SAURASHTRA UNIVERSITY

RAJKOT, 360005.

Syllabus for the Subject of PHYSICS

under the Faculty of SCIENCE

Accredited Grade A by NAAC

B.Sc.-Sem: 1&2 (Physics)

In force from June - 2016.

SAURASHTRA UNIVERSITY

At: RAJKOT, State: Gujarat,Pin: 360005.

B.Sc. Semester -1

P-101 : Physics Theory

(In force from June-2016)

(Mechanics & Semiconductor Electronics)

60 hour 70 Marks

UNIT 1: (12 hour : 14 Mark)

Vectors algebra and calculus: Vectors and Scalars, Addition of Vectors, Resolution of Vectors, Scalar and Vector Products, Differential Calculus as Rate Measurer, Differential Calculus as Maxima and Minima, Integral Calculus, Numerical Examples.

Basic electronics and Linear circuits: Electronic components, Basic idea of Passive components (Resistors, Capacitors, Inductors) and Active components, Source of Electric Power, Batteries, Concept of Voltage Sources, Ideal Voltage Source, Practical Voltage Source, Concept of Current Sources, Practical Current Source, Conversion of Voltage Source into Current Source and vice versa, RC circuits analysis and time constant.(Capacitor charging and discharging). Numerical Examples.

UNIT 2: (12 hour: 14 Mark)

Semiconductors Physics: Semiconductor materials, Energy Bands in solids-metals insulators and semiconductor, Intrinsic Semiconductor, Crystal Structure of Intrinsic semiconductor, Charge Carriers in Intrinsic semiconductor, Conduction in Intrinsic semiconductor, Extrinsic semiconductors, N-type Semiconductor, P-type Semiconductor, Effect of temperature on conductivity of Intrinsic and Extrinsic Semiconductor, PN junction, Formation of PN junction, PN junction with Forward and Reverse biasing, Reverse Breakdown, V-I Characteristic of a PN junction diode, The ideal diode, Static and Dynamics Resistance of a diode. Zener Diode, Zener Breakdown, V-I Characteristic of a Zener diode, Numerical Examples.

Reference books for unit 1,2 :

1. Concept of physics By H C Verma part 1 Publisher: Bharati Bhawan
2. Sears and Zemansky's University Physics with modern physics By H D Young Publisher: PEARSON
3. Basic electronics and linear circuits By N N BhargavA, D C Kushreshtha, S C Gupta Publisher: Technical Teachers Training Institute Chandigarh.
4. Elements of Electronics By Bagde & Singh Pub: S.chand

UNIT 3: (12 hour : 14 Mark)

Laws of Motion & Dynamics of System of Particles: Frames of reference, Newton's Laws of motion, Kinetic Energy, Work and Work-Energy theorem, Calculation of Work Done, Conservative and Non-Conservative force (only definition), Potential Energy and Conservation of Energy, Definition of Center of Mass, Center of Mass of Two Particles and several group of Particles, Linear Momentum and its Conservation Principle, Rocket Propulsion, Collisions, Inelastic Collisions, Elastic Collisions (one dimension and two dimension explanation), Numerical Examples.

UNIT 4: (12 hour : 14 Mark)

Rotational Mechanics: Angular velocity and Angular Acceleration, Torque of a Force about the Axis of Rotation, Moment of Inertia and $\tau = I\propto$, Moment of Inertia of rectangular Bar, Moment of Inertia of Solid Cylinder, Angular Momentum, Conservation of angular momentum, Kinetic Energy of a Rigid body, Two Theorems on Moment of Inertia. Numerical Examples.

Gravitation: Newton's Law of Gravitation, Gravitation Potential Energy, Gravitation potential, Gravitational field, Calculation of Gravitational Potential and Field due to a Point Mass, Kepler's Laws, Motion of Planets and Satellite in circular orbit. Geosynchronous orbits, Weightlessness, Escape velocity, Numerical Examples.

UNIT 5: (12 hour : 14 Mark)

Elasticity: Elasticity, Stress and Strain, Hooke's law, Relation between Longitudinal Stress and Strain(stress-strain diagram), Modulus of Rigidity, Poission's Ratio, Determination of Modulus of Rigidity by Searles method.

Oscillations: Simple Harmonic Motion, Equation for SHM and its Solutions, Terms associated with SHM like (Time Period, Frequency, Amplitude, and Phase), SHM as a Projection of Circular Motion, Energy conservation in simple harmonic motion, Kinetic and Potential Energy, Damped Oscillations, Forced Oscillation and Resonance. Numerical Examples.

Reference books for unit 3,4,5:

1. Concept of physics By H C Verma part 1 Publisher: Bharati Bhawan
2. Sears and Zemansky's University Physics with modern physics By H D Young Publisher: PEARSON

Other Reference books:

1. Mechanics Berkeley Physics course Vol 1
2. Lectures on physics, R.P.Feynman, Vol-1
3. Physics – Resnick and Halliday
4. Principles of electronics By V.K.Mehta Publisher: S.Chand
5. Electronic Device And Circuits By Allen Mottershead Pub: PHI

LIST OF EXPERIMENTS

B.Sc. Semester-I

1. To Study of errors in observation Using Vernier Caliper, Micrometer Screw.
2. To determine 'g' and radius of gyration using Bar Pendulum,
3. To determine the Moment of Inertia of rectangular body & prove law of perpendicular axis by Bifilar Suspension.
4. To determine the Moment of Inertia & Modulus of rigidity by Torsional pendulum.
5. To determine the Young's Modulus of long wire by Searl's method.
6. To determine the Poisson's ratio of rubber tube.
7. To study of Charging and Discharging of Capacitor and RC time constant.
8. To determine Low resistance by Projection method.
9. To study of Tangent galvanometer (Constant of T.G. & Verification of Ohm's law, to find reduction factor of TG)
10. To determine Low resistance by Potentiometer.
11. To study Semiconductor Diode Characteristics.
12. To study Zener diode Characteristics

Reference Books:

1. B.Sc. Practical physics By C.L.Arora Pub: S.chand.
2. A text book of Practical Physics By Indu Prakash & Ramkrishna
   Pub: Kitab Mahal, New Delhi.
3. Practical Physics By S.L.Gupta and V. Kumar
   Pub: Pragati Prakashan, Meerut.
4. B.Saraf et aI-Physics through experiments Vol. I & II.

Instruments List

Practical 1: Vernier Caliper, Micrometer Screw, A wooden piece.

Practical 2: Bar Pendulum, Spirit level, Stop-watch, Telescope, Meter Scale.

Practical 3: Bifilar Suspension Apparatus, A rectangular wooden piece (lamina), stand with meter scale, stop-watch.

Practical 4:Torsion pendulum, Right Circular Cylinder(Regular Body), Irregular Body(Rings of different radii), Spirit Level, Micrometer screw, Vernier Callipers, Stop-watch, Weight Box, Long thin wire.

Practical 5: Searle's Apparatus for Young Modulus, Stop-Watch, telescope, Meter Scale, Vernier Caliper, Micrometer Screw, Two identical wire.

Practical 6: Rubber Tube with metal sleeves and rubber stoppers, Metal Stand to hold rubber tube, Graduated tube, Hanger with Slotted Weight, Meter Scale, Measuring Cylinder, Thread

Practical 7: R-C Circuit with Transformer OR Step Down Transformer of 25 V with Variable adjustment , Capacitance (C = 10μF)and Resistance (300Ω) of different values, A.C MiliAmeter, A.C Voltmeter.

Practical 8: Wheastone'sBridge Wooden Apparatus, Resistance Box, Low resistance, Battery (0-10 Volt), Sensitive Galvanometer, Jockey, Key, four way key, Rheostat.

Practical 9: Tangent galvanometer, Battery, Resistance Box, Reversing Key, Rheostat, Voltmeter, Plug key.

Practical 10: Potentiometer Apparatus, Rheostat, Two Way Key, Plug Key, Resistance Box, Low resistance, Battery (0-10 Volt), Sensitive Galvanometer, Jockey, Key.

Practical 11: Semiconductor Diode, Battery(0 -100 V) , Milliammeter (0-500 ma),Voltmeter(0-3V),Microammeter(0-100μA),Or Diode Characteristic Circuit Board With Meters.

Practical 12: Zener Diode Characteristic Circuit Board with meters Or Zener Diode and same as per practical 11.

B.Sc. Semester -2

P-201 : Physics Theory

(In force from June-2016)

(Wave, Optics & Semiconductor Devices)

60 hour 70 marks

UNIT -1: (12 hour: 14 Mark)

Wave Motion and Waves in a String: Wave motion, Transverse Wave Travelling in String, Velocity of a Wave in a String, Interference and the principle of Superposition, Standing waves on a String, Normal Modes of a String, Laws of Transverse Vibrations of a String, Numerical Examples.

Sound: Speed of Sound Wave in a material medium, Speed of Sound in Gas-Newton's Formula and Laplace's Correction, Intensity and loudness of Sound Wave - Decibels, Beats, Musical Scale, Acoustics of Buildings, Application of Acoustic phenomena, Doppler Effect, Numerical Examples.

Reference books:

1. Concept of physics By H C Verma part 1 Publisher:Bharati Bhawan
2. Sears and Zemansky's University Physics with modern physics
By H D Young Publisher: PEARSON

UNIT -2: (12 hour: 14 Mark)

Semiconductor Diode: Use of Diode in Rectifiers, Half-Wave Rectifier, Full-Wave Rectifier, Centre-tap Rectifier, Bridge Rectifier, Performance of Half-Wave & Full-Wave Rectifier (Rms value of current, Ripple factor, Rectification Efficiency), Comparison of Rectifiers , Filter Circuit, Capacitor Filter, Inductor Filter, LC filter, π Filter, Review of Zener diode, Zener Diode as Voltage Regulator, Numerical Examples.

Transistor: Structure of Transistor, Types of BJT, Action of a Transistor, Working of a Transistor, Relation Between Different Current in Transistor, Three Configurations of Transistor, Transistor Characteristics (CB and CE Configuration), Comparison between the three configurations, Why CE Configuration is preferred in Circuit, Numerical Examples.

Reference books:

1. Basic electronics and linear circuits By N N BhargavA, D C Kushreshtha & S C Gupta , Publisher: Technical Teachers Training Institute Chandigarh.
2. Elements of Electronics By Bagde & Singh Publisher : S.chand
3. Principles of electronics By V.K.Mehta Publisher: S.Chand 4.
4. Electronic Device And Circuits By Allen Mottershead Pub: PHI

UNIT -3: (12 hour: 14 Mark)

Wave Optics: Interference: Electromagnetic nature of Light, Wave Front, Huygens Principle.

Superposition of Waves, Conditions for Interference, Techniques of Obtaining Interference: Division of Amplitude and Division of Wave front, Young's Double Slit Experiment, Lloyd's Single Mirror- Determination of Wavelength of Light, Fresnel Biprism – Experiment Arrangement & Determination of Wavelength of Light, Interference in Thin Films, Types of thin film -Parallel and wedge-shaped films, Newton's Rings: Determination of Wavelength of Light & refractive index, Numerical Examples.

UNIT -4: (12 hour: 14 Mark)

Wave Optics: Diffraction: Types of Diffraction-Fraunhofer and Fresnel Diffraction, Fraunhofer Diffraction at single slit, Fraunhofer Diffraction at Double Slit, Plane Diffraction Grating, Fraunhofer Diffraction at Plane Diffraction Grating.

Rectilinear Propagation of Light and Half-Period Zones, Zone Plate, Action of Zone Plate, Comparison Between Zone Plate and Convex Lens, Diffraction Pattern of a straight edge, Numerical Examples.

UNIT -5: (12 hour: 14 Mark)

Wave Optics: Polarization: Polarized Light, Production of Polarized Light- By Selective Absorption, By Reflection, By Scattering, By Double Refraction, Polarizer and Analyzer, Nicol Prism, Numerical Examples.

Geometrical Optics: Fermat's Principle of Least Time, Law of reflection & Law of refraction from Fermat's Principle, Cardinal Points, Nodal Points and Nodal Planes, Properties of Nodal Points, Construction of the Image Using Cardinal Points, Newton's Formula , Relation between f_1 and f_2, Dispersion by a Prism, Angular Dispersion, Dispersive Power, Numerical Examples.

Reference Books for unit 3,4,5 :

1. A Text Book Of OPTICS By N.Subrahmanyam, Brijlal, M.N. Avadhanulu Publisher: S.chand.
2. Principle of OPTICS By B.K.Mathur Publisher: Gopal Printing
3. Fundamentals of OPTICS By Jenkins and White Publisher: McGraw-Hill
4. Fundamentals of OPTICS By Gulati and Khanna Publisher: R.Chand

LIST OF EXPERIMENTS

B.Sc. Semester-II

1. To determine the unknown frequency of Tuning Fork By Melde' s Experiment
2. To Verify the Laws of vibrating strings by Melde's Experiment.
3. To Study the Resonator and to determine unknown frequency of tuning fork.
4. To Calibrate a Spectrometer.
5. To Study Dispersive curve, and to determine the dispersive power of the material of a prism for different colours.
6. To determine wavelength of light using Newton's Ring.
7. To study the CB Characteristic of Transistor.
8. To study the CE Characteristic of Transistor.
9. To study Half-Wave Rectifier.
10. To study Full-Wave Rectifier (Centre tap).
11. To study Bridge Rectifier.
12. To Study of a Transformer.
13. To study Characteristics of Photo diode.
14. To study Deflection magneto meter (one magnet and two magnets).

Reference Books:

1. B.Sc. Practical physics By C.L.Arora Pub: S.chand
2. A text book of Practical Physics By Indu Prakash & Ramkrishna Pub: Kitab Mahal, New Delhi.
3. Practical Physics By S.L.Gupta and V. Kumar Pub: Pragati Prakashan, Meerut.
4. B.Saraf et aI-Physics through experiments Vol. I & II

Instruments List

Practical 1: Tuning Fork, Stand with Clamp, Pulley, Weight Box, Light Weight Pan, String.

Practical 2: Tuning Fork, Stand with Clamp, Pulley, Weight Box, Light Weight Pan, String.

Practical 3: A resonator, rubber tubing, pinch cock, clamp stand, set of tuning forks, graduated cylinder

Practical 4: Prism, Spectrometer, Spirit Level, Mercury Vapour Lamp, Wooden Box with Aperture, Eye Piece, Lamp.

Practical 5: Prism, Spectrometer, Spirit Level, Mercury Vapour Lamp, Wooden Box with Aperture, Eye Piece, Lamp.

Practical 6: Travelling Microscope, Sodium vapour Lamp, Newton's Rings apparatus Consisting optically plane glass and a convex lens of about 100 Cm focal length placed in box having an optically plane glass plate inclined at an angle of 45^0 , Spectrometer or microscope, convex lens of Short Focal Length.

Practical 7: P-N-P Transistor OR N-P-N Transistor CB Characteristic Circuit Board, Battery(0-3 Volt & 0-10 Volt), Two MiliAmeter (0-25mA), Voltmeter (0-3 volt & 0-10Volt)

Practical 8: P-N-P Transistor OR N-P-N Transistor CE Characteristic Circuit Board,

Battery (0-3 Volt & 0-10 Volt), MiliAmeter (0-25mA), Micrometer, Voltmeter (0-3 volt & 0-10Volt)

Practical 9: Half Wave Rectifier Circuit Board, MiliAmeter (0-100mA), A.C. Voltmeter, D.C. Voltmeter OR VTVM.

Practical 10: Full Wave Rectifier Circuit Board, MiliAmeter (0-100mA), A.C. Voltmeter, D.C. Voltmeter OR VTVM.

Practical 11: Half Wave Rectifier Circuit Board, MiliAmeter (0-100mA), A.C. Voltmeter, D.C. Voltmeter OR VTVM.

Practical 12: Step-down Transformer, Rheostat, A.C. Milliammeter (0-500 ma), A.C. Voltmeter (0- 10 V).

Practical 13: Photo Diode, Battery, Light Source, Milliammeter, Voltmeter.

Practical 14: Bar Magnets, Deflection Magnetometer, Scale

PAPER STYLE For Semester -1and 2

1. B. Sc. Physics Syllabus for Semester 1 & 2 consists of 5 units:
2. All units carry 14 marks
3. 70 Marks for theory and 30 marks for Internal Examinations.
4. Total 5 questions one question from each unit.
5. Each question of 14 mark
6. Time duration: $2\frac{1}{2}$ Hours

Question:1 from Unit 1 : Mark 14

Question:2 from Unit 2 : Mark 14

Question:3 from Unit 3 : Mark 14

Question:4 from Unit 4 : Mark 14

Question:5 from Unit 5: Mark 14

Each Question divide in a,b,c and d sub question as shown below

(a) Shorts questions 4 [4 Marks]

(One word, one line, explanation, definition, true or false, fill up the blanks, etc.)

(b) Answer any 1 numerical out of 2 [2 Marks]

(c) Answer any1 out of 2 [3Marks], one question should be numerical

(d) Answer any1 out of 2 [5 Marks]

SAURASHTRA UNIVERSITY

RAJKOT

Accredited Grade "A" by NAAC

(CGPA 3.05)

FACULTY OF SCIENCE

SYLLABUS FOR

B.Sc.

PHYSICS

(Semester- 3 & 4)

According to Choice Based Credit System

Effective from June – 2017

B.Sc. (Physics)

Semester -3

Paper: Physics-301

(Electricity, Magnetism, & Semiconductor Electronics)

Course duration:

Theory: 60 hours, 6 hours a week, Credit: 4

External Marks: 70, Internal Marks: 30, Total: 100

Practical: 60 hours, 6 hours a week, Credit: 3

External Marks: 35, Internal Marks: 15, Total: 50

PAPER STYLE For Semester -3

1. B. Sc. Physics Syllabus for Semester 3 consists of 5 units:
2. All units carry 14 marks
3. Total 5 questions one question from each unit.
4. Each question of 14 mark
5. Time duration:2.5 Hours

Question:1 from Unit 1 : Mark 14

Question:2 from Unit 2 : Mark 14

Question:3 from Unit 3 : Mark 14

Question:4 from Unit 4 : Mark 14

Question:5 from Unit 5: Mark 14

Each Question divide in a,b,c and d sub question as shown below

(a) Shorts questions 4 [4 Marks]

(One word, one line, explanation, definition, true or false, fill up the blanks, etc.)

(b) Answer any 1 numerical out of 2 [2 Marks]

(c) Answer any1 out of 2 [3Marks], one question should be numerical.

(d) Answer any1 out of 2 [5 Marks]

Paper: Physics-301

(Electricity, Magnetism, & Semiconductor Electronics)

UNIT 1: (12 hours: 14 Mark)

Vector Analysis: Review of vector algebra, scalar and vector product, Triple product , How vectors transform, Gradient , The operator Del (∇), The Divergence, The Curl and their significance, Product rules, Integral Calculus – Fundamental theory for Gradient, Fundamental theorem for Divergences- Gauss's theorem, Fundamental theorem for Curls- Stokes theorem, Relations between fundamental theorems, Numerical Examples.

UNIT 2: (12 hour: 14 Mark)

Electrostatics: Introduction , Coulomb's law, Electric field, Continuous charge distributions, Field Lines and Gauss's law, Divergence and Curl of Electrostatic field, Application of Gauss theorem - electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor, Electric potential, Poisson's and Laplace equation, Potential of a charged distribution, Summary: Electrostatic Boundary Conditions, Work done in moving charge, The energy of point charge distribution, The energy of continuous charge distribution, Numerical Examples.

UNIT 3: (12 hour: 14 Mark)

Magnetostatics: Magnetic fields, Magnetic forces: Cyclotron and Cycloid motion, Current , Biot-Savart's law: Steady currents and the magnetic field of steady current, Straight line current, The divergence of B, The Curl of B, Ampere's law with examples , Comparison of Electrostatics and Magnetostatics, The Vector Potential , Summary: Magnetostatic Boundary Conditions, Numerical Examples.

UNIT 4: (12 hour: 14 Mark)

Electrostatic and Magnetostatics fields inside matter:

Dielectrics, Induced dipoles with examples, Alignment of Polar molecules, Polarization, The field of Polarized object: Bound charges, Physical interpretation of bound charges with examples, Field inside the dielectrics, The Electric displacement: Gauss's law in the presence of dielectrics, Susceptibility, Permittivity, and Dielectric Constant.

Magnetization: Diamagnets, Paramagnets, Ferromagnets, Torques and Forces on magnetic dipoles, Effect of magnetic field on atomic orbits, Magnetization, The field of magnetized objects: Bound currents, Physical interpretation of bound currents, The magnetic field inside matter, Ampere's law in magnetized materials, Magnetic Susceptibility & Permeability, Numerical Examples.

Basic Reference books for unit 1 to 4:

1) Introduction to electrodynamics By David J Griffiths, Publisher: PHI.

2) Electricity and Magnetisam By D.C. Tayal, Publisher: Himaliya publishing House.

UNIT 5: (12 hour : 14 Mark)

Transistor Biasing & Stabilization of operating point:

Review of transistor connection, Load line analysis, Operating point, Transistor amplifier performance, Cutoff and Saturation regions, Power rating of transistor , Transistor lead identification and testing , Faithful Amplification , Transistor Biasing, Inherent variation of the transistor parameters, stabilization , Stability factors, Methods of transistor biasing- base resistor method, Emitter Bias Method, feedback resistor method, voltage divider biasing, Low power transistor biasing circuit designing, Numerical Examples.

Single Stage Transistor amplifier circuit:

Introduction to the single stage transistor amplifier, How Transistor amplifies?, Graphical Explanation, Practical circuit of transistor amplifier, Phase reversal, voltage gain, Load line analysis, Classification of Amplifiers, Frequency response and bandwidth of CE amplifier, Numerical Examples.

Basic Reference books for unit-5:

1) Principles of electronics By V.K.Mehta & Rohit Mehta, Publisher: S.Chand

2) Basic Electronics By B.L.Thereja, Publisher : S.Chand.

Other Reference books for semester 3 :

1) Electromagnetics by B. B. Laud, Publisher: Willey Eastern Limited.

2) Electricity and Magnetism By Edward M. Purcell, Publisher: McGraw-Hill

3) Electricity and Magnetism By J.H. Fewkes & J.Yarwood, Publisher: Oxford University Press

4) University Physics By Ronald Lane Reese, Publisher: Thomson Brooks

5) Concept of physics By H C Verma part 1, Publisher: Bharati Bhawan

6) University Physics with modern physics By Sears ,Zemansky & H D Young, Publisher: PEARSON

7) Basic electronics and linear circuits By N N BhargavA, D C Kushreshtha, S C Gupta, Publisher: Technical Teachers Training Institute Chandigarh.

8) Elements of Electronics By Bagde & Singh, Publisher: S.chand

9) Electronic Device And Circuits By Allen Mottershead, Publisher: PHI

LIST OF EXPERIMENTS for B.Sc. (Physics) semester -3

1. To determine the Young's modulus (Y) of material by Cantilever method
2. To determine the Young's modulus (Y) of material by bending of beam.
3. To determine the viscosity of liquid by Searl's co-axial cylinder.
4. To determine the Moment of Inertia of a Fly wheel.
5. To determine resolving power of prism.
6. To determine resolving power of telescope.
7. To determine refractive index of liquid by using liquid lens method.
8. To determine radius of curvature of a given lens and refractive index of glass using optical lever method.
9. Study of Zener Diode as voltage regulating characteristics.
10. To study the Characteristics of Photo Transistor and verify inverse square law.
11. To determine Q point and Load line for BJT.
12. To determine the figure of merit & volt sensitivity of ballistic galvanometer.
13. To study the Frequency response & Bandwidth of R.C.Coupled Amplifier.
14. To study the variation of magnetic field of Solenoid.
15. Experimental measurements by Multimeter, (Power Supply, Resistor, Transistor, Diode, Capacitor).
16. To determine e/m by Thomson's method.
17. To verify the Thevnin's theorem.
18. To verify the Maximum Power transfer theorem.
19. To determine the capacity 'C' of Capacitor. (verification of Series & Parallel connection of capacitor).
20. To determine the self inductance 'L' of inductor (verification of series & Parallel connection of inductor).

Reference Books for practicals:

1) B.Sc. Practical physics By C.L.Arora, Publisher: S.chand.
2) A text book of Practical Physics By Indu Prakash & Ramkrishna
   Publisher: Kitab Mahal, New Delhi.
3) Practical Physics By S.L.Gupta and V. Kumar
   Publisher: Pragati Prakashan, Meerut.
4) B.Saraf et aI-Physics through experiments Vol. I & II.
5) B.Sc. Practical physics By Harnam Singh, Dr P.S. Hemne
   Publisher: S.chand

B.Sc. (Physics)

Semester -4

Paper: Physics-401

(Thermodynamics & Electronics)

Course duration: Theory: 60 hours, 6 hours a week, Credit: 4
Practical: 60 hours, 6 hours a week, Credit: 3
Theory: External Marks: 70, Internal Marks: 30, Total: 100
Practical: External Marks: 35, Internal Marks: 15, Total: 50

PAPER STYLE For Semester -4

1. B. Sc. Physics Syllabus for Semester 4 consists of 5 units:
2. All units carry 14 marks
3. Total 5 questions one question from each unit.
4. Each question of 14 mark
5. Time duration:2.5 Hours

Question:1 from Unit 1 : Mark 14

Question:2 from Unit 2 : Mark 14

Question:3 from Unit 3 : Mark 14

Question:4 from Unit 4 : Mark 14

Question:5 from Unit 5: Mark 14

Each Question divide in a,b,c and d sub question as shown below

(a) Shorts questions 4 [4 Marks]

(One word, one line, explanation, definition, true or false, fill up the blanks, etc.)

(b) Answer any 1 numerical out of 2 [2 Marks]

(c) Answer any1 out of 2 [3Marks], one question should be numerical.

(d) Answer any1 out of 2 [5 Marks]

Paper: Physics-401
(Thermodynamics & Electronics)

UNIT -1: (12 hour: 14 Mark)

Laws of thermodynamics: Thermodynamic System, Thermal equilibrium and Zeroth law of thermodynamics, Thermodynamic Equilibrium, Internal energy, Concept of Heat, First law, Specific heat of the gas – Mayer's formula, Various thermodynamics processes [only Definition], work done during isothermal and adiabatic processes, Cooling due to adiabatic reversible process, Joule Thomson expansion -the Porus Plug experiment, Heat engine and efficiency, Reversible and Irreversible processes, Carnot's ideal Engine and Carnot's cycle, Reversible and irreversible engine, second law of thermodynamics, Carnot theorem, Numerical Examples.

UNIT -2: (12 hour: 14 Mark)

Entropy: Concept of Entropy, Entropy change in - Adiabatic ,Reversible and Irreversible processes, Principle of increase of Entropy, The T- S Diagram, The calculation of Entropy , Third law of Thermodynamics, Unattainability of absolute Zero, Application of the Entropy principle, Entropy and Disorder, Numerical Examples.

Theory of Radiation: Thermal Radiation, Black Body and Black Body Radiation , Kirchhoff's Law, Stefan Boltzmann Law, Distribution of Energy in Black Body Spectrum, Wien's Displacement Law & Wien's law of energy distribution, Rayleigh- Jeans Law, Plank's Law, Wien's law and Rayleigh – Jeans law in relation to Planck's law, Numerical Examples.

UNIT -3: (12 hour: 14 Mark)

Thermodynamic potentials: Thermodynamic potentials and their relationships with thermodynamic variables- [Enthalpy, Gibbs, Helmholtz and internal energy functions, Maxwell's relations] , Applications of Maxwell's relations – Clausius- Clapeyron Equation, Specific Heat Equation, Joule-Thompson Effect & Joule- Thompson Coefficient , TdS Equations, Numerical Examples.

Basic reference book for unit 1 to 3:

1) Heat thermodynamics and statistical Physics By Singhal, Agrawal & Prakash, Publisher: Pragati Prakashan.
2) Heat thermodynamics and Statistical Physics By Brijlal, N. Subrahmanyam & P.S. Hemne, Publisher: S.Chand

UNIT -4: (12 hour: 14 Mark)

Semiconductor device: Principle, Working and Construction of - LED, Advantages of LED, Multicolor LED, Application of LED, Principle, Construction, Working and Applications of - Photo Diode, Varactor diode, Solar Cell, Thermistor.

FET- Types of FET, Construction and Working JFET, Advantage of JFET and difference between JFET and BJT, Output Characteristics of JFET, Parameters of JFET, J-FET Biasing, Construction & Working of UJT, Equivalent circuit of UJT, Characteristics of UJT, Advantages & Applications of UJT, Numerical Examples .

Digital Circuit: Analog and Digital Signal, Introduction to Number Systems, Decimal to Binary and Binary to Decimal Conversion, Binary Coded Decimal Code, Logic Gates- AND, OR and NOT Gates using Diode, NAND & Nor Gate , NAND and NOR Gate as a universal gate , X-OR Gates, Bollean Algebra and Theorems, De Morgan's Theorems, Simplification of Logic Circuit using Boolean Algebra, Numerical Examples.

Basic Reference Books:

1) Principles of electronics By V.K.Mehta & Rohit Mehta Publisher: S.Chand
2) Basic Electronics By B.L.Thereja Publisher : S.Chand

UNIT -5: (12 hour: 14 Mark)

A.C. Circuit: L-R circuit, R-C Circuit, L-C Circuit, L-C-R series and parallel Circuit with resonance, Numerical Examples.

A.C Bridge & their applications : A.C. Bridge –Condition for Bridge Balance (Impedence Bridge), Maxwell's Impedence & L/C Bridge, Owen's Bridge, De Sauty's Bridge, Wien's Bridge, Schering Bridge, Kohlraush's Bridge, , Numerical Examples.

Oscillators : Sinusoidal oscillators, Positive feedback, Barkhausen Criterion, Different types of transistor oscillators, Colpitt's Oscillator, Hartley Oscillator, Phase Shift Oscillator, Wein Bridge Oscillator, Numerical Examples.

Basic Reference books :

1) Electricity and Magnetisam By D.C. Tayal Publisher : Himaliya publishing House.
2) Moderan Electronics instrumentation and Mesurement techniques By Albert D Helfrick & William D Cooper Publisher : PHI
3) Principles of electronics By V.K.Mehta & Rohit Mehta Publisher: S.Chand

Other Reference books for semester 4 :

1) University Physics By Ronald Lane Reese Publisher: Thomson Brooks
2) Concept of physics By H C Verma part 1 Publisher: Bharati Bhawan
3) University Physics with modern physics By Sears ,Zemansky & H D Young Publisher: PEARSON
4) Basic electronics and linear circuits By N N BhargavA, D C Kushreshtha, S C Gupta Publisher: Technical Teachers Training Institute Chandigarh.
5) Elements of Electronics By Bagde & Singh, Publisher: S.chand
6) Electronic Device And Circuits By Allen Mottershead, Publisher: PHI
7) Thermodynamics, kinetic theory & Statistical thermodynamics By F.W.Sears & G.L.Salinger, Publisher: Narosa
8) Thermal Physics By S.garg, R.Bansal & C. Ghosh, Publisher: TMG
9) Heat & Thermodynamics by Mark W. Zemansky and R.H. Dittman, Publisher:McGraw Hill, Int. 7th edition.

LIST OF EXPERIMENTS for B.Sc. (Physics) semester -4

1. To Verify Stefan's Law.
2. To determine the thermal conductivity of cardboard by Lee's Method.
3. To determine the wavelength of using Diffraction grating.
4. To determine high resistances by method of leakage.
5. To compare the capacities of two capacitors by De Sauty's bridge.
6. To determine specific resistance of electrolyte by Kohlrauch's bridge.
7. To determine the self induction by Maxwell Bridge.
8. To determine the modulus of rigidity by Maxwell's needle.
9. To determine the modulus of rigidity by Statistical method (Barton's apparatus).
10. To study the resistance temperature characteristics of Thermistor & Determine energy band gap of semiconductor material by Thermistor.
11. To study of characteristics of Solar Cell.
12. To study the characteristics of FET & Determination of parameters of FET.
13. To study Characteristics of Uni Junction Transistor.
14. Verification of truth table of AND, OR, NOT, NAND & NOR gate.
15. To study NAND gate & NOR gate as Universal gate.
16. Construction of FET as Voltmeter.
17. Obtain IV characteristics of given LDR and calculate its resistance (for at least three different light levels).
18. To study L-R and R-C circuit
19. To study a series resonant L-C-R circuit & Determine resonate frequency and quality factor.
20. To study a parallel resonant L-C-R circuit & Determine resonate frequency and quality factor.

Reference Books for Practicals:

1) B.Sc. Practical physics By C.L.Arora, Publisher: S.chand.
2) A text book of Practical Physics By Indu Prakash & Ramkrishna
   Publisher: Kitab Mahal, New Delhi.
3) Practical Physics By S.L.Gupta and V. Kumar
   Publisher: Pragati Prakashan, Meerut.
4) B.Saraf et aI-Physics through experiments Vol. I & II.
5) B.Sc. Practical physics By Harnam Singh, Dr P.S. Hemne
   Publisher: S.chand

SAURASHTRA UNIVERSITY

RAJKOT

Accredited Grade "A" by NAAC

(CGPA 3.05)

FACULTY OF SCIENCE

SYLLABUS FOR

B.Sc.

PHYSICS

(Semester- 5 & 6)

According to Choice Based Credit System

Effective from June – 2018

Syllabus of B.Sc. (Physics) Sem-5
According to Choice Based Credit System
Effective from June – 2018

Course Contents :

- Physics-501 –Theory: Mathematical Physics, Classical Mechanics & Quantum Mechanics
- Physics-502 -Theory: Electrodynamics and Relativity
- Physics-503-Theory: Solid State Electronics
- Practical- Group A
- Practical- Group B
- Practical- Group C
- Project

Total Credit of the Semester-5: 24

Educational Study Tour:

Physics Department of college should arrange at least one Educational Study tour during semester 5 or 6. In this tour, students may visit any state or national research institute, scientific organization, industry or any educational scientific institute in India. Students have to submit detailed report of this study tour. This report is to be considered as a project of 50 marks.

B. Sc. Physics Semester : 5

The Course Design of B. Sc. Sem.- 5 (Physics) according to choice based credit system (CBCS) as follows :

Sr.No	Subject	No of theory Lecture per week	No of Practical Lecture per week	Total Marks	Credits
1	**PAPER Physics- 501 (Theory) Mathematical Physics Classical Mechanics & Quantum Mechanics**	6	-	70(External)+ 30(Internal) = 100 Marks	4
2	**PAPER Physics-502 (Theory) Electrodynamics and Relativity**	6	-	70(External)+ 30 (Internal) = 100 Marks	4
3	**PAPER Physics-503 (Theory) Solid State Electronics**	6	-	70(External)+ 30 (Internal) = 100 Marks	4
4	**Practical -1 (Group A)** **One practical from group A**	-	6	35(External)+ 15(Internal) = 50 Marks	3

5	**Practical -2 (Group B)** **<u>One practical from group B</u>**	-	6	35(External)+ 15(Internal) = 50 Marks	3
6	**Practical -3 (Group C)** **<u>One practical from group C</u>**		6	35(External)+ 15(Internal) = 50 Marks	3
7	**Project Work & Viva**	• 1 Guidance Lecture. for a group in a week. • Evaluation of project will be in the SIXTH semester			3
				<u>Total credit of the semester 5</u>	**24**

: Project Work :

Project work is divided in two parts :
(1) : Theoretical essay or educational tour report : 50 marks
(2) : Preparation of Working Model : 50 marks

Project (1): Theoretical essay or educational tour report:

Each student has to prepare one detailed essay based on any topic of Physics which includes the principle of physics or based on any theory of physics or application of physics.

OR

Student should submit detailed report of educational study tour.

Each student should submit this report at the end of the 6th Semester. The Project work would be evaluated by the examiner based on the presentation of the report by students and conducting viva-voce on the topic.

The distribution of marks is as follows:

Essay/ Report writing	: 35
Viva voce	: 15
Total	: 50

Project(2): Preparation of the Working Model:

The project work will be assigned in the team (group) of minimum one and maximum four students.

Students has to prepare one model (preferably working model) based on the principle of Physics. The model, along with a detailed write up (dissertation), explaining the principle, working and applications, should be submitted to the Practical-in-charge at the end of 6th semester.

Each group of the students has to submit a working model in common but each student of the group has to separately submit write up for their common group working model.

Project-in-charge should extend the guidance regarding the selection, preparation and troubleshooting of working model, and there would be one lecture per week per batch of students.

The Project work would be evaluated by the examiner based on the presentation of the report by students and conducting viva-voce and demonstration of the working model.
The distribution of marks is as follows:

Model making	: 20
Model presentation	: 15
Viva voce	: 15
Total	: 50

Total Marks of Project: 50 + 50 = 100.

The Evaluation of the project work will be done at the end of the sixth semester. For the Evaluation of the both types of project works one session of three hours should be allocated during the practical examination.

There would be three sessions of 3 hours each for three experimental practical examination. Fourth session of 3 hours would be for the project work evaluation. (in total a student has to undergo four sessions (3 hours each) of practical +project evaluation examination)

There shall be batch of 15 students for project and viva.

B.Sc. (Physics)

Semester -5

Paper: Physics-501

(Mathematical Physics, Classical Mechanics & Quantum Mechanics)

Course duration:

Theory: 60 hours, 6 hours a week, Credit: 4

External Marks: 70, Internal Marks: 30, Total: 100

PAPER STYLE For paper 501

1. Syllabus of Physics paper 501 consists of 5 units:
2. All units carry 14 marks each.
3. There would be total 5 questions. One question from each unit.
4. Each question of 14 mark
5. Student can use the scientific (Non programmable) calculator.
6. Time duration:2.5 Hours

Question:1 from Unit 1 : Mark 14
Question:2 from Unit 2 : Mark 14
Question:3 from Unit 3 : Mark 14
Question:4 from Unit 4 : Mark 14
Question:5 from Unit 5: Mark 14

Each Question is divided in sub questions a,b,c and d as shown below

(a) Short answer questions 4 [4 Marks] (All questions are compulsory)
(A short answer question may comprise of answer of One word, one line, explanation, definition, true or false, fill up the blanks, etc.)

(b) Sums - Numerical problem solving questions: (1 out of 2) [2 Marks]

(c) Moderate length questions: (1 out of 2) [3Marks] (In this section atleast one sum / numerical problem solving question should be preferably asked)

(d) Long questions (1 out of 2) [5 Marks]

Paper: Physics-501

(Mathematical Physics, Classical Mechanics & Quantum Mechanics)

UNIT 1: (12 hour : 14 Mark)

Fourier Series: Definition, Evaluation of the Coefficients of Fourier Series, Cosine Series, Sine Series, Dirichlet's Theorem (Statement only), Extension of Interval, Complex form of Fourier series, Advantages of Fourier series, Properties of Fourier series, Physical Applications of Fourier series analysis (square wave, full wave rectifier, half wave rectifier, triangle wave), Fourier integrals, Fourier Transforms, Fourier sine and cosine Transforms, Numerical Problems.

Dirac-Delta Function: Introduction, Representation of the Dirac delta Function, derivative at a discontinuity, properties of Dirac delta function, the three dimensional Dirac delta function, Numerical Problems.

Reference books :

1. Mathematical Physics By Rajput, Publisher: Pragati Prakashan, Meerut.
2. Quantum Mechanics theory and applications By Ajoy Ghatak & S Lokanathan Publisher: Macmillan India Limited.
3. Mathematical Physics By H K Dass & Dr. Rama Verma, ublisher:S.Chand
4. Mathematical Physics By P.K.Chattopadhyay

UNIT 2: (12 hours: 14 Mark)

Variational Principle and Lagrangian Formulation: Constrained motion, Constraints, degree of freedom, Generalized co ordinates, Generalized notation for displacements & Velocity, Limitation of Newton's laws, variation Technique for many independent variables, Euler-Lagrange differential equation, Hamilton's Variational Principle, Deduction of Lagrange's equations of motion from Hamilton's principle (for Conservative System), D'Alembert's principle, Lagrange's equations from D'Alembert's principle, Rayleigh's dissipation function, Deduction

of Hamilton's Principle from D'Alembert's principle, Deduction of Newton's second law from Hamilton's principle, Application of Lagrange's equation of motion – linear Harmonic oscillator, Simple Pendulum, Spherical Pendulum, Electric Circuit, Compound pendulum, Atwood machine, Numerical problems.

UNIT 3: (12 hour: 14 Mark)

Hamiltonian Formulation: Superiority of Lagrangian approach over Newtonian approach, Non- Holonomic System: Lagrangian method of undetermined multipliers, Application in simple pendulum, Conservation theorems- cyclic or ignorable Co-ordinate, generalized momentum, Phase space and the motion of the System, Hamiltonian, Hamilton's canonical equations of motion, Physical significance of H, Advantage of Hamiltonian approach, Deduction of canonical equations from variational principle, Applications of Hamilton's equations of motion – simple pendulum, Compound Pendulum, linear harmonic oscillator, charged particle in an Electromagnetic field, Numerical problems.

Reference books for 2 & 3:

1. Classical Mechanics By Gupta, Kumar, Sharma Publisher: Pragati Prakashan, Meerut **12th edition.**
2. Introduction to Classical Mechanics By R G Takwale & P S Puranik Publisher: TMG
3. Classical Mechanics By Herbert Goldstein Publisher: Narosa Publishing House

UNIT 4: (12 hour: 14 Mark)

Wave particle duality and Schrödinger equation: Introduction, particle nature of radiation, Compton effect, Wave nature of matter, Uncertainty principle, Schrödinger equation, Commutator, Physical interpretation of ψ, Expectation values, Proof of the uncertainty principle, Eigenfunction of operator p_x , General solution of the one dimensional Schrödinger equation for a free particle, Time evolution of

a wave packet, Group velocity of wave packet, Stationary state, Boundary and Continuity conditions, Degeneracy, Orthogonality of eigenfunctions, Parity, Some exact solutions- particles in a one dimensional infinitely deep potential well; particles in a one dimensional potential well of finite depth, Three dimensional Schrödinger equation, Particle in a box- density of states, Numerical Problems.

UNIT 5: (12 hour: 14 Mark)

Harmonic oscillator & Angular momentum: Introduction, Solution of the time dependent Schrödinger equation, Eigenfunctions, Angular momentum operator, Eigen values and Eigenfunctions of L^2 ,Spherically symmetric potentials, Two body problem, Hydrogen-like atom, Bra and ket notation, Linear operator, Eigenvalue equation, Completeness condition, Examples from Matrix Algebra, Solution of the Eigen value problem, Harmonic oscillator wave functions, Coherent state, Time evolution of the coherent state, Number operator, Density operator, Numerical Problems.

Reference books for 4 & 5:

1. Quantum Mechanics theory and applications By Ajoy Ghatak & S Lokanathan Publisher: Macmillan India Limited.
2. A text book of quantum mechanics By P M Mathews & K Venkatesan Publisher: TMG.

B.Sc. (Physics)

Semester -5

Paper: Physics-502

(Electrodynamics and Relativity)

Course duration:

Theory: 60 hours, 6 hours a week, Credit: 4

External Marks: 70, Internal Marks: 30, Total: 100

PAPER STYLE For paper 502

1. Syllabus of Physics paper 502 consists of 5 units:
2. All units carry 14 marks each.
3. There would be total 5 questions. One question from each unit.
4. Each question of 14 mark
5. Student can use the scientific (Non programmable) calculator.
6. Time duration:2.5 Hours

Question:1 from Unit 1 : Mark 14
Question:2 from Unit 2 : Mark 14
Question:3 from Unit 3 : Mark 14
Question:4 from Unit 4 : Mark 14
Question:5 from Unit 5: Mark 14

Each Question is divided in sub questions a,b,c and d as shown below

(a)Short answer questions 4 [4 Marks] (All questions are compulsory)
(A short answer question may comprise of answer of One word, one line, explanation, definition, true or false, fill up the blanks, etc.)

(b) Sums - Numerical problem solving questions:(1 out of 2) [2 Marks]

(c) Moderate length questions: (1 out of 2) [3Marks] (In this section atleast one sum / numerical problem solving question should be preferably asked)

(d) Long question: (1 out of 2) [5 Marks]

Paper: Physics-502

(Electrodynamics and Relativity)

UNIT 1: (12 hour : 14 Mark)

Electrodynamics: Ohm's law, Electromotive force and motional emf, Faraday's law, The induced Electric field, inductance, energy in magnetic fields, Electrodynamics before Maxwell, Maxwell's modification of Ampere's law, Maxwell's equations, The continuity equation, Poynting's theorem, Newton's third law in Electrodynamics, Maxwell's stress tensor, conservation of momentum, Angular momentum, Numerical Problems.

UNIT 2: (12 hour : 14 Mark)

Electromagnetic Waves:

Waves in one dimension: Wave equation, sinusoidal waves, Boundary conditions: Reflection and Transmission, Polarization, Electromagnetic waves in vacuum: The wave equations for **E** and **B**, Monochromatic plane waves, Energy and Momentum in Electromagnetic waves, Numerical Problems.

UNIT 3: (12 hour : 14 Mark)

Potentials and Fields:

The Potential formulations: Scalar and Vector potentials, Gauge transformations, Coulomb Gauge and Lorentz Gauge, Retarded potentials, Jefimenko's equations, Point charges: Lienard-Wiechert potentials, The fields of a moving point charge, Electric and Magnetic field of moving charge with constant velocity, Numerical Problems.

UNIT 4: (12 hour : 14 Mark)

Radiation:

Dipole radiation: What is radiation? , Electric dipole radiation, Explanation of Blueness of sky and Redness of sunset, Magnetic dipole radiation, Radiation from an arbitrary source, Power radiated by a point charge, Radiation reaction, The physical basis of radiation reaction, Numerical Problems.

UNIT 5: (12 hour : 14 Mark)

Electrodynamics and relativity:

The special theory of relativity and Einstein postulates of it, The geometry of relativity, Lorentz transformations, structure of space-time, Proper time and Proper velocity, Relativistic momentum and relativistic energy, Relativistic Kinematics, Relativistic Dynamics, Numerical Problems.

Basic Reference book: Introduction to electrodynamics By David J Griffiths, Publisher: PHI.

Other Reference Books:

1. Electricity and Magnetism - Mahajan and Rangwala
2. Classical Electrodynamics - J.D.Jackson
3. Electricity and Magnetism - R. Murugeshan
4. Electromagnetics - B.B.Laud
5. Electricity and Magnetism - K.K.Tiwari
6. Electricity and Magnetism - Berkeley Physics Course, Vol. II
7. Electricity and Magnetisam By D.C. Tayal, Publisher: Himaliya publishing House.
8. Refresher Course in Physics Volume 1,2 & 3 By C.L.Arora

B.Sc. (Physics)

Semester -5

Paper: Physics-503

(Solid State Electronics)

Course duration:

Theory: 60 hours, 6 hours a week, Credit: 4

External Marks: 70, Internal Marks: 30, Total: 100

PAPER STYLE For paper 503

1. Syllabus of Physics paper 503 consists of 5 units:
2. All units carry 14 marks each.
3. There would be total 5 questions. One question from each unit.
4. Each question of 14 mark
5. Student can use the scientific (Non programmable) calculator.
6. Time duration:2.5 Hours

Question:1 from Unit 1 : Mark 14
Question:2 from Unit 2 : Mark 14
Question:3 from Unit 3 : Mark 14
Question:4 from Unit 4 : Mark 14
Question:5 from Unit 5: Mark 14

Each Question is divided in sub questions a,b,c and d as shown below

(a)Short answer questions 4 [4 Marks] (All questions are compulsory)
(A short answer question may comprise of answer of One word, one line, explanation, definition, true or false, fill up the blanks, etc.)

(b) Sums - Numerical problem solving questions: (1 out of 2) [2 Marks]

(c) Moderate length questions: (1 out of 2) [3Marks] (In this section atleast one sum / numerical problem solving question should be preferably asked)

(d) Long question: (1 out of 2) [5 Marks]

Paper: Physics-503
(Solid State Electronics)

UNIT 1: (12 hour : 14 Mark)

Multi-stage Transistor Amplifiers: Multistage Transistor Amplifier, Role of Capacitors in Transistor Amplifiers, RC coupled Transistor Amplifier, Transformer Coupled Amplifier, Direct coupled Amplifier, Comparison of Different types of coupling, Numerical Problems.

Transistor Audio Power Amplifiers: Transistor Audio Power Amplifier, Difference between Voltage and Power amplifier, Performance Quantities of power amplifier, Classification of Power amplifier, Expression for Collector Efficiency, Efficiency of Class A Amplifier, Maximum Efficiency of Transformer Coupled Class A Power amplifier, thermal Runaway, Heat sinks, Mathematical Analysis, Push pull Amplifier, Complementary Symmetry Amplifier, Numerical Problems.

UNIT 2: (12 hour : 14 Mark)

Solid State Switching Circuits : Switch, Mechanical switch, Electronic Switches, Advantages of electronic switches, switching transistors, switching action of Transistor, Multivibrators, Types of Multivibrators, Transistor Astable Multivibrators, Transistor Monostable Multivibrators, Transistor Bistable Multivibrators, Differentiating circuit, Integrating circuit, Clipping circuits, Application of Clippers, Basic idea of a clamper, clamping circuits, Numerical Problems.

UNIT 3: (12 hour : 14 Mark)

Regulated D.C. Power Supply: Ordinary D.C. power supply, Important terms, Regulated Power supply, Types of voltage regulators, Zener diode as a voltage regulator, Transistor series

voltage regulator, Series feedback voltage regulator, Short-circuit protection, Transistor shunt voltage Regulator, Numerical Problems.

Integrated Circuits: Integrated Circuits, Advantages &Disadvantages of ICs, Scale of Integration, Classification of ICs, Comparison between different ICs, IC Symbol, Operational Amplifier, Differential Amplifier, Basic circuit of Differential Amplifier, Operation of Differential Amplifier , Common-mode and Differential-mode signals, Common- mode Rejection Ratio, DC Analysis of Differential Amplifier, Ideal Operational Amplifier, OP-AMP Applications, Linear Amplifier, Adder, Subtractor, Integrator, Differentiator, Comparator, Numerical Problems.

UNIT 4: (12 hour : 14 Mark)

Transducer : Transducer, Classification of Transducers, Resistive Position Transducer, Resistive Pressure Transducer, Inductive Pressure Transducer, Capacitive Pressure Transducer, Self-generating Inductive Transducers, Linear Variable Differential Transformer(LVDT), Piezoelectric Transducer Strain Gauge, Temperature Transducer, Resistance temperature detectors, Thermistor, Thermocouples, Photoelectric Transducer, Various Types of Microphones, Carbon Microphone, Ribbon Microphone, Moving Coil Microphone, Crystal Microphone, Ceramic Microphone, Numerical Problems.

UNIT 5: (12 hour : 14 Mark)

Electronic Instruments: Analog and Digital Instruments, Functions of Instruments, Electronic versus Electrical Instruments, Essentials of an Electronic Instrument, The Multimeter, Rectifier type AC meter, Electronic Voltmeter, Electronic voltmeter for Alternating currents, Digital voltmeter,

Cathode Ray Oscilloscope, Frequency Determination, Application of CRO.

Basic Reference Books for above units :

1. Principles of Electronics By V.K.Mehta & Rohit Mehta. Publisher:S. Chand &Company Ltd.
2. Basic Electronics By B.L.Theraja, Publisher:S. Chand & Company Ltd

Digital circuits & Applications:

Combinational logic circuits : Introduction, Half adder; Full adder; Multiplexer: 16 to 1 Multiplexer; The 74150; Multiplexer Logic; Bubbles on Signal Lines; Nibble Multiplexers, Demultiplexer: 1 to 16 Demultiplexer; The 74154, 1 of 16 Decoder, BCD To Decimal Decoders; The 7445, Encoder, The 74147.

Sequential logic circuits: Introduction, RS flip-flop, Clocked RS flip-flop, D flip-flop, JK flip-flop JK Master- slave flip-flop.

IC 555 timer and its application as astable and monostable Multivibrator. Numerical Problems.

Basic Reference Book:

Digital Principles and Applications By Malvino & Leach, Publisher: Tata McGraw Hill Publishing Company Limited. 4TH Edition.

Other Reference Books:

1. Electronic Devices & Circuits By Allen Mottershad, Publisher: Prentice-Hall of India Pvt. Ltd., Delhi
2. Electronic Devices & Circuits Theory by Boylestead & Nashelsky
3. Handbook of Electronics By Kumar & Gupta, Publisher: Pragati Prakashan, Meerut, India
4. Principal of Electronics By Malvino, Publisher: TMG
5. Modern Digital Electronics By R.P.Jain
6. A Text book of Digital Electronics By R.S.Sedha, Publosher:S.Chand

B.Sc. Semester – 5 - Practical

Each student will have to perform **three (3) experiments (one from each group)** in the University Examination.

Each Practical would be of 35 Marks and should be performed in a session of 3 Hours in practical exam.

There would be three sessions of 3 hours each for three experimental practical examination.

There shall be **batch of 15 students** for practical exam in university examination.

List of Experiments

Group A

1. Determine the "g" using Kater's Pendulum
2. Study of Damped Simple Harmonic Motion
3. Study of Fabry-Perot Etalon
4. Study of Lloyd's Mirror.
5. Study of Double Refraction in Calcite Prism
6. Young Modulus of beam by elevation method
7. To determine the thermal conductivity of cardboard (bad conductor) byLee's Method.
8. η of metal rod using Barton's Vertical apparatus
9. To determine radius of curvature of a given lens and refractive index of glass using optical lever method.
10. To study Diffraction at Straight edge.
11. To study the elliptical polarization of light using babinet compensator.
12. To determine viscosity of liquid by log decrement method.

Group B

1. Study of Absorption spectra of Iodine
2. Comparison of Capacities by Mixture Method
3. Determine the constant of Ballistic Galvanometer
4. Determine the Self Induction of coils using Owen's Bridge
5. Determine the Mutual Induction of coils using Ballistic Galvanometer
6. Study of Transformer's coils using Bridge rectifier
7. Determine e/m using Magnetron Method.
8. Determine e/m using Helical Method
9. Study of Hysterisis loop of Ferromagnetic Material
10. Study of Hall Effect.
11. To determine the self inductance/ Mutual Inductance of a given coil by Rayleigh's method.
12. Absolute value of capacity of a capacitor by B.G.
13. To determine Permeability of Free space.

Group C

1. Study of h-Parameter of CE- Transistor.
2. Study of Single stage Transformer coupled Amplifier
3. Study of Complementary-Symmetry Power Amplifier
4. Study of Series Voltage Regulator using Transistor
5. Electronic voltmeter using FET
6. Study of Hartley Oscillator.
7. Study of RC phase shift Oscillator.

8. Study of Lissageous figure/Measurement of frequency and phase using CRO.
9. Study of X-OR Gate.
10. Study of X-NOR Gate.
11. Verification of De'Morgans Theorem.
12. To determine the capacitance or to compare capacitance by Wien Brideg.

Reference Books:

1. Practical Physics by C.L.Arora (S.Chand)
2. Advanced Practical Physics by Chauhan & Singh. (Pragati Prakashan)
3. B.Saraf et ai-Physics through experiments Vol.I & II
4. Electronic Laboratory Primer by Poorna Chandra & Sasikala, (S.Chand)
5. Practical Physics by Chattopadhyay, Rakshit & Saha.

Syllabus of B.Sc. (Physics) Sem-6
According to Choice Based Credit System
Effective from June – 2018

Course Contents :

- Physics-601 -Theory: Nuclear & Particle Physics
- Physics-602 -Theory: Statistical Mechanics & Solid state physics
- Physics-603-Theory: Spectroscopy and Applied Optics
- Practical- Group A
- Practical- Group B
- Practical- Group C
- Project

Total Credit of the Semester-6: 24

Educational Study Tour:

Physics Department of college should arrange at least one Educational Study tour during semester 5 or 6. In this tour, students may visit any state or national research institute, scientific organization, industry or any educational scientific institute in India. Students submit detailed report of this study tour. This report consider as a project of 50 marks.

B. Sc. Physics Semester : 6

The Course Design of B. Sc. Sem.- 6 (Physics) according to choice based credit system (CBCS) as follows :

Sr.No	Subject	No of theory Lecture per week	No of Practical Lecture per week	Total Marks	Credits
1	**PAPER Physics-601 (Theory) Nuclear & Particle Physics**	6	-	70(External)+ 30 (Internal) = 100 Marks	4
2	**PAPER Physics-602 (Theory) Statistical Mechanics & Solid state physics**	6	-	70(External)+ 30 (Internal) = 100 Marks	4
3	**PAPER Physics-603 (Theory) Spectroscopy and Applied Optics**	6	-	70(External)+ 30 (Internal) = 100 Marks	4
4	**Practical -1 (Group A)** **One practical from group A**	-	6	35(External)+ 15(Internal) = 50 Marks	3

5	**Practical -2 (Group B)** **<u>One practical from group B</u>**	-	6	35(External)+ 15(Internal) = 50 Marks	3
6	**Practical -3 (Group C)** **<u>One practical from group C</u>**		6	35(External)+ 15(Internal) = 50 Marks	3
7	**Project Work & Viva**	• 1 Guidance Lecture. for a group in a week. • Evaluation of project will be in SIXTH semester		50 + 50 = 100 Marks	3
			<u>Total credit of the semester 6</u>		**24**

B.Sc. (Physics)

Semester -6

Paper: Physics-601

(Nuclear & Particle Physics)

Course duration:

Theory: 60 hours, 6 hours a week, Credit: 4

External Marks: 70, Internal Marks: 30, Total: 100

PAPER STYLE For paper 601

1. Syllabus of Physics paper 601 consists of 5 units:
2. All units carry 14 marks each.
3. There would be total 5 questions. One question from each unit.
4. Each question of 14 mark
5. Student can use the scientific (Non programmable) calculator.
6. Time duration:2.5 Hours

Question:1 from Unit 1 : Mark 14
Question:2 from Unit 2 : Mark 14
Question:3 from Unit 3 : Mark 14
Question:4 from Unit 4 : Mark 14
Question:5 from Unit 5: Mark 14

Each Question is divided in sub questions a,b,c and d as shown below

(a)Short answer questions 4 [4 Marks] (All questions are compulsory)
(A short answer question may comprise of answer of One word, one line, explanation, definition, true or false, fill up the blanks, etc.)

(b) Sums - Numerical problem solving questions: (1 out of 2) [2 Marks]

(c) Moderate length questions: (1 out of 2) [3Marks] (In this section atleast one sum / numerical problem solving question should be preferably asked)

(d) Long question: (1 out of 2) [5 Marks]

B.Sc. (Physics)
Semester -6
Paper: Physics-601
(Nuclear & Particle Physics)

UNIT -1: (12 hour: 14 Mark)

General Properties of Nuclei & Nuclear Models: Rutherford's alpha Scattering Experiment, Rutherford's Atom Model, Constitute of nucleus and their intrinsic properties, qualitative facts about size, mass, Charge, density, Classification of Nuclei, Nuclear Stability, binding energy, main features of binding energy versus mass number curve, Nuclear Models: liquid drop model, Shell model: Evidence of Shell Model, Semi empirical mass formula and significance of various terms. Numerical Problems.

UNIT -2: (12 hour: 14 Mark)

Radioactivity: Natural Radioactivity, Properties of alpha, beta and gamma ray, The Law of Radioactive Decay, Half Life , Mean Life, Radioactive Series, Units of Activity, General Rule of Alpha and Beta Decay, Theory of alpha decay- Barrier Penetration, Beta Decay-Continuous beta ray spectrum- Difficulties in understanding it, Neutrino hypothesis and Fermi theory of Beta Decay, Gamma Decay – Gamma Ray emission, Nuclear isomerism, Internal Conversion, Application of Radio isotopes, Determination of the Age of Earth, Carbon Dating, Numerical Problems.

UNIT -3: (12 hour: 14 Mark)

Interaction of Nuclear Radiation with matter And Detector:

Interaction between Energetic Particle and matter, Principle construction and working of - Ionization Chamber; Solid state Detector; Scintillation Counters, GM Counter, Plateau Curve.

Nuclear Reaction: Rutherford experiment for artificial transmutation, Q-value of Nuclear reaction, Type of Nuclear reactions, Energy balance in Nuclear reaction, Threshold energy of Endoergic reaction, Nuclear Transmutation, Numerical Problems.

UNIT -4: (12 hour: 14 Mark)

Particle Accelerator: Construction and working of – Linear Accelerator; Cyclotron, Formula of Cyclotron Frequency, Limitation of Cyclotron, Principle of Phase Stability, Synchrocyclotron, Synchrotron - Proton Synchrotron; electron Synchrotron(Betatron).

Nuclear Fission: Discovery of Nuclear fission, Energy released in fission, Bohr & Wheeler's theory of fission, Chain reaction, Multiplication Factor, Critical Size, Atom bomb, Nuclear reactors, Use of Nuclear Reactor Power Reactor, Breeder Reactor, Numerical Problems.

UNIT -5: (12 hour: 14 Mark)

Nuclear fusion: Nuclear fusion, Source of stellar energy, Thermonuclear reactions, Hydrogen Bomb, Controlled Thermo Nuclear Reaction, Fusion Reactor, Plasma Confinement – Gravitation Confinement, Magnetic Bottle, Tokamak, Internal Confinement, Numerical Problems.

Elementary Particles: Introduction, Classification of Elementary Particles, Particles & Antiparticles, Antimatter, The fundamental Interactions, Elementary particle Quantum numbers, Conservation laws and symmetry, Quark model.

Reference Books:

1. Modern Physics By R.Murugeshan & Kiruthinga Sivaprasatha, Publication: S.Chand & Company Ltd.
2. Nuclear Physics: An Introduction By S.B. Patel Publisher: New Age International (P) Limited.

3. Nuclear Physics By D.C.Tayal Publisher: Himalaya Publishing House.
4. Concept of Nuclear Physics By B.L.Cohen Publisher:TMG
5. Nuclear Physics By Irving Kaplan Publisher: Narosa Publishing House.
6. Concept of Modern Physics By Arthur Beiser Publisher: TMG
7. Refresher Course in Physics Volume 1,2 & 3 By C.L.Arora

B.Sc. (Physics)
Semester -6
Paper: Physics-602
(Statistical Mechanics & Solid state physics)

Course duration:

Theory: 60 hours, 6 hours a week, Credit: 4

External Marks: 70, Internal Marks: 30, Total: 100

PAPER STYLE For paper 602

1. Syllabus of Physics paper 602 consists of 5 units:
2. All units carry 14 marks each.
3. There would be total 5 questions. One question from each unit.
4. Each question of 14 mark
5. Student can use the scientific (Non programmable) calculator.
6. Time duration:2.5 Hours

Question:1 from Unit 1 : Mark 14
Question:2 from Unit 2 : Mark 14
Question:3 from Unit 3 : Mark 14
Question:4 from Unit 4 : Mark 14
Question:5 from Unit 5: Mark 14

Each Question is divided in sub questions a,b,c and d as shown below

(a)Short answer questions 4 [4 Marks] (All questions are compulsory)
(A short answer question may comprise of answer of One word, one line, explanation, definition, true or false, fill up the blanks, etc.)

(b) Sums - Numerical problem solving questions: (1 out of 2) [2 Marks]

(c) Moderate length questions: (1 out of 2) [3Marks] (In this section atleast one sum / numerical problem solving question should be preferably asked)

(d) Long questions: (1 out of 2) [5 Marks]

Paper: Physics-602

(Statistical Mechanics & Solid state physics)

UNIT -1: (12 hour: 14 Mark)

Classical Distribution Law: Phase Space (till the derivation of dr> =h^3), Volume in Phase Space, Micro States and Macro States(number of microstates accessible to a macroscopic system onwards not included), Stirling's approximation, Thermodynamic Probability, Division of Phase Space into Cells, Classical Maxwell Boltzmann Distribution law. Bose-Einstein and Fermi Dirac Statistics Derivation of the distribution law of Bose-Einstein Statistics, Derivation of the distribution law of Fermi Dirac Statistics, Comparison of the Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics, Numerical Problems.

Basic Reference Book:

Elementary Statistical Mechanics by Gupta and Kumar, Publisher: Pragati Prakashan.

UNIT 2: (12 hour : 14 Mark)

Crystal structure: The crystal lattice and lattice translation vector, Unit cell, Bravais lattice in three dimension, Crystal planes and mirror indices, Simple crystal Structure (hcp,fcc,bcc,sc,Dimond)

Crystal binding: Ionic crystals, Covalent crystals, Metallic crystals, Hydrogen bonded crystals.

Thermal conductivity of solids: Heat capacity, classical theory of heat capacity of solids, Einstein model, Debye model, Density modes (one and three dimensions), Debye formula, criticism of Debye model, Thermal expansion, Thermal conductivity of solids, Numerical Problems.

UNIT 3: (12 hour : 14 Mark)

Free electron theory of metals: Free electron model, Free electron gas in one and three dimensions, Density of states, Effect of temperature, Thermal conductivity of free electron system, Sommerfield

theory of thermal conductivity, The Boltzmann equation, Wiemann-Franz law, Hall effect, Band theory of metals: The Block theorem, Kronig Penny model, Numerical Problems.

UNIT 4: (12 hour : 14 Mark)

Semiconductor physics: Insulators, Semiconductors, Intrinsic semiconductors: Electron-Hole carrier concentrations, Fermi level, Electrical conductivity and bonding, effect of impurities
Extrinsic semiconductors: Donor-Acceptors states, Fermi level, Thermal ionization, Band structure of Si and Ge crystals, Numerical Problems.

Basic Reference Book for (2 to 4):

A text book of Solid State Physics By S.L.Kakani & C. Hemrajani, Publisher: S Chand .

UNIT 5: (12 hour : 14 Mark)

Superconductivity: Experimental Aspects, Influence of external agents on Superconductivity, Meissner effect, Critical field of Small Specimens, Thermodynamic of Superconducting transition, Alloys & Compounds, London's theory, Josephson effects, BCS theory, Applications of Superconductivity, Numerical Problems.

Basic Reference books:

1. Fundamental of Solid State Physics By Saxena, Gupta, Saxena, Publisher: Pragati Prakashan
2. A text book of Solid State Physics By S.L.Kakani & C. Hemrajani, Publisher: S Chand .

Other Reference Books:

1. Statistical Mechanics by Mayor and Mayor
2. Statistical Mechanics by Agrawal and Eisner
3. Introduction to Solid State Physics by Charles Kittle (7th edition),John Wiley & Sons
4. Solid State Physics by A.J.Dekker, Macmillan India Ltd.

5. Introduction to Solid by L.V.Azaroff, Tata McGraw Hill Pub.
6. Solid State Physics by Puri and Babbar, S.Chand.
7. Superconductivity & Superconducting Materials by Narlikar and Ekbote.
8. Refresher Course in Physics Volume 1,2 & 3 By C.L.Arora

B.Sc. (Physics)

Semester -6

Paper: Physics-603

(Spectroscopy and Applied Optics)

Course duration:

Theory: 60 hours, 6 hours a week, Credit: 4

External Marks: 70, Internal Marks: 30, Total: 100

PAPER STYLE For paper 603

1. Syllabus of Physics paper 603 consists of 5 units:
2. All units carry 14 marks each.
3. There would be total 5 questions. One question from each unit.
4. Each question of 14 mark
5. Student can use the scientific (Non programmable) calculator.
6. Time duration:2.5 Hours

Question:1 from Unit 1 : Mark 14
Question:2 from Unit 2 : Mark 14
Question:3 from Unit 3 : Mark 14
Question:4 from Unit 4 : Mark 14
Question:5 from Unit 5: Mark 14

Each Question is divided in sub questions a,b,c and d as shown below

(a)Short answer questions 4 [4 Marks] (All questions are compulsory)
(A short answer question may comprise of answer of One word, one line, explanation, definition, true or false, fill up the blanks, etc.)

(b) Small Length Questions: (1 out of 2) [2 Marks] (In this section sums / numerical problem solving questions should be preferably asked)

(c) Moderate length questions: (1 out of 2) [3Marks] (In this section atleast one sum / numerical problem solving question should be preferably asked)

(d) Long questions: (1 out of 2) [5 Marks]

Paper: Physics-603

(Spectroscopy and Applied Optics)

UNIT -1: (12 hour: 14 Mark)

Atomic Spectroscopy:

Production of Spectra, Type of Spectra- Emission Spectra, Absorption Spectra. Bohr's Theory of atom, Franck-Hertz Experiment, Shortcoming of Bohr Theory, Sommerfield Elliptical orbits (theoretical part only), The spinning electron, Space quantization, Quantum numbers and their physical interpretations, Magnetic moments of an Atom and Lande's g Factor.

Experimental study of Zeeman effect, Classical interpretation of Normal Zeeman effect, Vector atom model and Normal Zeeman effect, Vector atom model and Anomalous Zeeman effect, Paschen-Back effect, Stark effect, Numerical Problems.

Basic Reference Book: Elements of Spectroscopy By Gupta, Kumar, Sharma Publisher: Pragati Prakashan Twenty-eight Edition 2016.

UNIT -2: (12 hour: 14 Mark)

Molecular Spectroscopy: Introduction, Experimental study, Theoretical explanation, Theory of pure rotational Spectra, Theory of rotational Vibrational Spectra, Theory of electronic band Spectra,

Basic Reference Book: Atomic Physics By J.B.Rajam. Publisher: S.Chand &Company Ltd.

Raman Spectra: Raman effect and its Salient features, Observation of Raman Spectra, Classical theory of Raman effect, Quantum theory of Raman effect, Vibrational Raman Spectra, Pure Rotational Raman Spectra, Vibrational- Rotational Raman Spectra, Structure determination from Raman Spectroscopy, Applications and its importance, Numerical Problems.

Basic Reference Book: Elements of Spectroscopy By Gupta,
Kumar, Sharma Publisher: Pragati Prakashan Twenty-eight Edition 2016.

UNIT -3: (12 hour: 14 Mark)

Laser: Three basic radiation process- Spontaneous emission, Stimulated emission, Absorption, Laser principle, Properties of Laser beam, Einstein's Coefficients, Population Inversion, Pumping Processes, Pumping Scheme, Metastable states, The principle pumping schemes, Types of Lasers:Ruby Laser, Nd:YAG Laser, He-Ne Laser,Semiconductor Laser, Holography: Principal of Holography-Recording of hologram, Reconstruction of image, Applications of Laser : Laser in industry, Laser induced fusion, Laser tracking, LIDAR, Numerical Problems.

Basic Reference Book: Elements of Spectroscopy By Gupta,
Kumar, Sharma Publisher: Pragati Prakashan Twenty-eight Edition 2016.

UNIT -4: (12 hour: 14 Mark)

X-Rays and X-Ray Diffraction: Production of X-rays, Properties of X-rays, Continuous X-ray Spectrum, Characteristic Emission Spectrum, Explanation of Emission Spectra, Diffraction of X-ray, Brag's Law, Laue Spots, Bragg's Spectrometer, Spectra, Reciprocal lattice, Properties of reciprocal lattice, Bragg diffraction equation in reciprocal lattice, Brillouin zones, Atomic scattering factors, Structure factor, Experimental methods for X-ray Diffraction: Laue method, Rotating crystal method, Powder diffraction method, Numerical Problems.

Basic Reference Books:

1. Elements of Spectroscopy By Gupta,
Kumar, Sharma Publisher: Pragati Prakashan Twenty-eight Edition 2016.
2. A text book of Solid State Physics, S.L.Kakani & C. Hemrajani,
Publisher: S.Chand &Company Ltd.

UNIT -5: (12 hour: 14 Mark)

Fiber optics: Optical Fibers, Necessary of cladding, Total internal reflection, Critical angle of Propagation, Modes of propagation, Acceptance angle, Fractional refractive index change, Numerical Aperture, Types of Optical Fibers, Losses in optical fiber – Attenuation, Distortion, Applications: Illumination & Image transmission, Military Applications, Medical Applications , Optical fiber Sensors, Fiber optic communication System, Merits of optical fibers, Numerical Problems.

Basic Reference book : A Text Book of Optics N.Subrahmanyan, Brij Lal & M.N.Avadhanulu, Publisher: S.Chand &Company Ltd.

Other Reference Books:

1. Fundamentals of Solid state Physics by Saxena, Gupta and Saxena, Publisher:Pragati Prakashan
2. Introduction to LASER by Tyagrajan.
3. Optics and Spectroscopy - R. Murugeshan & Kiruthiga Sivaprashatha. Publisher: S.Chand & Company Ltd.
4. Optical Electronics - A.K.Ghatak and K. Thyagarajan. Publisher: Cambridge Uni. Press.
5. A Text Book of Optics N.Subrahmanyan, Brij Lal & M.N.Avadhanulu, Publisher: S.Chand &Company Ltd.
6. Atomic Physics By J.B.Rajam. Publisher: S.Chand &Company Ltd.
7. Modern Physics By S.L.Kakani and Shubhra Kakani
8. Fundamental of Molecular Spectroscopy By Colin N Banwell & Elaine M McCash Publisher: TMG Latest Edition
9. Refresher Course in Physics Volume 1,2 & 3 By C.L.Arora

B.Sc. Semester – 6 - Practical

Each student will have to perform **three (3) experiments (one from each group)** in the University Examination.

Each Practical would be of 35 Marks and should be performed in a session of 3 Hours in practical exam.

There would be three sessions of 3 hours each for three experimental practical examination. Fourth session of 3 hours would be for the project work evaluation. (So, in total a student has to undergo four sessions (3 hours each) of practical +project evaluation examination)

There shall be **batch of 15 students** for practical exam in university examination.

List of Experiments

Group A

1. To Study of Resonance Pendulum.
2. To Determine the Young's Modulus by Koeing Method.
3. Determine the Elastic constants using Flat Spiral Spring.
4. Study of Platinum Resistance Thermometer.
5. Study of Searle's Goniometer.
6. Resolving power of Diffraction Grating.
7. To Study of Edser-Butler Plate.
8. To determine Planck's constant using Photocell.
9. Study of Temperature ON-OFF Controller with Thermistor.
10. To determine Young's modulus(Y), modulus of rigidity (η), Poission's ratio (σ) and bulk modulus (K) for the material of wire by Searl's arrangement.
11. To measure the divergence of a given LASER source.

12. To determine wavelength of LASER by Diffraction Gratting.
13. To determine refractive index of liquid by Bi prism.

Group B

1. Photo Conductivity of Selenium cell
2. Characteristics of SCR.
3. Study of Linear Variable Differential Transformer (LVDT) Trainer.
4. To determine e/m by Thomson's method.
5. To verify the Thevnin's theorem.
6. To determine self inductance of a coil by Anderson's Bridge.
7. To study variation of thermo-electric emf with temperature for Thermo couple.
8. 'e' By Milikan's Method
9. e/K By Power Transistor
10. Convert a moving coil galvanometer into current meter& Voltmeter
11. Study of the Output Wave form Clipping circuit
12. Study of the Output Wave form Clamping circuit

Group C

1. Study of OP-AMP using IC 741.(adder and Subtractor)/(inverter and noninverter).
2. To study the working of an OP-AMP as integrator and differentiator.
3. Study of IC 555 Timer circuit.
4. Study of Multiplexer(4-1 line) using (Discrete components or using IC.
5. Study of Demultiplexer(1-4 line) using (Discrete components or using IC
6. Study of Encoder & Decoder Circuit.
7. Study of 4-bit Ripple Counter.
8. Study of Astable/ Monostable Multivibrator.
9. Study of UJT as Relaxation Oscillator.

10. Study of RS, D & JK Flip-flop.
11. Study of Modulation and Demodulation using IC 723.

Reference Books:

1. Practical Physics by C.L.Arora (S.Chand)
2. Advanced Practical Physics by Chauhan & Singh. (Pragati Prakashan)
3. B.Saraf et ai-Physics through experiments Vol.I & II
4. Electronic Laboratory Primer by Poorna Chandra & Sasikala, (S.Chand)
5. Practical Physics by Chattopadhyay, Rakshit & Saha.

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