B.Sc Physics Hons/General/Major/Minor
List of Practicals/Numerical Labs

Department of Physics, Netaji Mahavidyalaya

Semester I (NEP)
MAJOR-I: PHYS1011: MATHEMATICAL PHYSICS-I & MINOR-I: PHYS1021: MATHEMATICAL PHYSICS-I

Practicals:
C/C++

Semester II (NEP)
MAJOR-II: PHYS2011: MECHANICS & MINOR II : PHYS2021: MECHANICS

1. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity.
2. To determine the Moment of Inertia of a Flywheel/regular shaped body.
3. To determine g and velocity for a freely falling body using Digital Timing Technique.
4. To determine the Young's Modulus of a Wire by Optical Lever Method.
5. To determine the Modulus of Rigidity of a Wire by Maxwell’s needle/dynamical method.
6. To determine the elastic Constants of a wire by Searle’s method.
7. To determine the value of g using Bar pendulum/Kater’s Pendulum.
8. To determine the value of Young’s Modulus by Flexure method.

Semester-I Hons (CBCS)
CC- II: MECHANICS

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To study the random error in observations.
3. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c)Modulus of rigidity.
4. To determine the Moment of Inertia of a Flywheel / regular shaped body.
5. To determine g and velocity for a freely falling body using Digital Timing Technique.
6. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille’s method).
7. To determine the Young's Modulus of a Wire by Optical Lever Method.
8. To determine the coefficient of viscosity of highly viscous liquid by Stoke’s method.
9. To determine the Modulus of Rigidity of a Wire by Maxwell’s needle/ dynamical method.
10. To determine the elastic Constants of a wire by Searle’s method.
11. To determine the value of g using Bar pendulum / Kater’s Pendulum.
12. To determine the value of Young‟s Modulus by Flexure method

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Semester II Hons (CBCS)

CC- III: ELECTRICITY AND MAGNETISM

1. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses.
2. To study the characteristics of a series RC Circuit.
3. To determine an unknown Low Resistance using Potentiometer.
4. To determine an unknown Low Resistance using Carey Foster‟s Bridge.
5. To compare capacitances using De'Sauty's bridge.
6. Measurement of field strength B and its variation with distance using search coil.
7. To verify the Thevenin and Norton theorems.
8. To verify the Superposition, and Maximum power transfer theorems.
9. To determine self inductance of a coil by Anderson's bridge.
10. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
11. To study the response curve of a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.
12. Measurement of charge and current sensitivity and CDR of Ballistic Galvanometer
13. Determine a high resistance by leakage method using Ballistic Galvanometer.
14. To determine the mutual inductance of two coils by Carey-Foster‟s method.
15. Construction of one ohm coil.

CC- IV :WAVES AND OPTICS

1. To investigate the motion of coupled oscillators.
2. To study Lissajous Figures.
3. Familiarization with: Schuster's focusing; determination of angle of prism.
4. To determine refractive index of the Material of a prism using sodium source.
5. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
6. To determine wavelength of sodium light using Fresnel Biprism.
7. To determine wavelength of sodium light using Newton‟s Rings.
8. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.
9. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating.
10. To determine dispersive power and resolving power of a plane diffraction grating.

SEMESTER – III Hons (CBCS)

CC- V : MATHEMATICAL PHYSICS-II
Practicals: Scilab

CC- VI: THERMAL PHYSICS

1. To determine Stefan's constant.
2. To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus.
3. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton"s disc method.
4. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT) and determine the boiling point of a liquid.
5. To study the variation of Thermo-emf of a Thermocouple with Difference of Temperature of its Two Junctions.
6. To calibrate a thermocouple to measure temperature in a specified Range using (i) Null Method, (ii) Direct measurement using Op-Amp difference amplifier and to determine Neutral Temperature.

CC- VII : DIGITAL SYSTEMS AND APPLICATIONS

1. To measure (a) Voltage, and (b) Time period of a periodic waveform using CRO.
2. To test a Diode and Transistor using a Multimeter.
3. To design a switch (NOT gate) using a transistor.
4. To verify and design AND, OR, NOT and XOR gates using NAND gates.
5. To design a combinational logic system for a specified Truth Table.
6. To convert a Boolean expression into logic circuit and design it using logic gate ICs.
7. To minimize a given logic circuit.
8. Half Adder, Full Adder and 4-bit binary Adder.
9. Half Subtractor, Full Subtractor, Adder-Subtractor using Full Adder I.C.
10. To build JK Master-slave flip-flop using Flip-Flop ICs
11. To design an astable multivibrator of given specifications using 555 Timer.
12. To design a monostable multivibrator of given specifications using 555 Timer.
13. Write the following programs using 8085 Microprocessor
    a) Addition and subtraction of numbers using direct addressing mode
    b) Addition and subtraction of numbers using indirect addressing mode
    c) Multiplication by repeated addition.
    d) Division by repeated subtraction.

SEMESTER – IV Hons (CBCS)

CC - VIII: MATHEMATICAL PHYSICS-III
Practicals: Scilab

CC - IX : ELEMENTS OF MODERN PHYSICS

1. Photo-electric effect: Photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
2. To determine work function of material of filament of directly heated vacuum diode.
3. To determine the Planck's constant using LEDs of at least 4 different colours.
4. To determine the wavelength of H-alpha emission line of Hydrogen atom.
5. To determine the excitation potential of mercury/Argon by Franck-Hertz experiment.
6. To determine the absorption lines in the rotational spectrum of Iodine vapour.
7. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
8. To setup the Millikan oil drop apparatus and determine the charge of an electron.
9. To show the tunnelling effect in tunnel diode using I-V characteristics.
10. To determine the wavelength of laser source using diffraction of single slit.

CC - X : ANALOG SYSTEMS AND APPLICATIONS

1. To study V-I characteristics of PN junction diode, and Light emitting diode.
2. To study the V-I characteristics of a Zener diode and its use as voltage regulator.
3. Study of V-I & power curves of solar cells, and find maximum power point & efficiency.
4. To study the characteristics of a Bipolar Junction Transistor in CE configuration.
5. To study the frequency response of voltage gain of a RC-coupled transistor amplifier.
6. To study a Wien bridge oscillator for given frequency using an op-amp.
7. To design an inverting / non-inverting amplifier using Op-amp (741) for dc voltage of given gain.
8. To add two dc voltages using Op-amp in inverting and non-inverting mode.
9. To investigate the use of an op-amp as an Integrator / Differentiator.

SEMESTER – V Hons (CBCS)

CC - XI :QUANTUM MECHANICS AND APPLICATIONS
Practicals: Scilab

CC- XII : SOLID STATE PHYSICS

1. To measure the Dielectric Constant of a dielectric Materials with frequency.
2. To determine the band gap using a thermistor.
3. To study the PE Hysteresis loop of a Ferroelectric Crystal.
4. To draw the BH curve of Ferromagnetic material using Solenoid & determine energy loss from Hysteresis.
5. To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150^{o}C) and to determine its band gap.
6. To determine the Hall coefficient of a semiconductor sample.

DSE-1 : (1) ADVANCED MATHEMATICAL PHYSICS
Practicals: Scilab

DSE-2: (5) CLASSICAL DYNAMICS
No Practicals

SEMESTER – VI (Hons) (CBCS)

CC - XIII :ELECTROMAGNETIC THEORY

1. To determine the specific rotation of sugar solution using Polarimeter.
2. To analyze elliptically polarized Light by using a Babinet's compensator.
3. To determine the wavelength and velocity of ultrasonic waves in a liquid (Kerosene Oil, Xylene, etc.) by studying the diffraction through ultrasonic grating.
4. To determine the refractive Index of (1) glass and (2) a liquid by total internal reflection using a Gaussian eyepiece.
5. To verify the law of Malus for plane polarized light.
6. To determine the Boltzmann constant using V-I characteristics of PN junction diode.

CC - XIV : STATISTICAL MECHANICS
Practicals: Scilab

DSE- 3: (6) Nuclear and Particle Physics
No Practicals

DSE- 4: (8) Astronomy & Astrophysics
No Practicals
