

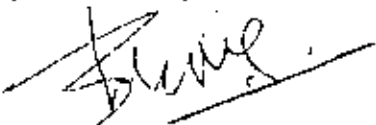
UNIVERSITY OF PUNE  
Circular No 237 of 1996

In pursuance of the decision taken by the University authorities, it is hereby notified for the information of all concerned that the syllabus for F.Y.E.Sc. in Physics has been revised as given in appendix 'A'

The revised syllabus will be implemented from the academic year 1996-97.

The Principals of all affiliated Colleges in Science where Physics is taught, are requested to bring the contents of this circular to the notice of all concerned teachers and students.

Gandshkhind,  
Pune-411 007.  
Ref.No.CB/S/Physics/619  
Date :

  
for Registrar

To,

The Principals of all affiliated Science Colleges.

Copy f.w.cs. to for information :

- 1) The Dean, Faculty of Science
- 2) The Members, of BOS in the Faculty of Science
- 3) The Controller of Examinations.
- 4) The Director, BCUD
- 5) The Director, Competative Exam.Centre
- 6) The System Analyst, Data Processing Unit.
- 7) The Dy,Registrar, (Admission)
- 8) The Dy.Registrar,(Examinations 1,2,3,4)
- 9) The Asstt.Registrar, (Exam.Co-ordination Unit)
- 10) The Asstt.Registrar (Exam.S & T.Unit)
- 11) The Asstt.Registrar (Strong Room)
- 12) The Asstt.Registrar (Admission)
- 13) The Public Relation Officer
- 14) The Law Officer
- 15) The University Sub-Centres, Ahmednagar
- 16) The S.O.Eligibility
- 17) The S.O.Affiliation
- 18) The S.O.External

Authority H 60 PA 60/96 dt. 19/2/96, 7,8/3/96

# SYLLABUS FOR F.Y.B.Sc. FOR PHYSICS

## STRUCTURE OF B.Sc. COURSE

Paper	Section I (First Term)	Section II (Second Term)
<b>F.Y.B.Sc.</b>		
I	Mechanics & Properties of Matter.	Heat & Thermodynamics.
II	Modern Physics	Electromagnetics.
<b>S.Y.B.Sc. :</b>		
I	Mathematical Methods in Physics.	Electronics
II	Waves-Oscillations & Sound.	Optics & Lasers.
<b>T.Y.B.Sc. :</b>		
I	Mathematical Methods in Physics	Classical Electrodynamics.
II	Classical Mechanics	Quantum Mechanics.
III	Nuclear Physics	Atomic & Molecular spectra.
IV	Solid State Physics	Material Science
V	Electronics	Statistical Mechanics.
VI	Optional course	Optional course.

PAPER I : SECTION (I) : MECHANICS AND PROPERTIES OF MATTER

- 1) Motion : ( 3 Lectures)
  - 1.1 Motion of a particle under constant resistive force.
  - 1.2 Projectile motion (without resistive force).
  - 1.3 Kepler's laws of planetary motion (Statements only).
  
- 2) Rotational Motion : ( 3 Lectures)
  - 2.1 Moment of a force, analogy between rotational and translational motion.
  - 2.2 Physical significance of moment of inertia, concept of radius of gyration.
  - 2.3 Determination of M.I. of cylinder, spherical solid sphere about diameter and about tangent.
  - 2.4 Motion of bodies rolling down an inclined plane. Wheel (torque, kinetic energy).
  
- 3) Elasticity :
  - 3.1 Hook's Law, definition of elastic constants, work-done in strain, Poisson's ratio, it's determination limiting values.
  - 3.2 Relation between three elastic constants ( $\gamma, k, n$ )
  - 3.3 Determination of  $Y$  of thin rectangular bar loaded at centre.
  - 3.4 Torsional oscillations & Determination of modulus of flat spiral spring ( $\gamma, n, 6$ ).
  
- 4) Viscosity : (10 Lectures)
  - 4.1 Streamline and turbulent flow, tube of flow, Equation of continuity. Flow of liquid through a capillary, Poiseuille's equation, Reynold's number.
  - 4.2 Concept of pressure energy, Bernoulli's theorem, it's application, Venturi-meter, Pitot tube.
  - 4.3 Viscosity by rotating cylinder method
  - 4.4. Temperature dependence of viscosity.

5) Surface tension :

- 5.1 Surface tension and surface energy, capillary action, angle of contact.
- 5.2 Relation between surface tension, excess pressure and curvature.
- 5.3 Surface tension by soap bubble Jaeger's method, Quincke's method.
- 5.4 Temperature dependence of surface tension.

List of Books :

- 1) Properties of matter- D.S.Mathur
- 2) Text book of Physics - Duncan and Starting.
- 3) Physics Part I- Resnik- Haliday.
- 4) Principles of Physics - F. Bueche.
- 5) Introductory applied Physics - Harris and Hammerling.

PAPER I : SECTION II : HEAT AND THERMODYNAMICS

- 1) Equations of states (6 Lectures)
  - 1.1 Equation of state, Andrew's experiment, Amagat's experiment.
  - 1.2 Van der-Wall's equation of state, critical constants.
  - 1.3 Reduced equation of state, Boyle temperature.
- 2) Thermodynamics (10 Lectures)
  - 2.1 Isothermal and adiabatic changes, work-done in isothermal and adiabatic changes.
  - 2.2 First law of thermodynamics.
  - 2.3 Carnot's heat engine, Carnot's cycle for perfect gas.
  - 2.4 Efficiency of Carnot's heat engine and concept of absolute zero.
  - 2.5 Second law of thermodynamics (Clausius's statement)
- 3) Applications of 1st and 2nd law of thermodynamics. ( 10 Lectures)
  - 3.1 Otto--cycle, Otto engine, Diesel cycle, Diesel engine, efficiencies.
  - 3.2 Introduction to refrigeration, principle, coefficient of performance, simple structure of gas refrigerator.
  - 3.3 Principle of air conditioning, comfort chart, A.C. machine, factors affecting size and capacity of A.C. machine.
- 4) Entropy ( 6 Lectures)
  - 4.1 Concept of entropy, change of entropy during reversible and irreversible process, entropy temperature diagram--change of phase.
  - 4.2 First and second latent heat equation.
  - 4.3 Effect of change of pressure on melting and boiling point of liquid, principle of increasing entropy.

(4 Lectures)

5) Thermometry

5.1 Principle of thermometry, platinum resistance thermometer.

5.2 Thermocouple thermometers, radiation pyrometer.

List of Books :

- 1) Heat and thermodynamics - Zemansky
- 2) Treatise on heat - Shah and Shrivastava
- 3) Heat and thermodynamics - Brijlal and Subramaniam.
- 4) Elements of heat engines - R.C. Patel, C.J. Karamchandani.
- 5) Thermodynamics - J.N. Gurtu.
- 6) Thermal Physics - S.C. Garg, R.M. Bansal, C.K. Ghosh.
- 7) Applied thermodynamics - Rai & Sarao.

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PAPER II : SECTION I : MODERN PHYSICS

- 1) Cathode rays ( 10 Lectures)
  - 1.1 Motion of charged particles in electric and magnetic fields.
  - 1.2 Determination of "e" and e/m (Millikan's method and Thomson's method.)
  - 1.3 Positive rays, discovery, early studies on positive rays.
  - 1.4 Dempster's mass spectrograph.
  - 1.5 Electromagnetic spectrum (ranges, sources & applications).
  
- 2) Matter waves ( 9 Lectures)
  - 2.1 Dual nature of light (historical background).
  - 2.2 Dual nature of matter (de-Broglie's hypothesis).
  - 2.3 Compton effect (without mathematical treatment).
  - 2.4 Concepts of wave packets, phase velocity, particle velocity & group velocity (their relationships).
  - 2.5 Electron diffraction (Davisson & Germer experiment).
  - 2.6 Uncertainty principle
  
- 3) Solar Cells (9 Lectures)
  - 3.1 Conventional and non-conventional energy sources.
  - 3.2 Solar energy as an alternative source of energy.
  - 3.3 Photovoltaic principle.
  - 3.4 Construction and types of solar cells.
  - 3.5 I-V Characteristics of solar cells ( $I_{sc}$ ,  $V_{oc}$  parameters)
  - 3.6 Efficiency of solar cells.
  - 3.7 Solar radiation spectral distribution.
  - 3.8 Applications of solar cells.

- 5) Thermometry (4 Lectures)
- 5.1 Principle of thermometry, platinum resistance thermometer.
- 5.2 Thermocouple thermometers, radiation pyrometer.

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- 3) Heat and thermodynamics - Brijlal and Subramaniam.
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  - 3.6 Efficiency of solar cells.
  - 3.7 Solar radiation spectral distribution.
  - 3.8 Applications of solar cells.

- 4) Atomic Structures ( 5 Lectures)
- 4.1 Bohr's hydrogen atom model (revision)
  - 4.2 Experimental verification of discrete atomic energy levels  
(Frank and Hertz experiment)
  - 4.3 Fine structure of "H" line-failure of Bohr's theory
  - 4.4 Sommerfeld's correction (elliptical orbit and azimuthal quantum number)
  - 4.5 Bohr's correspondence principle.

- 5) Atomic nucleus ( 3 Lectures)
- 5.1 Composition of nucleus (Introduction of nuclear forces)
  - 5.2 Mass defects and binding energy curve.
  - 5.3 Packing fraction.

List of Books :

- 1) Modern Physics - J.V. Rajam.
- 2) Perspectives of modern Physics - A. Beiser.
- 3) Modern Physics- F.K. Richtmayer.
- 4) Modern Physics - B.V. N. Rao
- 5) Introduction to modern Physics- H.S. Mani & G.K. Mehta.
- 6) Modern Physics - N.K. Sehgal & K.L. Chopra.
- 7) Solar energy - Sukhatme.

PAPER II : SECTION II : ELECTROMAGNETICS

- 1) Vectors & Scalars ( 6 Lectures)
  - 1.1 Revision of basic concepts (Vectors, scalar differentiation & integration).
  - 1.2 Elementary concepts of partial differentiation.
  - 1.3 Operator del (  $\nabla$  ), its applications (cartesian co-ordinates only).
  
- 2) Study of Dielectrics (9 Lectures)
  - 2.1 Dielectrics, polar & nonpolar molecules, forces & density, surface charge density & linear charge density.
  - 2.3 Gauss's law in dielectrics, electric displacement vector, relation between D, P & E boundary conditions at dielectric interface.
  
- 3) Magnetostatics ( 8 Lectures)
  - 3.1 Concept of magnetic field, magnetic flux & magnetic induction.
  - 3.2 Ampere circuit law (Statement & Mathematical Formulation).
  - 3.3 Magnetic induction inside a solenoid, magnetic induction inside a toroid.
  - 3.4 Magnetisation of matter, definition of  $J$ ,  $H$  &  $M$  and relation between them, magnetic susceptibility (qualitative treatment only).
  
- 4) Electromagnetic Induction ( 3 Lectures)
  - 4.1 Self & mutual induction.
  - 4.2 Theory of transformer, losses in transformer & its efficiency, reflected resistance, choke coil.
  
- 5) Current Electricity ( 10 Lectures)
  - 5.1 Concept of current density & maximum power transfer theorem (D.C. circuits), electrical circuit (D.C.) growth & decay of current and voltage in a circuit

Containing capacitor & resistor, concept of time constant.

5.2 Electrical circuit (A.C.) containing inductor and resistor, capacitor and resistor, capacitor, inductor and resistor (series circuit only)

5.3 Reactance, impedance, power factor, Q - factor with phase diagram.

List of Books :

- 1) Fundamentals of Electricity & Magnetism - S. P. S. & Millford.
- 2) Physics Volume II - Resnick & Halliday,
- 3) Electricity & Magnetism - A. S. Mahajan & A. A. Langwala
- 4) Electricity & Electronics - Drijalal & Subrahmanyam.
- 5) A Text Book of Electrical Technology - B. L. Theraja.
- 6) Electricity and Magnetism - A. Kip.

LIST OF PHYSICS PRACTICAL

SECTION I

- 1) Viscosity by flow through a capillary tube ( The Poiseuille's method).
- 2) Flat Spiral Spring :  $Y$  and  $n$  .
- 3) M.I. of disc,  $n$  by torsional pendulum.
- 4) Poission's ratio by rubber cord method.
- 5) M.I. of a fly wheel.
- 6)  $Y$  (of a rectangular thin bar) by bending.
- 7) Surface tension of water by Jaeger's method
- 8) Surface tension by a soap bubble method.
- 9) Thermal conductivity by Lee's method.
- 10) Specific heat of graphite by electrical method.
- 11) Thermocouple as a thermometer.
- 12) Study of temperature coefficient of resistance.
- 13) Velocity of sound in air by Kund's tube.
- 14) Measurement of sound level.

SECTION II

- 1) Verification of a Kirchoff's law
- 2) Charging and discharging of a condensor.
- 3) L<sub>2</sub>C-R Series/parallel resonance and Q factor.
- 4) Comparison of capacities by Desauty's method.
- 5) Angle of dip by each inductor.
- 6) Vector diagram of L-R circuit and power factor.
- 7) Figure of a merit of a mirror Galvanometer.
- 8) Frequency of A.C. by using vibrating wire and magnets.
- 9) Study of inductive and capacitive reactances.

- 10) Use of analogue and digital multimeters-
  - i) Study of electronic components (resistance, capacitance)
  - ii) Measurements of A.C. and D.C. Voltages.
  - iii) Study of diodes, transistors.
  - iv) Tracing a circuit (fault findings.)
11. Study of Photoresistance/light dependent resistance(LDR) (Characteristics and applications).
- 12) Study of hysteresis by solenoid method.
- 13) Characteristics of solar cell.
- 14) Determination of wavelength of Na-light using biprism.
- 15) Study of spectrometer, determination of angle of prism, study of Schuster's method.
- 15) Determination of dispersive power of a prism.

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