Savitribai Phule Pune University

Faculty of Science and Technology

Board of Studies

in

Physics

List of Practicals (for UG and PG) to be conducted through online mode and evaluated as per the guidelines given by the Savitribai Phule Pune University, Pune.

F.Y.B.Sc Physics Practical

Course code and title: PHY-113 Physics Laboratory 1A (SEM I)

PHY-113 Physics Laboratory 1A (SEM I) (Credit 1.5)

Section I- Mechanics and Properties of Matter

LIST OF PRACTICALS

Sr No	Title of the experiment	Resource details
1	Study of Modulus of Rigidity of wire using Torsional Oscillations	VlabOK :https://vlab.amrita.edu/index.php?sub=1&brch=280&sim=1518&cnt=1
2	Study of surface tension by Jaeger's method	Youtube video demo https://www.youtube.com/watch?v=5xC6glA1NAA
3	Study of Poisson's ratio of rubber using rubber tube /rubber chord	Youtube video demo https://www.youtube.com/watch?v=0ux0I5aOfF0

Section II-Physics Principles and Applications

Sr No	Title of the experiment	Resource details
4	Study of Spectrometer and determination of angle of prism.	Vlab: OK https://vlab.amrita.edu/index.php?sub=1&brch=281&sim=1508&cnt=1
5	Determination of wavelength of LASER light by plane diffraction grating.	Youtube video demo: https://www.youtube.com/watch?v=XS8imIr8Ss4
6	Study of I-V characteristics of solar cell.	Youtube video demo: https://www.youtube.com/watch?v=1BlUC8nYuTs

F.Y.B.Sc Physics Practical

Course code and title: PHY-123 Physics Laboratory 1B (SEM II) (Credit 1.5)

Section I- Heat and Thermodynamics

LIST OF PRACTICALS

Sr No	Title of the experiment	Resource details
1	Study of temperature coefficient of Thermistor.	Vlab: https://vlab.amrita.edu/?sub=1&brch=282&sim=1511&cnt=2 Youtube video demo: https://www.youtube.com/watch?v=y7U4GDUK0BU
2	Study of thermal conductivity by Lee's method.	Vlab:https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=353&cnt=1 Youtube video demo 1.https://www.youtube.com/watch?v=tPqZM6ylM3U
3	Interpretation of Isothermal and Adiabatic curve on P-V diagram and theoretical study of Carnot's cycle by drawing graphs of Isothermal and Adiabatic curves.	Isothermal and Adiabatic curve https://www.youtube.com/watch?v=Jsnv8L7HdEk Carnot's cycle by drawing https://www.youtube.com/watch?v=t2dxbbcAfVk

Section II-Electricity and Magnetism

Sr No	Title of the experiment	Resource details
4	Study of charging and discharging of capacitor	Youtube video: https://www.youtube.com/watch?v=4DPKVSI5oHE
5	Study of Kirchhoff's Laws	https://vlab.amrita.edu/?sub=1&brch=75&sim=217&cnt=1 KCL: https://www.youtube.com/watch?v=-84TNVuK8Ww KVL: https://www.youtube.com/watch?v=VvmA2TZczfk
6	Study of Diode characteristics	http://vlabs.iitkgp.ac.in/be/exp5/index.html

S.Y.B.Sc Physics Practical

Course code and title: PHY-233 Physics Laboratory Course 2A (SEM I)

LIST OF PRACTICALS

S	Title of the experiment	Link
Section I: Electronics/Instrumentation		
1	Circuit Theorems (Thevenin's, Norton's and m Power Transfer Theorems) Maximum Power Transfer Theorem: https://www.youtube.com/watch?v=Fb_vDMet__	Thevenin's Theorem: http://vlabs.iitkgp.ac.in/asnm/exp3/index.html ww.youtube.com/watch?v=IW-taJrxhkM Theorem: http://vlabs.iitkgp.ac.in/asnm/exp2/index.html# https://www.youtube.com/watch?v=x7QRAM5w1K8
2	Transistor Characteristics (Input and Output ristics of CE Configuration)	http://vlabs.iitkgp.ac.in/be/exp11/index.html
3	Study of Rectifiers (Half, Full Wave and Bridge)	Half Wave: http://vlabs.iitkgp.ac.in/be/exp6/index.html# Full wave :http://vlabs.iitkgp.ac.in/be/exp7/index.html#
4	Op-amp as inverting and non-inverting amplifier	http://vlabs.iitkgp.ac.in/be/exp17/index.html
5	Study of logic gates and verification of de s theorems	Logic Gates: https://de-iitr.vlabs.ac.in/exp/truth-table-gates/theory.html De Morgan's Theorem: ww.youtube.com/watch?v=GFJ7YCPCdwE
Section II: Use of Computer		
6	Plotting of various trigonometric functions using heet/any graphic software viz. Microsoft Excel, in x, cos x, tan x, e^{x}, e^{-x}, log x, ln x, x^{n}	https://drive.google.com/file/d/1-SLrSaCQfaSNB0be_bYdfGyAXgc1wAT4/view?usp=sharing

	Additional Activity (Any One) 1. Plotting of any two graphs using data obtained from various experiments. 2. Demonstrations –Any **two** demonstrations. 3. Mini Project

Note: Video will help you to understand how to use Virtual Labs.

https://drive.google.com/file/d/1rpCOyGl5Gi95w_h81nkx5hg7VKV3fJPE/view?usp=sharing

S.Y.B.Sc Physics Practical

Course code and title: PHY-243 Physics Laboratory Course 2B (SEM II)

LIST OF PRACTICALS

Sr. No	Title of the experiment	Link for the Experiment
Section I: Oscillations, Waves and Sound		
1	'g' by bar pendulum.	https://www.youtube.com/watch?v=YgmcXZM9mFw
2	Velocity of sound by Phase shift method	https://www.youtube.com/watch?v=-wqHyDnX6rk
3	Study of Lissajous figures and determination of unknown frequency	https://www.youtube.com/watch?v=NICbc35BxqE
Section II: Optics		
4	Newton's Ring: Determination of wavelength of monochromatic source (λ).	https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=335&cnt=1
5	Dispersive power of glass prism.	https://vlab.amrita.edu/index.php?sub=1&brch=281&sim=851&cnt=1
6	Double refracting prism	https://www.youtube.com/watch?v=hl55pMTfjIw&t=508s

	Additional Activity (Any One) 1. Plotting of any two graphs using data obtained from various experiments. 2. Demonstrations –Any **two** demonstrations. 3. Mini Project	

Note: Video will help you to understand how to use Virtual Labs.
https://drive.google.com/file/d/1rpCOyGl5Gi95w_h81nkx5hg7VKV3fJPE/view?usp=sharing

T.Y.B.Sc Physics Practical
Course code and title: PHY-347 Physics Laboratory Course I
Group - I

Sr. No.	Title of the Experiment	Links for the Experiment
1	Viscosity of liquid by Rotating cylinder method	https://bop-iitk.vlabs.ac.in/exp/liquid-viscosity/
2	Determination of wavelength of light by Michelson's interferometer	https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=1106&cnt=1
3	Energy gap of a semiconductor	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/energy-band-gap-iitk/theory.html
4	Resistivity by Four probe method	https://vlab.amrita.edu/index.php?sub=1&brch=282&sim=1512&cnt=1
5	Moment of inertia by Bifilar suspension (pg # 1 – 3)	1. Video - https://www.youtube.com/watch?v=oYkBjEdtK1Q 2. Theory –http://rbvrrwomenscollege.net/wp-content/uploads/2018/04/SEM-I-RECORD.pdf

Group II

Sr. No.	Experiment Name	Links for the Experiment
1	Determination of Rydberg's constant (Experiment can be performed using Link # 2 and observing video with Link # 1)	1. Video - https://www.youtube.com/watch?v=T4MeU-LbKdM 2. https://vlab.amrita.edu/index.php?sub=1&brch=195&sim=359&cnt=2 3. Theory - http://www.phys.utk.edu/labs/modphys/BalmerSeries.pdf
2	Verification of Stefan's law by torch bulb filament	http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/vlabs_recbanda/labs/exp1/simulation.html
3	Determination of Planck's constant	https://vlab.amrita.edu/index.php?sub=1&brch=195&sim=547&cnt=1
4	Self-Inductance by Anderson's bridge	https://vlab.amrita.edu/index.php?sub=1&brch=192&sim=859&cnt=1
5	Thermal conductivity by Forbes Method	https://www.youtube.com/watch?v=Xd3Qhxa5LLc

Additional Activities (Any One)

1. Demonstrations
2. Mini project 3. Computer aided demonstrations

T.Y.B.Sc Physics Practical

Course code and title: PHY-348 Physics Laboratory Course II

Group - I

Sr. No.	Title of the Experiment	Links for the Experiment
ELECTRONICS (ESSENTIAL) (For the students not offering advance electronics in theory courses)		
1	Characteristics of JFET	https://www.youtube.com/watch?v=Q_mhFTe8-Po
2	Integrator using Op-Amp Differentiator using Op Amp	http://vlabs.iitkgp.ac.in/be/exp18/rcintegrator_opamp.html

		http://vlabs.iitkgp.ac.in/be/exp18/rcdifferentiator_opamp.html
ADVANCED ELECTRONICS (For the students offering advance electronics in theory courses)		
1	Temperature controller using PT 100 / thermocouple /thermistor temperature sensors	https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=351&cnt=1
2	Instrumentation Amplifier	http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/electronerds/experiments/instrumentation-amplifier-pvg/simulation.html
ACOUSTICS and Lasers		
3	Use of Ultrasonic interferometer to measure velocity of sound in liquids	https://vlab.amrita.edu/?sub=1&brch=201&sim=803&cnt=1

Note:: Practicals number 4 and 5 will be from **optional course I and II (One each) to be conducted / performed on college/ department level**

Group – II

Sr. No.	Title of the Experiment	Links for the Experiment
COMPUTER INTERFACED PHYSICS EXPERIMENTS/INSTRUMENTATION)		
1	Charging and discharging of capacitor and RC time constant OR IV Characteristics of diode	

C-PROGRAMMING		
2	Factorial of a number by simple and recursive method	
3	To find out the first 100 prime numbers	
COMPUTATIONAL PHYSICS		
4	Roots of polynomial (Newton Raphson)	
5	Trapezoidal and Simpson's 1/3 rule	

Additional Activities (Any One)

1. Demonstrations
2. Mini project
3. Computer aided demonstrations

T.Y.B.Sc Physics Practical
Course code and title: PHY-349 Physics Laboratory Course III (Project)

PROJECT WORK

Project to be taken by the teacher by conducting online/virtual activities like topic selection, defining the problem, literature survey, review work/writing followed by the sequence of the project as Title, Background, Objective, Significance, Importance, Applications, Methods and Materials, Experimental details, Results, Discussion Conclusion and References. Students should submit soft copy of the project report/dissertation/activity report in PDF format to the respective guide, teacher or examination section of the college/department

M.Sc- I Physics Practical

Course Code and Title: PHCP-115 Physics Laboratory-I (Electronics)

LIST OF EXPERIMENTS
M.Sc- I Physics Practical

Sr. No.	Title of the Experiment	Links for the Experiment
1	Diode Pump Staircase generator using UJT	https://www.youtube.com/watch?v=SYGD6DSsDCc
2	Optocoupler using OPAMPs and IC MCT-2E	https://www.youtube.com/watch?v=dZ2_yjCSq7o
3	Constant current Source using OP-AMP	https://www.youtube.com/watch?v=hNp-Fa5rslc http://vlabs.iitb.ac.in/vlabs-dev/labs/analog-electronics/experiments/voltage-regulator-iitr/ (After performing exp. Calculate load current from load resistance and output current)
4	DAC (Digital to Analogue Converter) using R-2R and Binary ladder	http://vlabs.iitkgp.ac.in/psac/newlabs2020/vlabiitkgpAE/exp1/index.html# https://www.youtube.com/watch?v=F78h92mgUQE
5	Active filters using OP-AMP IC741	http://vlabs.iitkgp.ac.in/psac/newlabs2020/vlabiitkgpAE/exp2/index.html# https://www.youtube.com/watch?v=JELIRui3Z0s (LP, HP and Band pass) https://www.youtube.com/watch?v=ss8c_BW1jHw (Active low pass filter) https://www.youtube.com/watch?v=1sT3nU_YCoQ (Active notch Filter)
6	Study of Multiplexer and Demultiplexer	https://de-iitr.vlabs.ac.in/exp/multiplexer-demultiplexer/theory.html
7	Precision rectifier	https://www.youtube.com/watch?v=Ok4zrz1zutQ https://www.youtube.com/watch?v=dCojRDwoFaI
8	OPAMP : logarithmic amplifier	https://www.youtube.com/watch?v=6Ns5ikck57k https://ae-iitr.vlabs.ac.in/exp/log-antilog-amplifier/simulation/Log%20Amplifier/log.html

M.Sc- I Physics Practical

Course Code and Title: PHCP-125 Physics Laboratory-II
(General Lab)
LIST OF EXPERIMENTS

Sr. No.	Experiment Name	Links for the Experiment
1	To determine the wavelength of He-Ne LASER by using Michelson's Interferometer apparatus	https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=1106&cnt=1 Link: https://www.youtube.com/watch?v=iTliVHjNDEA
2	Millikan Oil Drop Apparatus: To measure the rise and fall times of the oil droplets at different voltages having different charges. a) To determine the radii of droplets. b) To determine the charge 'e' on the droplets	https://vlab.amrita.edu/?sub=1&brch=195&sim=357&cnt=1 Link: https://www.youtube.com/watch?v=ijHKu6iXiRk
3	Electron Spin Resonance: To study the Electron Spin Resonance and to determine Lande's g-factor	https://vlab.amrita.edu/?sub=3&brch=206&sim=583&cnt=999 Link : https://www.youtube.com/watch?v=1vROHZqNsKI
4	Frank-Hertz experiment: To study the discrete energy levels using Frank-Hertz experiment	https://vlab.amrita.edu/?sub=1&brch=195&sim=355&cnt=1 Link: https://www.youtube.com/watch?v=FNthDviDSpw
5	Four Probe method: Temperature variation and Band gap of Ge-semiconductor	https://vlab.amrita.edu/?sub=1&brch=282&sim=1512&cnt=1 Link: https://www.youtube.com/watch?v=L0NGS978DWA
6	G.M. counter: Counting statistics, Characteristics of GM tube and determination of end point energy of β-ray source	https://vlab.amrita.edu/?sub=3&brch=45&sim=539&cnt=906 Link: https://www.youtube.com/watch?v=Q_1Lho0NTCQ
7	Hall effect experiment	https://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1

8	Black Body Radiation: Determination of Stefan's Constant	https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=548&cnt=1

M.Sc- II Physics Practical

Course Code and Title: PHCP 235 Physics Laboratory III

COMPUTER LABORATORY

LIST OF EXPERIMENTS
(Section I)

Sr. No.	Title of the Experiment
1	Legendre polynomials using the standard recurrence relation. Confirm that the method works well for Legendre functions by comparing with standard tables for special functions. (Use forward recursion.)
2	Bessel functions of the first kind using the standard recurrence relation. Use backward recursion with $J(50) = 0, J(49) = 0.1\ X\ 10^{-30}$ and Verify sum rule = $J(0) + 2 * \sum_{n=1}^{25} J(2n)$ =1
3	To generate random numbers. Find out the value of 'π' using Monte-Carlo methods. Obtain your result correct up to five decimal positions.
4	Interpolation: Interpolate the value of a function at a point. Use Lagrange interpolation method.

Section II	
5	Differential Equation: Find out the motion of a charged particle in a uniform magnetic field. The equation of motion of particle with charge ‘q’ and mass ‘m’ in a uniform magnetic field B.
6	Different equation: Write the differential equation for charging /discharging of a capacitor C through a resistance ‘R’. Solve this equation using Euler method and display your result in tabular as well as graphical form.
7	Write a program to graphically display Eigen functions and probability density curves for particle in one dimensional rigid box.
8	Fourier Analysis: perform the Fourier analysis (1) Full wave rectifier (2) Square wave

Note: For Optional Practical Course MSc Part-I and Part-II, i.e. PHOP-XXX (Two Credit Course) practical’s to be conducted (minimum four practical’s) at college / department level according to university guidelines.

M.Sc-II Physics Project
Course code and title: PHCP 235 Physics (Project)

PROJECT WORK

Project to be taken by the teacher by conducting online/virtual activities like topic selection, defining the problem, literature survey, review work/writing followed by the sequence of the project as Title, Background, Objective, Significance, Importance, Applications, Methods and Materials, Experimental details, Results, Discussion Conclusion and References. Students should submit soft copy of the project report/dissertation/activity report in PDF format to the respective guide, teacher or examination section of the college/department