

SAURASHTRA UNIVERSITY

RAJKOT, 360 005.



S.Y.B.Sc. (Physics)

SYLLABUS

(Under Choice Based Credit System)

In force from June – 2011.

SAURASHTRA UNIVERSITY

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B.Sc. (Physics)

Syllabus

(Under Choice Based Credit System)

In force from June – 2011.

There will be two semesters in S.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-III :- Physics Paper- 301 (theory)

Semester-IV :- Physics Paper- 401 (theory)

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

B.Sc. Physics Paper- 301

(In force from June-2011)

(Thermodynamics, Electricity, Magnetism, Electronics & Modern Physics)

UNIT I

[1] Properties of Matter

Bending of Beam (7.18), Bending Moment of a Beam (7.19), Cantilever loaded at the free end (7.20), Cantilever supported at its ends, loaded in the middle (7.21), Viscosity and coefficient of viscosity (8.16), Streamline and Turbulent flow (8.17), Reynold's number (8.18), Poiseuille's Equation for the flow of liquid through a tube (8.19), Volume of liquid flowing out (8.20), Stoke's law (8.21).

[2] Thermodynamics

Work done of a gas at constant pressure (12.4), Change in internal energy (12.8), Work done by isothermal expansion (13.7), First law of Thermodynamics (15.1), Second law of Thermodynamics (15.4), Thermodynamic Process (only definition) (15.5), Heat Engine (15.7), Thermal efficiency of Heat Engine (15.8), Carnot Theorem (15.11), Concept of entropy (15.21), General Expression for the change of Entropy of a Perfect gas (15.22), Isothermal and Adiabatic process (15.23), Change of entropy in Reversible and Irreversible process (15.27), Entropy and Disorder - Third law of Thermodynamics (15.28).

UNIT II

[3] Radiation Heat

Properties of radiant heat (16.9), Emission and absorption of Radiation (16.11), Absorbing power, Reflecting power, Transmitting power (16.12 to 16.14), Radiating (16.15), Black Body (16.16), Stefan's Law (16.19), Wien's Law (16.24), Energy distribution in a Black Body (16.25), Rayleigh-Jeans Law (16.26), Planck's Law (16.27).

[4] Electric Field and Potential

Electric field intensity (43.8), Electric Flux (43.12), Electric Flux density (43.13), Gauss Law (43.14), Proof of Gauss Law (43.15), Field around a charged straight conductor (43.16), Electric field around a sphere (43.18), Electric Potential (43.19), Potential gradient and Electric Intensity (43.24), Potential of a charged sphere(43.25), Potential and Electric field due to Electric dipole (43.29), Potential energy of a Capacitor(44.3), Capacity of a condenser (Capacitor) (44.5), Capacity of a Parallel Plate Condenser (44.6).

UNIT III

[5] Magnetism

Magnetic field and Magnetic Induction (47.3), Hall Effect (47.4), Hall Voltage and Hall coefficient (47.5), Hall Mobility (47.6), Magnetic flux (47.7), Magnetic field around current carrying conductor (47.8), Magnetic field due to solenoid (47.11), Magnetic susceptibility and permeability (48.12), Para, Dia, Ferro-magnetic substances (48.17-a-b-c), Hysteresis loop (48.28), Energy loss due to Hysteresis (48.29), Self Induction (49.6), Self Inductance of a solenoid (49.7), Mutual Inductance (49.8), Mutual Inductance of two solenoids (49.9).

Basic Reference book for [1-5] : Engineering Physics R.K.Gaur & S.L.Gupta. (Dhanpat Rai Publications).

[6] Relativity

Galilean Transformation[1.4], Ether Hypothesis[1.5], Michelson-Morley Experiment[1.6], Special theory of Relativity[1.7], Lorentz Transformation[1.8], Length contraction[1.9], Time dilation[1.10], Relativity of simultaneity[1.11], Addition of velocities[1.12], Variation of mass with velocity[1.13], Mass-Energy relation[1.14].

Basic Reference book for [6] : Modern Physics by R. Murugesan & Kiruthinga Sivaprasth, S. Chand Comp.

UNIT IV

[7] Transistor Biasing

Transistor biasing[12.2], Inherent variations of Transistor Parameters[12.3], Stabilization[12.4], Stability Factor[12.6], Methods of Transistor Biasing[12.7], Base Resistor method[12.8], Biasing with feedback resistor[12.9], Voltage divider bias method[12.10], Design of transistor biasing circuits[12.11].

[8] Single stage Transistor Amplifier

Single stage Transistor amplifier[13.1], How a transistor amplifier works[13.2], Practical Circuit of Transistor amplifier[13.4], Phase reversal[13.5], Load line analysis[13.7], Voltage gain[13.8], Classification of Amplifier[13.13], Frequency response & Bandwidth[14.2].

Basic Reference book for [7-8] : Principles of Electronics V.K.Mehta & Rohit Mehta (S.Chand & Co.)

List of Experiments

Semester – III

1. Determine the Young's modulus by Cantilever.
2. Determine the Young's modulus by bending of beam.
3. Study of one dimensional elastic collision using two spheres.
4. Determine the viscosity of liquid by Searl's co-axial cylinder.
5. Determine the thermal conductivity of cardboard by Lee's Method.
6. Temperature of filament and Heat radiation & verification of Stefan's Law.
7. Find the co-efficient of viscosity of water by its flow through capillary tube of uniform bore.
8. Determine the Moment of Inertia of a Fly wheel.
9. Determine the figure of merit & volt sensitivity of ballistic galvanometer.
10. Measurement of High resistances by leakage.
11. Comparison of Capacitance by De Sauty's method
12. Measurement of specific resistance of electrolyte by Kohlrauch's Method
13. Study of magnetic field of Solenoid.
14. Determine the self induction by Maxwell Bridge.
15. Frequency response & Bandwidth of R.C. Coupled Amplifier.
16. Experimental check ups by Multimeter, (Power Supply, Resistor, Transistor, Diode, Capacitor).

- ***A minimum of 70% experiments shall be done by each student.***

Basic References:

1. Practical Physics – C.L.Arora (S.Chand & Co.)
2. Advanced Practical Physics – Chauhan & Singh (Pragati Prakashan)
3. B.Saraf et al. – Physics through experiments Vol I & II
4. Practical Physics – Chattopadhyaya, Rakshit & Saha.

B.Sc. Physics Paper - 401

(Optics, Laser & Electronics)

UNIT I

[1] Diffraction

Introduction[17.1], Two types of Diffraction[17.7], Fresnel's Explanation of the Rectilinear propagation of light(up to equation 17.2)[17.4], Zone Plate[17.5], Action of Zone Plate[17.5.1], Comparison between Zone plate & convex lens[17.5.1] Fraunhofer diffraction at Double Slit (Geometry Method) [18.4], Plane diffraction grating[18.7], Theory of grating[18.7.1], Determination of wavelength[18.7.6], Prism & Grating Spectra[18.7.8].

[2] Lasers

Interaction of Radiation with matter(Spontaneous and stimulated emission)[2.4,2&4], Einstein's Relations[22.5], Light amplification & conditions[22.6], Population Inversion[22.7], Pumping[22.9], Metastable states[22.10], The principle pumping schemes[22.11], Optical Resonance[22.12], Types of Lasers[22.16], Ruby Laser[22.16.1], Nd:YAG Laser[22.16.2], He-Ne Laser[22.16.3], Semiconductor Laser[22.17], PN junction Laser[22.17.2], Applications.

UNIT II

[3] Fiber Optics

Optical Fibers[24.2], Critical angle of Propagation[24.3], Modes of propagation[24.4], Acceptance angle[24.5], Fractional refractive index change[24.6], Numerical Aperture[24.7], Types of Optical Fibers[24.8], Applications[24.12], Illumination & Image transmission[24.12.1], Optical Communications[24.12.2], Military Applications[24.12.5], Optical fiber Sensors[24.12.3], Medical Applications[24.12.4], Fiber optic communication[24.13], Advantage[24.14].

Basic Reference book for [1-3] : A Text Book of Optics N.Subrahmanyam, Brij Lal & M.N.Avadhanulu (S.Chand & Co.)

[4] Oscillators

Sinusoidal oscillators[17.1], Positive feedback[17.5], Barkhausen Criterion[17.7], Different types of transistor oscillators[17.8], Colpitt's Oscillator[17.10], Hartley Oscillator[17.11], Phase Shift Oscillator[17.12 & 17.13], Wein Bridge Oscillator[17.14].

UNIT III

[5] Modulation and Demodulation

Radio broadcasting, transmission & reception[19.1], Modulation[19.2], Types of Modulation[19.3], Amplitude Modulation[19.4], Transistor AM Modulator[19.8], Limitations of Amplitude Modulation[19.10], Frequency Modulation[19.11], Demodulation[19.12], Essentials of demodulation[19.13], AM diode detector[19.14], Types of AM radio receivers[19.16].

[6] Solid State Devices

Types of Field Effect Transistors[22.1], Junction Field Effect Transistors[22.2], Working principle of JFET[22.3], Symbol[22.4], Importance of JFET[22.5], Difference between JFET & Bipolar Transistor[22.6], Output Characteristics of JFET[22.8], Advantages of JFET[22.11], Parameters of JFET(only definition)[22.12], MOSFET[22.18 & 22.19], Unijunction Transistor[24.9], Equivalent circuit of UJT[24.10], Characteristics of UJT[24.11], Advantages & Applications of UJT[24.12 & 24.13], Thermistor(From reference book).

UNIT IV

[7] Digital Electronics

Analog and Digital Signal[28.1], Binary number system[28.3], Logic gates[28.7 & 8], OR gate[28.9] AND gate[28.10], NOT gate[28.11], Combination of basic logic gates[28.12], NAND gate as universal gate[28.6], Encoders and Decoders[28.15], Advantages and disadvantages of Digital electronics[28.16], Boolean algebra[28.17], Boolean theorems[28.18], De Morgan's Theorems[28.19].

Basic Reference book for [4-7] : Principles of Electronics V.K.Mehta & Rohit Mehta (S.Chand & Co.)

[8] Optoelectronic Devices

Photo Transistor[56.2], LCD[56.5], Solar cell[56.5], Light Dependent Resistor, Light operated Relay, (a)Flame failure Relay, (b)Smoke Detector, (c)Twilight Switch, (d)Temperature Control Circuit.

Basic Reference book for [8] : Modern Physics by R.Murugesan & Kiruthiga Sivaprasath (S.Chand & Co.)

List of Experiments

Semester – IV

1. Determine the modulus of rigidity by Maxwell's needle.
2. Determine the modulus of rigidity by Statistical method.
3. Find the focal length & Refractive index of Convex lens by Optical lever.
4. Determination of λ using mercury light by Diffraction gratings.
5. Resolving power of prism.
6. Resolving power of telescope.
7. Energy band gap of thermistor.
8. Study of Characteristics of Solar Cell.
9. Characteristics of Field Effect Transistor. Determination of m, R_d, G_m .
10. Characteristics of Uni Junction Transistor.
11. Verification of truth table of AND, OR, NOT, NAND & NOR gate.
12. NAND gate as Universal gate.
13. Study of Zener Diode as voltage regulating characteristics.
14. Study of Characteristics of Photo Transistor.
15. FET as Voltmeter.
16. e/m by Thomson's method.

- ***A minimum of 70% experiments shall be done by each student.***

Basic References:

1. Practical Physics – C.L.Arora (S.Chand & Co.)
2. Advanced Practical Physics – Chauhan & Singh (Pragati Prakashan)
3. B.Saraf et al. – Physics through experiments Vol I & II
4. Practical Physics – Chattopadhyaya, Rakshit & Saha.

Other Reference : (Paper-301 & Paper-401)

1. University Physics – Sears, Zeemansky and Young. (Narosa Publishing)
2. Physics – Halliday and Resnick (John Wiley)
3. Properties of Matter – Mathur
4. Electronics Devices & Circuits – Allen Mottershad
5. Electronic Devices & Circuits Theory – Boylstaed & Nashelsky
6. Classical Electrodynamics – J.D.Jackson
7. Heat & Thermodynamics – Mark W. Zeemansky
8. A Text Book of Quantum Mechanics – Matthew & Venkateshan
9. Principal of Optics – Mathur & Pandya
10. Hand Book of Electronics – Kumar & Gupta
11. Principal of Electronics – Malvino
12. Atomic Physics – J.B.Rajam (S.Chand & Co.)
13. Electricity and Magnetism – Berkeley Physics Course Vol.-II.
14. Modern Engineering Physics – A.S.Vasudeva (S.Chand & Co.)
15. Engineering Physics – M.N.Avadhanulu & P.G.Kshirsagar (S.Chand & Co.)
16. Optical Electronics – A.K.Ghatak & >Thyangrajan (Cambridge University Press (UK) 1989; Reprinted by Foundation Books, India, 1991.)

Useful 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)
5. Encyclopedia Britanica – 2007.