

SAURASHTRA UNIVERSITY

RAJKOT

**Accredited Grade “A” by NAAC
(CGPA 3.05)**



**FACULTY OF SCIENCE
(SUBJECT- PHYSICS)**

SYLLABUS FOR

B.Sc.

PHYSICS

(Semester- 1 & 2)

According to Choice Based Credit System

Effective from June – 2019

B.Sc. (Physics)
Semester -1
Paper: Physics-101
(Mechanics & Semiconductor Electronics)
Effective from June – 2019

Course duration:

Theory: 60 hours, 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 -1

1. B. Sc. Physics Syllabus for Semester 1 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-101

(Mechanics & Semiconductor Electronics)

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 $\tau = I\alpha$, 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 Elasticity, Poission's Ratio, Determination of Young modulus 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 al-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 ($C = 10\mu\text{F}$) and Resistance (300Ω) of different values, A.C MilliAmmeter, A.C Voltmeter.

Practical 8: Wheastone's Bridge 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(0-100 μ A), 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.

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B.Sc. Semester -2
B.Sc. (Physics)
Semester -2

Paper: Physics-201

(Wave, Optics & Semiconductor Devices)

Effective from June – 2019

Course duration:

Theory: 60 hours, 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 -2

6. B. Sc. Physics Syllabus for Semester 2 consists of 5 units:
7. All units carry 14 marks
8. Total 5 questions one question from each unit.
9. Each question of 14 mark
10. 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]

Physics -201

(Wave, Optics & Semiconductor Devices)

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. 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 al-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° , 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

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