

SAURASHTRA UNIVERSITY

RAJKOT, 360 005.



F.Y.B.Sc. (Physics)

SYLLABUS

(Under Choice Based Credit System)

In force from June – 2010.

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B.Sc. (Physics)

Syllabus

(Under Choice Based Credit System)

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There will be two semesters in F.Y.B.Sc. In each semester there will be one paper of Physics. The content of the syllabus is prepared assuming that 75 hours of teaching hours will be available per Semester. For Practicals 6 (six) hours per week are required.

Credit for each unit = 1.25

Credit for theory in each semester = $4 \times 1.25 = 5$

Credit for practicals in each semester = 3

Total Credit per semester = 8

Semester-I :- Physics Paper- 101 (theory)

Semester-II :- Physics Paper- 201 (theory)

Students can use Calculator (Scientific) in Theory and Practical Examinations.

B.Sc. Physics Paper- 101

(In force from June-2010)

(Mechanics, Elasticity, Electricity & Modern Physics)

UNIT I

(1) **Conservation Laws:**

Review of Newton's laws of motion(2.9, 2.11, & 2.14), Work(4.1), Power(4.2), Conservation of Force (4.3), Kinetic energy-Work-Energy Principle (4.4), Potential energy (4.5), The law of Conservation of energy (4.6), One dimensional Conservative system (4.7-a) Conservation of linear momentum (4.9), Centre of Mass (4.10), Collision (4.12)

(2) **Dynamics of Rigid Bodies:**

Rotational motion (only definition) (5.1), Torque acting on a particle (5.2), Angular momentum (5.3), Relation between Torque and Angular momentum (5.4), Moment of Inertia (5.6), Expressions for Moment of Inertia (5.7), Radius of Gyration (5.8), Theorems on Moment of Inertia (5.11), Moment of Inertia of a Rectangle (5.13), Moment of Inertia of Circular ring (5.14), Moment of Inertia of Circular disc (5.15)

UNIT II

(3) **Gravitation, Gravity and Satellites :**

(Review of Newton's Gravitational law, Gravitations field & Potential) (6.1 to 6.3) Relation between Gravitational Potential and Field strength (6.6) Potential and Field Due to a Solid Sphere (6.8), Gravitational Potential Self Energy (6.10), Gravitational Self-Energy (6.11), Escape Velocity (6.12), Kepler's Laws of Planetary Motion (6.13), Proof of Kepler's Laws (6.14), Satellites (6.15), Time Period of Satellite (6.16), State of Weightlessness (6.17)

(4) **Elasticity:**

Introduction (7.1), Stress and strain (7.2), Hooke's Law (only definition), Young's Modulus (7.4), Bulk Modulus (7.5), Modulus of Rigidity (7.6), Poisson's Ratio (7.7), Equivalence of Shear to Compression & Extension (7.8), Relation between Y , K , η & σ (7.10 to 7.14), Determination of Young's Modulus by Searle's Method (7.15)

UNIT III

(5) **D.C.Circuits & A.C.Circuits:**

Growth and decay of current in L-R circuit with D.C.source (49.12). Charge and discharge of R-C. circuit with D.C. source (49.13), A.C.Circuits: (Review of Alternating currents, Cycle, Frequency, Phase) (50.1,4,6,7), R.M.S value of Alternating currents(50.9), L-C-R series A.C.source (50.19), L-C-R series resonance (50.20), Parallel resonance (50.21).

Basic Text Book : for (1), (2), (3), (4) & (5)

Engineering Physics by R.K.Gaur, S.L.Gupta, Dhanpat Rai Publications.

(6) **Network Theorems & Multimeter :**

Constant voltage source (1.9), Constant current source (1.10), Maximum power transfer theorem (1.12), Thevenin's theorem (1.13), Norton's theorem (1.14), Chassis and ground (1.15), Multimeter (25.2).

Basic Text Book : for (6)

Principles of Electronics by V.K.Mehta & Rohit Mehta., S.Chand Company.

UNIT IV

(7) **Structure of The Atom:**

Failure of Classical Mechanics (5.11), Effect of Nuclear Motion on Atomic Spectra (6.5), Correspondence Principle (6.7), Critical Potentials (6.8), Atomic Excitation (6.9), Vector Model (6.12), Quantum numbers (only definitions) (6.13).

(8) **Wave Mechanics:**

De'Broglie wavelength & Phase velocity of De'Broglie's wave (11.1), Expression for group velocity, Group velocity of de Broglie's wave, Relation between Phase velocity & Group velocity (11.2), Heisenberg's Uncertainty Principle (only) (11.4) wave mechanical atom model (11.5)

Basic Text Book : for (7) & (8)

Modern Physics by R.Murugesan & Kiruthiga Sivaprasath, S.Chand Comp.

LIST OF EXPERIMENTS (F.Y.B.Sc)

Semester-I

1. Study of errors in observation.
2. Bar Pendulum : Determination of 'K' and 'g'
3. Bifilar Suspension. (M.I. of rectangular body & law of perpendiculars)
4. Torsion pendulum. (Moment of Inertia of disc & Modulus of rigidity)
5. Young's Modulus of long wire by Searl's method.
6. Poisson's ratio of rubber tube.
7. Newton's law of cooling and specific heat of liquid.
8. Calibration of Thermometer using Thermocouple/RTD & determination of unknown temperature.
9. Discharge of Capacitor and RC time constant.
10. Series Resonance.
11. Parallel Resonance.
12. Verification of Thevenin's theorem. (using PCB)
13. Verification of Maximum power transfer theorem. (using PCB)
14. Low resistance by Projection method.
15. Tangent galvanometer (Constant of T.G. & Verification of Ohm's law)
16. Low resistance by Potentiometer.

B.Sc. Physics Paper- 102

(Waves, Optics, Crystallography, Electronics & Modern Physics)

UNIT I

(1) **Waves :**

Wave motion (4.1), Differential equation of a wave motion (4.12), Particle velocity and wave velocity (4.13), Newton's formula for velocity of sound in air and velocity of sound in water (5.10), Laplace's correction (5.4 to 5.9), velocity of sound in isotropic solids (5.12), velocity of transverse waves along a stretched string (7.2), Laws of transverse vibrations of strings (7.3), Verifications of Laws of vibrations (7.4), Melde's experiment (7.5)

Basic Text Book : for (1)

Waves and Oscillations by Brij Lal and Subrahmaniam. S.Chand comp.

(2) **Optics**

Dispersion (18.13), Dispersive Power(18.14), Fermat's Principle, Law of reflection & Law of refraction from Fermat's Principle(18.17) ***Interference:-*** Interference(26.2), Conditions for interference of light (26.6), Types of Interference (26.7), Interference in thin films (26.14), Newton's rings (26.17), Determination of wave length of Sodium light using Newton's rings (26.18).

Basic Text Book : for (3)

Engineering Physics by R.K.Gaur, S.L.Gupta, Dhanpat Rai Publications.

UNIT II

(3) **Semiconductor Diode:**

Semiconductor diode (9.1), Crystal diode rectifiers(9.7), Half wave rectifier (9.8), Efficiency of half wave rectifier (9.9), Full-wave rectifier (9.10), Centre-tap full wave rectifier (9.11), Full wave bridge rectifier (9.12), Efficiency of full-wave rectifier (9.13), Ripple factor (9.15), Comparison of rectifiers (9.16), Filter circuits (9.17), Types of filter Circuits (9.18), Voltage stabilization (9.19), Zener diode (9.20), Zener diode as voltage stabilizer (9.22).

(4) **Special Purpose Diodes:**

Light emitting diode (10.2), LED voltage and current (10.3), Advantages of LED (10.4), Multicolour LEDs (10.5), Applications of LED (10.6), Photo diode (10.7), Photo-diode operation (10.8), Characteristics of Photo-diode (10.9), Applications of Photo-diode (10.10), Optoisolator (10.11).

UNIT III

(5) **Transistors:**

Transistor (11.1), Transistor Action (11.4), Transistor connections (11.7), Common base connection (11.8), Characteristics of common base connection (11.9), Common emitter connection (11.10), Characteristics of common emitter connection (11.11), Common collector connection(11.12), Comparison of transistor connections (11.13), Commonly used Transistor connection (11.14), Transistors load line analysis (11.16), Operating point (11.17), Cut off and saturation points (11.21).

Basic Text Book : for (3), (4) & (5)

Principles of Electronics by V.K.Mehta & Rohit Mehta. S.Chand Company.

(6) **Crystallography:**

Crystallography (Type of Solid, Periodic arrays of Atoms, Translation vector, Lattice & Basis, Crystal structures, Unit cell and Primitive cell)(7.15), Bravais lattices in three dimensions (7.17), Miller indices (7.18), Some Crystal structures:– NaCl, CsCl, Diamond (41.9),

Basic Text Book : for (6)

Modern Physics by R.Murugesan & Kiruthiga Sivaprasath, S.Chand Comp

UNIT IV

(7) **X-rays:**

Production of X-rays(8.1), Origin of X-ray (8.2), X-ray Spectrum (8.3), Intensity Measurement of X-rays (8.7), Wave nature of X-ray (8.10), Laue's Spot & Uses (8.11& 8.12), Bragg's Spectrometer(8.13), Theory of Diffraction (8.14), Bragg's Law(8.15), Compton effect, (8.20), Properties of X-ray (8.21), Practical applications of X-rays (industrial, scientific, medical) (8.22).

(8) **Natural Radioactivity:**

Radioactivity (11.1), Natural and Artificial Radioactivity (11.2), General Properties of Radioactive Radiation(11.3), Properties of α -rays (11.6), Properties of β -rays (11.7), Properties of γ -rays (11.10), Radioactive Disintegration (11.12),

Law of Radioactive Disintegration (11.13), Decay Constant (11.14), Half-life Period (11.15) Average life (11.16)

Basic Text Books: for (7) and (8)

Modern Physics by B.L. Theraja, S.Chand Comp.

LIST OF EXPERIMENTS (F.Y.B.Sc)

Semester-II

1. Melde's Experiment.
2. Study of Resonator.
3. Calibration of Spectrometer & determination of unknown wavelength.
4. Dispersive curve of a prism.
5. Newton's rings, Determination of λ using sodium light.
6. Determination of the capacity 'C' of Capacitor. (verification of Series & Parallel connection of capacitor)
7. Determination of self inductance 'L' of inductor (verification of series & Parallel connection of inductor)
8. Deflection magnetometer.
9. Study of a Transformer.
10. P-N Junction diode characteristics, Calculate dynamic resistance. (using PCB)
11. P-N Junction diode as Full Wave Rectifier.
12. V-I characteristics of Zener diode. (using PCB)
13. Characteristics of Photo diode.
14. Characteristics of Common Emitter Transistor. (input & output)
15. P-N Junction diode as Bridge Rectifier.

Basic Reference Book:

1. Practical Physics by C.L.Arora, S. Chand Comp.
2. Advanced Practical Physics by Chauhan & Singh. Pragati Prakashan.
3. Experimental Physics, University Granth Nirman Board, (Gujarati Medium)

4. B.Saraf et al-Physics through experiments Vol. I & II
5. Practical Physics by Chattopadhyay, Rakshit & Saha

Other Reference Books: (Paper-I & Paper-II)

1. Modern Engineering Physics by A.S. Vasudeva, S.Chand Company.
2. University Physics by Sears, Zeemansky and Young. Narosa Publishing
3. Physics by Halliday and Resnick. John Wiley.
4. Heat and Thermodynamics by Brij Lal and Subrahmaniam.
5. Oscillations, Waves, Acoustics and Optics by R.L.Saigal, S.Chand Co.
6. Principles of Optics by Mathur & Pandya.
7. Properties of Matter by Mathur.
9. Atomic Physics by J.B.Rajam. S.Chand & Company Ltd.
10. Elements of Electronics by M.K.Bagde & S.P.Singh. S.Chand.
11. Electronic Devices & Circuits. By Allen Mottershed.
12. Introduction of Solid State Physics by C.Kittle
13. Engineering Physics by M.N. Avadhanulu & P.G. Kshirsagar. S.Chand.
14. The World of Science, Paragon, U.K
15. A Text Book of Quantum Mechanics By Mathew & Venkateshan

CD Rom for e-learning:

1. Hyper Physics.
2. Encyclopedia of Science. (D.K Multimedia)
3. Physics Encyclopedia.
4. Virtual Physics Junior. (Original PC CD Rom)

Useful Web site for e-learning:

1. www.physic.about.com
2. www.physic.org
3. www.Physicsclassroom.com
4. www.howstuffworks.com
5. www.colorado.edu/physics/2000
6. www.ndrs.org.physic.com
7. www.physlinc.com
8. www.fearofphysics.com
9. www.hyperphysics.com