

-ve sign shows that F always acts in opposite direction of the displacement x.

Ex :- (i) Oscillations of a loaded spring
(ii) Vibrations of a tuning fork

Picture of the Group discussion & Workshop held in the Dept. of Physics in the session 2022-23

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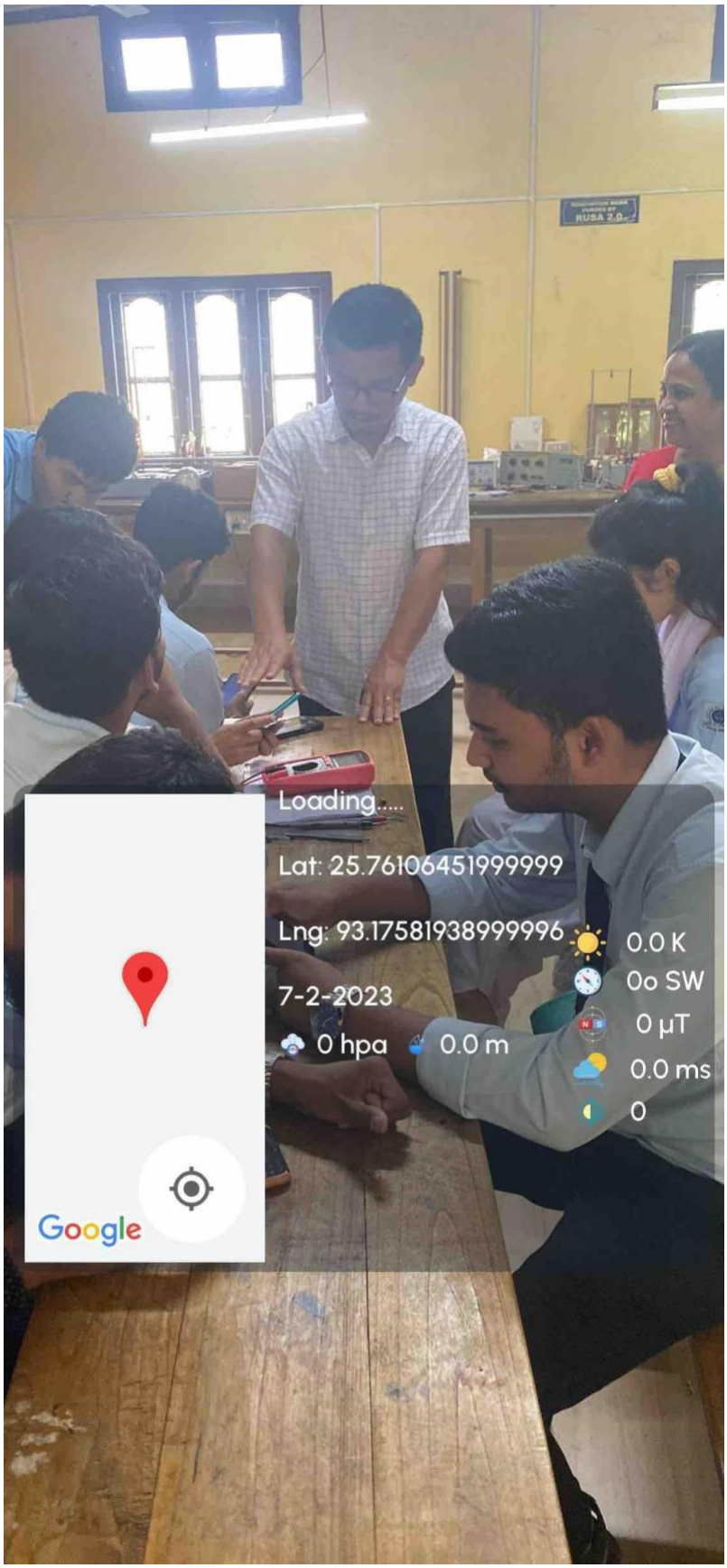
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PHILIPS