

# Syllabus for B.Sc (Physics)

[BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)]

From the academic year 2006 - 2007

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**  
**Dept. of Physics**

**Details about the Paper Codes, Paper Number & Title of the Paper**  
**PHYSICS (02)**

Sl. No.	Paper Code	Paper No.	Title of the Paper
1.	A 0201	Paper I	Mechanics of particles Rigid Bodies & Continuous Media
2.	A 0202	Paper II	Kinetic Theory & Thermodynamics
3.	A 0203	Paper III	Oscillations & Waves
4.	A 0204	Paper IV	Acoustics & Statistical Physics
5.	A 0205	Paper V	Practicals I
6.	A 0206	Paper VI	Optics
7.	A 0207	Paper VII	Electricity
8.	A 0208	Paper VIII	Magnetism and Electrodynamics
9.	A 0209	Paper IX	Electronics
10.	A 0210	Paper X	General Practicals II
11.	A 0211	Paper XI	Quantum Mechanics
12.	A 0212	Paper XII	Solid State Physics
13.	A 0213	Paper XIII	Laser and Molecular Spectroscopy
14.	A 0214	Paper XIV	Advanced Electronics - I
15.	A 0215	Paper XV	Fundamentals of Microprocessors & Computers
16.	A 0216	Paper XVI	Atomic Physics and Relativity
17.	A 0217	Paper XVII	Nuclear Physics
18.	A 0218	Paper XVIII	Advanced Electronics - II
19.	A 0219	Paper XIX	Environmental Physics
20.	A 0220	Paper XX	General Practical - III
21.	A 0221	Paper XXI	Electronics Practical
22.	A 0281	Allied Paper I	Allied Physics I for Chemistry
23.	A 0282	Allied Paper II	Allied Physics II for Chemistry
24.	A 0283	Allied Practical	Allied Physics Practicals for Chemistry

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**I - Semester**

**Main Paper - I**

**MECHANICS OF PARTICLES, RIGID BODIES AND CONTINUOUS MEDIA**

**(Paper Code A0201)**

**UNIT - I: 16 hours**

Newton's equations of motion, laws of motion, forces of nature - conservative and non-conservative forces - centripetal and coriolis accelerations - centripetal force. Motion under a Central force, Kepler's laws of planetary motion - Newton's law of gravitation - Derivation of inverse square law from Kepler's laws - determination of mass of a planet.

Fields and potential - gravitational field and potential due to a uniform spherical shell, solid sphere, gravitational self energy of a uniform solid sphere.

**UNIT - II: 14 hours**

System of particles, centre of mass - motion of Centre of mass - Expressions for Velocity and acceleration - Centre of mass and laboratory reference frame - Two - body problem, Reduced mass, binary stars- Laws of conservation of energy, linear momentum and angular momentum.

**UNIT - III: 14 hours**

Elastic and inelastic collisions Laws of Collision - Coefficient of restitution - Direct and oblique collisions - Expressions for final velocities and loss of energy - Scattering - Impact parameter and scattering cross-sections - Rigid body, degrees of freedom, Euler's theorem.

**UNIT - IV: 14 hours**

Moments of inertia and products of inertia, theorems of parallel and perpendicular axes, Moment of inertia of a solid sphere and hollow sphere - Equations of motion for rotation, Molecular rotations (as rigid bodies); di and tri-atomic molecules - intrinsic spin, angular momentum in elementary particles, Precessional motion; top, gyroscope.

**UNIT - V: 14 hours**

Elastic constants for an isotropic solid, their inter-relation, torsion of a cylinder, bending of a beam. Kinematics of moving fluids, equation of continuity, Euler's equation, Bernoulli's theorem.

Viscous fluids, streamline and turbulent flow, flow through a capillary tube, Reynold's number, Stoke's law. Surface tension and surface energy - molecular interpretation - pressure on a curved liquid surface.

**Textbooks:**

1. Mechanics - D.S. Mathur - 2004. S. Chand & Co.
2. Dynamics - M. Narayanamurthi - 2002, National Publishing House.
3. Properties of Matter - D.S. Mathur - 2004. S. Chand & Co.,
4. Mechanics - Joseph Ittyavirah - Resmi Printers - Palai (For Units I, II and III), 2002
5. A text book of Mechanics - Bargava & Sarma - Ratan Prakashan Mandir, 1987
6. Elements of Mechanics - Gupta, Prakash and Agarwal- Pragathi Prakashan (For units IV and V)

**Reference Books:**

1. Physics - Volume - I Resnik & Halliday - Wiley Eastern: 2003
2. Mechanics - H.S. Hans & S.P. Puri - 2003 TMH.
3. Feynman lectures on Physics - Vol. I : Narosa: 1986

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**I - Semester**

**Main Paper - II**

**KINETIC THEORY & THERMODYNAMICS**

**(Paper Code A0202)**

**UNIT - I: 14 hours**

Ideal gas: Review of the kinetic model of an ideal gas; interpretation of temperature, Equipartition of energy; specific heats of gases. Real gas: Van der Waals model; equation of state, nature of Van der Waals forces, critical constants. Transport Phenomena: Mean free path, transport of momentum (viscosity), of energy (thermal conduction) and matter (diffusion).

**UNIT - II: 16 hours**

Joule Thomson and adiabatic cooling: Joule-Thomson expansion; constancy of  $U + PV$ , cooling in J-T expansion, adiabatic expansion of an ideal gas, principles of regenerative and cascade cooling, liquefaction of  $H_2$ ,  $O_2$  and He. Low temperature: Production and measurement of very low temperatures.

**UNIT - III: 14 hours**

Laws of thermodynamics: - Zeroth law; indicator diagrams, work done, the first law - internal energy, Carnot engine and its efficiency, Carnot's theorem the second law. Entropy as a thermodynamic variable; reversible and irreversible processes. Principle of increase of entropy. Thermodynamic scale of temperature; its identity with perfect gas scale, impossibility of attaining the absolute zero (third law).

**UNIT - IV: 14 hours**

Thermodynamic relationships: Maxwell's equations; application to Clausius - Clapeyron equation and Joule - Thomson effect. Thermodynamic potentials: Relation to thermodynamic variables; equilibrium in thermodynamic systems, simple applications.

**UNIT - V: 14 hours**

Black body radiation: Temperature and radiation, Stefan - Boltzmann law, spectral distribution, Wien's displacement law. Rayleigh - Jeans law and the ultraviolet catastrophe, Planck's hypothesis, mean energy of an oscillator and Planck's law.

**Textbooks:**

1. Heat and thermodynamics, Brijlal and Subramanian (S. Chand & Co.), 2004
2. Heat and thermodynamics, Mathur (S. Chand & Co), 1986
3. A Textbook of Heat and thermodynamics (J.B. Rajam and C.L. Arrora), 1976.

**Reference Books:**

4. D.P. Khandelwal and A.K. Pande; "Thermodynamics and Statistical Physics" (Himalayan Publication House, Bombay), 1976.
5. S.P. Puri: "Vibrations and Waves" (Tata McGraw-Hill), 1987
6. C. Kittel and H. Kroemer; "Thermal Physics" (CBS Publishers, Delhi), 2004
7. M.W. Zemanasky; "Heat and Thermodynamics" (McGraw-Hill), 1986

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**  
**Dept. of Physics**  
**B.Sc., (Physics)**  
**(For the students admitted from the academic year 2006 - 2007)**  
**II - Semester**  
**Main Paper - III**  
**OSCILLATIONS AND WAVES**  
**(Paper Code A0203)**

**UNIT - I: 16 hours**

Free oscillations of simple systems: Equilibrium; concept of potential well, small oscillations of Mass between two springs, diatomic molecule, reduced mass concept.

Damped and forced oscillations: Damped oscillations; critical damping, Q of an oscillator. Forced oscillator with one degree of freedom; Transient and steady state oscillations, resonance energy absorption, low and high frequency responses.

**UNIT - II: 14 hours**

Free oscillations of system with two degrees of freedom: Two dimensional oscillator, normal modes.

Fourier analysis: Fourier series and Fourier coefficients; simple examples, use of exponential representation for harmonic oscillations, expression for Fourier coefficients.

**UNIT - III: 14 hours**

Waves in a one-dimensional chain of particles; classical wave equation; particle velocity, boundary conditions and normal modes, dispersion relations, dispersive waves, acoustic and optical modes: Stationary and progressive waves and their characteristics.

**UNIT - IV: 14 hours**

Waves in continuous media: Speed of transverse waves on a uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves, typical measurements, dispersion in waves, group velocity and phase velocity, their relation and measurements.

**UNIT - V: 14 hours**

Superposition of waves: Linear homogenous equations and the superposition principle, interference in space and energy distribution; beats and combination tones.

Ultrasonics: Production, detection and applications of ultrasonic waves.

**Textbooks:**

1. M. Ghosh, A Text Book of Sound (S. Chand & Co.), 1986.
2. D.P. Khandelwal, "Oscillations and Waves" (Himalaya Publishing House, Bombay), 1976.
3. Berkely Physics Course, Vol. III, "Waves and Oscillations", 1984.
4. R. Murugesan, Sound, 1989.
5. Elements of mechanics - Gupta, Prakash etc., Pragathi Prakashan, 2006.

**Reference Books:**

6. Waves and Oscillations - N. Subramanyam and Brij Lal - Vikas Publishing House, 2001
7. Oscillations and Waves - Satya Prakash - Pragati Prakashan, 2005.
8. Mechanics - D.S. Mathur, 2004 S. Chand & Co., 2005.
9. Mechanics - Joseph Ittyavirah, Resmi Printers, Palai, 2002.
10. Waves and Oscillations - N.K. Bajaj - TMH, 1984.

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**  
**Dept. of Physics**  
**B.Sc., (Physics)**  
**(For the students admitted from the academic year 2006 - 2007)**  
**II - Semester**  
**Main Paper - IV**  
**ACOUSTICS AND STATISTICAL PHYSICS**  
**(Paper Code A0204)**

**UNIT - I: 12 hours**

Vibrations in bounded systems: Normal modes of a bounded system; harmonics, the quality of sound, Chladni's figures, vibration of a drum. Noise and Music: Limits of human audibility, intensity and loudness, bel and decibel. Musical scale-diatonic scale, tempered scale, temperament and musical instruments.

**UNIT - II: 14 hours**

Reflection, refraction and diffraction of sound: Acoustic impedance of a medium, percentage reflection and refraction at a boundary, Diffraction of sound; principle of a sonar system, sound ranging.

Applied - acoustics: Transducer and their characteristics, recording and reproduction of sound. The acoustics of halls, reverberation period, Sabine's formula.

**UNIT - III: 16 hours**

The statistical basis of thermodynamics: Probability and thermodynamic probability; principle of equal a priori probabilities, probability distribution, its narrowing with increasing  $n$ , average properties, fluctuations, accessible and inaccessible states. Phase space representation: The  $\mu$  space; its division into sheets of energy, phase cells of arbitrary size, one-dimensional oscillator, free particles, the functions  $\phi(E)$  and  $\Omega(E)$ , definition of probability, average properties of the system in equilibrium state.

**UNIT - IV: 16 hours**

The bridge with thermodynamics: Thermal equilibrium between two systems, beta parameter and its identify with  $(kT)^{-1}$ , probability and entropy, Boltzmann entropy relation, statistical interpretation of the second law of thermodynamics. Boltzmann canonical distribution law; equipartition of energy, Maxwellian distribution of speeds in an ideal gas: Derivation of the distribution of speed and velocities.

**UNIT - V: 14 hours**

Transition to quantum statistics: Cases of particles in a box and simple harmonic oscillator. Setting phase - cell size as nature's constant (Planck's constant  $h$ ); quantization of energy. Indistinguishability of particles, effect on absolute entropy. Bose-Einstein and Fermi-Dirac conditions - Comparison between the three statistics.

**Textbooks:**

1. M. Ghosh, A Text Book of Sound (S. Chand & Co.), 1986.
2. R.K. Ghosh; "The Mathematics of waves and vibrations" (Macmillan, 1975)
3. Heat and thermodynamics, Mathur (S. Chand & Co.), 1986
4. A Text book of Heat and thermodynamics (J.B. Rajam and C.L. Arrora), 1976
5. Elements of statistical mechanics - Kamal Singh, S.P. Singh (S. Chand & Co.), 1988

**Reference Books:**

6. D.P. Khandelwal and A.K. Pande; "Thermodynamics and Statistical Physics" (Himalaya Publication House, Bombay), 1976
7. F. Reif: "Berkeley Physics Course, Vol. 3, Statistical Physics", 1976
8. B.B. Laud; "Introduction to Statistical Physics" (MacMillan 1981)
9. Heat, Thermodynamics and Statistical Physics - Singal, Agrawal etc., Pragati Prakashan, 1991.

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**  
**Dept. of Physics**  
**B.Sc., (Physics)**  
**(For the students admitted from the academic year 2006 - 2007)**  
**I & II - Semester**  
**Main Paper - V**  
**PHYSICS PRACTICAL - I**  
**(Paper Code A0205)**

Choose any 16 experiments from the list given below.

**LIST OF EXPERIMENTS : 4 hours per week**

1. Compound pendulum.- determination of  $g$ , radius of gyration and moment of inertia
2. Young's modulus - non-uniform bending - pin & microscope.
3. Young's modulus - cantilever - pin & microscope.
4. Surface tension of a liquid and interfacial surface tension between water and kerosene by the method of drops.
5. Rigidity modulus - torsional oscillations without masses.
6. Specific heat capacity of a liquid and emissivity of a surface - method of cooling.
7. Thermal conductivity of a bad conductor - Lee's disc method.
8. Sonometer - determination of frequency and verification of laws of transverse vibrations.
9. Melde's apparatus - determination of frequency.
10. Spectrometer - refractive index of a liquid - hollow prism.
11. Spectrometer - calibration of a grating - minimum deviation method.
12. P.O. box - resistivity and verification of laws of resistance.
13. P.O. box - temperature coefficient of the material of a coil of wire.
14. Potentiometer - calibration of low range voltmeter (0 - 1.5 V).
15. Potentiometer - calibration of ammeter (0-1.5 amps).
16. Oscillations on a bifilar suspension
17. Searle's method for determining  $Y$ ,  $n$  and  $\sigma$  of a material.
18. Variation of period of oscillations of a spring (or rubber band) with mass and spring constant
19. Jolly's constant volume air thermometer - determination of melting point of wax.
20. Study of characteristics of a thermistor
21. Emf of thermocouple using digital multimeter
22. Kater's pendulum - determination of acceleration due to gravity at a place
23. Stoke's method of viscosity determination
24. Terminal velocity for bodies falling through a fluid
25. Study of laws of parallel and perpendicular axes for estimation of moment of inertia
26. Computer simulation of Equations of motion for a system of particles
27. Computer simulation of Molecular rotations, as rigid bodies
28. Computer simulation of Study of coupled oscillations -
29. Computer simulation of analyzing a given wave-form for its harmonic components.
30. Computer simulation of Generation of phase space plots of simple harmonic oscillator

**Textbooks:**

1. DP Khandelwal "Laboratory Manual of Physics for undergraduate classes" (Vani Publishing House, New Delhi), 1976
2. B Saraf et al. "Physics through Experiments, Vol. 1, Mechanical Systems" (Vikas Publication House, New Delhi), 1978

**Reference Books:**

3. V Y Rajopadhye and V L Purohit; Text book of experimental Physics, 1976.



**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**  
**Dept. of Physics**  
**B.Sc., (Physics)**  
**(For the students admitted from the academic year 2006 - 2007)**  
**III - Semester**  
**Main Paper - VI**  
**OPTICS**  
**(Paper Code A0206)**

**UNIT - I: 12 hours**

Fermat's principle: Principle of extremum path; the aplanatic points of a sphere and other applications. Cardinal points of an optical system; general relationships, thick lens and lens combinations.

Aberration in images: chromatic aberrations; achromatic combination of lenses in contact and separated lenses; Monochromatic aberrations and their reduction.

**UNIT - II: 16 hours**

Interference of light: The principle of superposition; two-slit interference, coherence requirements for the sources, localized fringes in thin films, transition from fringes of equal thickness to those of equal inclination. Michelson interferometer; its uses for determination of wavelength, wave length difference and standardization of the meter. Intensity distribution in multiple beam interference; Fabry-Perot interferometer and etalon.

**UNIT - III: 16 hours**

Fresnel diffraction: Half-period zones, circular apertures and obstacles, straight edge, explanation of rectilinear propagation - Zone plate.

Fraunhofer diffraction: Diffraction at a slit, a circular aperture and a circular disc; Resolution of images; Rayleigh criterion, resolving power of a telescope and a microscope, outline of phase contrast microscopy.

Diffraction grating: Diffraction at N parallel slits; plane diffraction grating, concave grating, resolving power of gratings and prisms.

**UNIT - IV: 14 hours**

Double refraction - definition - uniaxial and biaxial crystals - Explanation of double refraction in terms of electromagnetic theory (no derivation) - phase retardation plates and their uses - Description of quarter-wave and half-wave plates - Distinction between them. Optical rotation - types of optically active substances - Laws of optical rotation.

**UNIT - V: 14 hours**

Origin of optical rotation in liquids and in crystals - Fresnel's explanation of optical rotation - Dispersion and dispersive power of a prism - normal and anomalous dispersion - Cauchy's equation and Hartmann's formula - Sellmeier's formula - Lorentz electromagnetic theory of dispersion - theory of Rayleigh scattering.

**Textbooks:**

1. Brijlal and Subramanian, Optics (S. Chand & Co.), 2005.
2. S.L.Kakani and H.C. Bhandrai, Optics (Sultan Chand & Co.), 2005.
3. D.P. Khandelwal; Optics and Atomic Physics (Himlaya Publishing House, Bombay 1988)
4. Principles of optics - B.K. Mathur - New Gopal Printing Press., 1988.

**Reference Books:**

5. A.K. Ghatak; "Physics of Optics", 2003
6. Jenkins and White; "Fundamental of Optics" (McGraw-Hill), 1982
7. Smith and Thomson; "Optics" (John Wiley and Sons, 1980)
8. R.S. Longhurst; "Geometrical and Physical Optics" (Longmans, 1966)



**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**III - Semester**

**Main Paper - VII**

**ELECTRICITY**

**(Note: Vector language is to be used all through)**

**(Paper Code A0207)**

**UNIT - I: 12 hours**

Electric field : Coulomb's law; Conservation and quantisation of charge; field due to different charge distribution, monopole, dipole, quadropole, flux of an electric field. Gauss's law; applications to deduce E fields, force per unit area on the surface of a charged conductor.

**UNIT - II: 16 hours**

Potential: Line integral of electric field and electrical potential; field as the gradient of potential. Potential pair of charges, line charge, sheet charge, charged hollow disc energy of a system of charges. Energy associated with E field. Differential form of Gauss's law, Poisson's equation, Laplace's equation, boundary conditions, and Uniqueness theorems.

Electric field around conductors: Induced charges; field and potential inside a conductor, field near the surface of a conductor, method of images.

**UNIT - III: 14 hours**

Electric fields in matter: Atomic and molecular dipoles - induced dipoles - dipole moment - polarisability tensor - electronic, molecular and orientation polarisabilities - Electric field caused by polarised matter - E and D fields - polarisation density vector - permittivity - dielectric constant - capacitor filled with a dielectric - field equations in the presence of dielectric.

**UNIT - IV: 14 hours**

The field of a polarised sphere (molecular field) - dielectric sphere in a uniform field - energy in dielectric systems - electric susceptibility - frequency dependence of polarisability - Clausius - Mosatti equation - its limitation - Debye's relation and molecular structure.

**UNIT - V: 16 hours**

Electrical current and current density . Equation of continuity - Kirchoff's laws - Thevenin's Theorem - Norton's theorem - Superposition theorem - maximum power theorem - Non-ohmic circuitry - Thermistors - varying current - Rise and fall of currents in LR circuits - growth and decay of charge in CR circuits - time constant - Integrating and differentiating circuits.

**Textbooks:**

1. Electricity and Magnetism - K.K. Tewari - 2005 - Chand & Co.,
2. Electricity and Magnetism - R. Murugesan - 2005 - S. Chand & Co.,
3. Electricity and Magnetism - Narayanamurthy - 2000 - National Publishing House.

**Reference Books:**

1. Electrodynamics - Gupta, Kumar and Singh - 2005 - Pragati Prakshan
2. Electricity and Magnetism - Ittya virah - Reshmi Publishers - Palai, 2002.
3. Electricity and Magnetism - A.S. Mahajan and A.A. Rangawala - TMH, 1988
4. Electricity and Magnetism - W.J. Duffin - ELBS, 1981.

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**IV - Semester**

**Main Paper - VIII**

**MAGNETISM AND ELECTRODYNAMICS**

**(Paper Code A0208)**

**UNIT - I: 12 hours**

Magnetic field: Magnetic field  $\mathbf{B}$  seen through Lorentz force on a moving charge, unit for  $\mathbf{B}$  defined through force on a straight current, torque on a current loop in  $\mathbf{B}$  field, magnetic dipoles in atoms and molecules. Motion of charges in electric, magnetic and crossed fields - Principle, Construction, Working and uses of cathode ray oscillograph (CRO)

**UNIT - II: : 14 hours**

Magnetic field due to currents: Biot and Savart's law. Field equations in magnetostatics, Ampere's law. Fields due to a straight wire, magnetic dipole, circular current and solenoid. Magnetic fields in matter: Magnetizing current, magnetization vector,  $\mathbf{H}$  and  $\mathbf{B}$  fields, magnetic permeability, susceptibility. Comparison of magneto statics and electrostatics. Field equations for  $\mathbf{E}$ ,  $\mathbf{D}$ ,  $\mathbf{B}$ ,  $\mathbf{H}$ .

**UNIT - III: 16 hours**

Alternating currents - Principle and working of AC generator - skin effect for resistance at high frequencies - complex impedance - reactance, impedance of LCR series and parallel circuits resonance - Q - factor - power dissipation and power factor - AC bridges - Balancing conditions - Anderson's and Owens bridges to find 'L'.

**UNIT - IV: 14 hours**

Generators - Three phase electrical power supply - delta and star connections - Methods for high DC voltage generation - DC dynamo and induction coil methods - Principle of mass spectrograph - positive ray parabola (Thomson) - Velocity selector and Bainbridge mass spectrograph - magnetic focusing and Dempster's mass spectrograph.

**UNIT - V: 16 hours**

Faraday's law for electromagnetic induction: Faraday's law in integral and differential forms; self-inductance of a solenoid and of a straight conductor, energy stored in an inductor and in the magnetic field. Displacement current; modified Ampere's law, Maxwell's equation for time-dependent electromagnetic field in vacuum, and in material media, boundary conditions.

Electromagnetic potentials : Magnetic vector potential  $\mathbf{A}$  and scalar potential  $\Phi$ , Poisson's equation for  $\mathbf{A}$  in terms of current density.

**Textbooks:**

1. K.K. Tewari, Electricity and Magnetism (S. Chand & Co.), 2005.
2. Murugesan Electricity and Magnetism, (S. Chand & Co.), 2005.
3. S.L.Guptha, S.P. Singh, V. Kumar, Electrodynamics (Prakati Praksan), 2005

**Reference Books:**

1. A.S. Mahajan and A.A. Rangawala "Electricity and Magnetism" (Tata McGraw-Hill) A M, 1988
2. Electricity and magnetism - Brij Lal and Subramanyam, Ratan Prakashan Mandir. 2004
3. Modern Physics, R. Murugesan, 2005. (S. Chand & Co.,)

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**  
**Dept. of Physics**  
**B.Sc., (Physics)**  
**(For the students admitted from the academic year 2006 - 2007)**  
**IV - Semester**  
**Main Paper - IX**  
**ELECTRONICS**  
**(Paper Code A0209)**

**UNIT - I: 14 hours**

Semiconductor diodes - p-n junction diode - V-I characteristics - Applications in half-wave, full wave and Bridge-rectifiers, clipper circuits, clamper circuits - Zener diode - Avalanche breakdown and zener breakdown - Zener diode as voltage regulator - opto electronic diodes - LED, photo diode - LCD - Construction, working and applications.

**UNIT - II: 14 hours**

Bipolar junction transistors (BJT): pnp and npn structures; active and saturation regions, characteristics of BJT, common-emitter configuration, input and output characteristics, common-base configuration, output characteristics. Two-port analysis of a transistor, definition of h-parameters, load-line concept, emitter follower, biasing methods (base bias and voltage divider bias), stability factor, low frequency model.

**UNIT - III: 16 hours**

Cascade connections in amplifiers; Theory and Frequency response of RC and transformer coupled amplifiers; bandwidth, decibel power gain and loss.

Field effect transistor (FET): Classification of various types of FETs, constructional details of junction field-effect transistor, drain characteristics of JFET, biasing of JFET, operating regions, pinch-off voltages, idea of metal-oxide-semiconductor transistor (MOS transistor) - construction, working and characteristics of d-MOSFET and e-MOSFET.

**UNIT - IV: 12 hours**

Operational amplifiers: Differential amplifiers, principles of operational amplifiers, transfer characteristics, offset parameters, differential gain, CMRR, application of operational amplifiers, linear circuits.

**UNIT - V: 16 hours**

Oscillators and wave-form generators: Positive feedback, Barkhausen criterion, RC oscillator, Wien Bridge oscillator, phase shift oscillator, Colpitt's oscillator, Hartley oscillator, unijunction oscillator.

**Textbooks:**

1. B.L. Theraja, Basic Electronics, (S. Chand & Co.,)
2. Milliman & Halkias, Integrated Electronics (Tata McGraw-Hill)
3. Electronic Fundamentals & Applications, Chattopadhyay & Rakshit (New-Age International)
4. Principles of electronics - V.L. Metha - 2005. S. Chand & Co.,

**Reference Books:**

5. J. Millman and A. Grabel, "Microelectronics", Second Edition (McGraw-Hill International Edition).
6. W.D. Stanley, "Electronic Devices: Circuits and Applications" (Prentice-Hall)
7. L. Schilling and Belove, "Electronic Circuits", Third edition (McGraw-Hill)
8. Applied electronics - R.S. Sedha - 2005, (S. Chand & Co.,)

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**III & IV - Semester**

**Main Paper - X**

**PHYSICS PRACTICAL - II**

**(Paper Code A0210)**

Choose any 18 experiments from the list given below.

**LIST OF EXPERIMENTS : 4 hours per week**

1. Young's modulus - Uniform bending - scale & telescope
2. Young's modulus - Koenig's method.
3. Rigidity modulus - Torsional pendulum with masses.
4. Rigidity modulus - Static torsion.
5. Specific latent heat of fusion of ice.
6. Specific Heat capacity of a liquid - Joule's calorimeter.
7. Spectrometer- determination of wavelength - Minimum deviation method.
8. Spectrometer calibration of grating - Normal incidence method.
9. Spectrometer - i-d curve.
10. M and  $B_H$  - using deflection and vibration magnetometer.
11. Field along the axis of the circular coil carrying current and determination of  $B_H$ .
12. Carry-Foster's bridge - Resistivity of the material of the coil of wire.
13. Carry-Foster's bridge - Temperature co-efficient of the material of a wire.
14. Potentiometer - Internal resistance of a cell.
15. Potentiometer -Calibration of a high range voltmeter.
16. Figure of merit of a periodic moving coil galvanometer.
17. B.G - Comparison of emf of two cells.
18. B.G. - Comparison of capacities.
19. Melde's string - Specific gravity of a solid and liquid.
20. Determining the focal length of a high power microscope objective.
21. Study of interference fringes in a bi-prism arrangement
22. Study of polarization of light by simple reflection.
23. Study of optical rotation by solutions.
24. Study of the rise and decay of current in a RC circuit
25. Study of the rise and decay of current in a RL circuits
26. Study of the impedance of an inductor at varying frequencies to measure R and L
27. Study of the impedance of a capacitor of varying frequencies to measure C.
28. computer simulation of effect of magnetic and electric field on charged particles
29. computer simulation of propagation of electromagnetic waves
30. computer simulation of multiple beam interference

**Textbooks:**

1. DP Khandelwal: A Laboratory Manual for Physics for Undergraduate Students (Vani Publications, New Delhi)
2. B Saraf et al. "Physics through Experiments, Vol. H.,EMF constant and varying" (Vikas Publications, New Delhi)

**Reference Books:**

3. Olon; "Experiments in Modern Physics"
4. V.Y. Rajopadhye and V.L. Purohit; Text book of experimental Physics.

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**V - Semester**

**Main Paper : XI**

**QUANTUM MECHANICS**

**(Paper Code A0211)**

**UNIT - I: 14 hours**

Distribution of energy in the spectrum of black body - Failure and limitations of Wien's law and Rayleigh - Jean's law (no derivations) - Planck's quantum theory and its features - Laws of photo electric effect - Failure of classical physics - Einstein's explanation - Bohr's theory of hydrogen atom (Qualitative ideas) - its limitations - Drawbacks of old quantum theory.

**UNIT - II: 14 hours**

Dual character of light - De Broglie's hypothesis - Matter waves - De Broglie wave length - wave velocity, group velocity of de Broglie waves - wave packets - Davisson and Germer's experiment - G.P. Thomson's experiment-. Consequences of De Broglie concepts - Principle, design and working of electron microscope

**UNIT - III: 16 hours**

Heisenberg's uncertainty principle - Explanation and elementary proof - Schrödinger's one-dimensional time - dependent wave equation - Schrödinger's one-dimensional time-independent wave equation - physical significance of wave function - orthogonal and normalized wave functions - definition of an operator - Eigen function , eigen value and eigen value equation.

**UNIT - IV: 12 hours**

Operators in quantum mechanics - Expectation values - postulates of quantum mechanics - transition probability - free particle and bound particle - particle in a one-dimensional box - particle in a rectangular three dimensional box - one-dimensional simple harmonic oscillator.

**UNIT - V: 16 hours**

Reflection at a step potential - transmission across a potential barrier - Tunnel effect - its applications - Tunnel diode - Emission of  $\alpha$  - particle from radio active elements - working of scanning tunneling microscope (STM) - Hydrogen atom - solution of radial equation - Degeneracy of energy-level.

**Textbooks:**

1. Elements of quantum mechanics - 2005, Kamal Singh and S.P. Singh (S.Chand & Co.,)
2. Quantum Mechanics, S.P. Singh and M.K. Bagde, (S. Chand & Co.), 1990
3. Modern Physics, R. Murugesan, 2005, (S.Chand & Co.,)

**Reference Books:**

1. Quantum Mechanics, Satyaprakash and C.K. Singh, Kedarnath Ram Nath & Co., 1991
2. Quantum Mechanics, Ghatak and Loganathan, T.M.H., 1989
3. Quantum Mechanics, G. Aruldas, 2005, PHI.
4. A text book of quantum mechanics, P.M. Mathews and K. Venkatesan, TMH., 1991

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**V - Semester**

**Main Paper : XII**

**SOLID STATE PHYSICS**

**(Paper Code A0212)**

**UNIT - I : 14 hours**

Crystal lattice - Crystal planes - Miller indices - unit cell - Lattice parameters of units cells - primitive cell - Typical crystal structures - co-ordination number - packing fraction - symmetry elements and symmetry operations - crystal classes - point groups and space groups.

X-ray diffraction - Bragg's law - Bragg's - X-ray spectrometer - Rotating crystal method - powder method.

**UNIT - II: 16 hours**

Types of chemical bonding - Ionic bonding and its properties - Expression for lattice energy of ionic crystal - Madelung constant - properties of covalent, metallic Vander waal's and hydrogen bonds - Lattice vibrations - optic and acoustic modes of vibration - phonons and their characteristics - specific heat capacity - Dulong and Petit's Law - Einstein's theory of specific heat capacity - Debye's theory of specific heat capacity.

**UNIT - III: 14 hours**

Drude - Lorentz theory - conductivity, resistivity and mobility - Weidemann - Franz law Lorentz number - Magneto resistance - Sommer field's free electron theory - Fermi function - Density of energy states - Expression for Fermi energy - Hall effect in metals - Hall coefficient - Hall angle - Applications of Hall effect.

**UNIT - IV: 14 hours**

Hall effect in semiconductors - Bands in solids - Division of conductors, insulators and semiconductors on the basis of energy band diagram - elementary Band theory of solids (no derivation) - concept of energy gap - intrinsic and extrinsic semi conductors - general equation for carrier density - Theory of n-type and p-type semiconductors.

**UNIT - V: 14 hours**

Zero resistivity and perfect diamagnetism - critical temperature – persistent current - critical **B** field - Meissner effect - Type I and Type II super conductors - BCS theory (qualitative ideas)- Josephson effect and its applications - SQUIDS and its applications (Basic concepts only)

Nanophase materials - definition - preparation of nanomaterials - properties - general applications of nanophase materials.

**Textbooks:**

1. Solid state physics - S.O. Pillai - Sixth edition - 2006, New age international publishers
2. Solid state physics - Gupta and Kumar - 2005 - K. Nath & Co., Meerut.
3. Introduction to solid state physics - C. Kittel - Latest edition - Wiley Eastern, 2003

**Reference Books:**

1. Material Science - M. Arumugam - 2002 - Anuradha Agencies
2. Solid State Physics - J.S. Blackmore – CUP, 1982
3. Solid state Physics - Saxena Etal., - Pragati Prakashan, 2004



**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**  
**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**V - Semester**

**Main Paper : XIII**

**LASERS AND MOLECULAR SPECTROSCOPY**

**(Paper Code A0213)**

**UNIT - I: 14 hours**

Purity of a spectral line - coherent length and coherent time (Basic concepts only) - spatial coherence - temporal coherence - Absorption of light - Spontaneous & stimulated emission - Einstein's **A** and **B** coefficients - conditions for light amplification and for large stimulated emissions - population - concept of population inversion - pumping - pumping methods - Active medium - Meta stable states.

**UNIT - II: 16 hours**

Pumping schemes - Two level, three level and four level pumping schemes - Types of Lasers - Design and Operation of He-Ne Laser - Design and working of Nd-Yag laser - Tunable dye laser - Design and operation of semiconductor diode laser - concepts of quantum-well & excimer lasers - Applications of lasers in holography

**UNIT - III: 14 hours**

Molecular spectrum - Translational, rotational and vibrational energies of a molecule - types of molecules and their moments of inertia - types of molecular spectra - The intensity of spectral lines - the width of spectral lines - Line broadening (Natural broadening, collision broadening & Doppler broadening) - Rotational spectrum - The rigid diatomic molecule - non-rigid rotator and its spectrum - spectrum of carbon oxysulphide.

**UNIT - IV: 14 hours**

Modes of vibrations of a molecule - IR absorption spectroscopy - Regions of IR - Fingerprint region - conditions of absorption of IR radiation - Description and working of a modern IR spectrophotometer - Fourier transform IR spectroscopy (no derivation) Applications of IR spectroscopy to elucidate molecular structure - simple examples ( $H_2O$ ,  $CO_2$ ,  $NO_3$ ) - Rule of mutual exclusion - coriolis interaction.

**UNIT - V: 14 hours**

Raman effect - stokes and anti stokes lines - Classical & Quantum theory of Raman effect - Laser as Raman source - Design and working of Laser Raman spectrophotometer - Types of Raman spectrum - general applications of Raman spectrum to study molecular structure - examples of  $CO_2$ ,  $N_2O$ ,  $H_2O$  and  $SO_2$  - comparison between IR and Raman spectra.

**Textbooks:**

**For Units I and II**

1. An introduction to Lasers - M.N. Avadhanulu - 2001 - S. Chand & Co.,
2. Essential of lasers and Non-linear optics - G.D. Baruah - 2000 - Pragati Prakeshan
3. Lasers and non-linear optics - B.B. Laud - 2002 - New age.

**For Units III, IV and V**

4. Fundamentals of molecular spectroscopy - C.N. Banwel, 2002
5. Spectroscopy - Gundeep & Chatwal - Himalaya - 2002.

**Reference Books:**

1. Laser Fundamentals - W.T. Silfvast - 2000 - CUP
2. Instrumental methods of analysis - Willard etc., - Narosa, 1986
3. Spectroscopy - B.K. Sarma, 2004 - Krishna Prakashan.



**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**  
**Dept. of Physics**  
**B.Sc., (Physics)**  
**(For the students admitted from the academic year 2006 - 2007)**  
**V - Semester**  
**Main Paper - XIV**  
**ADVANCED ELECTRONICS - I**  
**(Paper Code A0214)**

**UNIT -I: 12 hours**

Number system, binary arithmetic, Basic gates and universal gate operations - Boolean algebraic theorems and properties - Karnaugh map: two to four variable map, POS and SOP simplification, NAND and NOR implementation, don't care conditions.

**UNIT-II: 16 hours**

Logic families: characteristics and parameters, TTL gates, TTL open collector gates, Three state devices, CMOS gates, TTL - CMOS interface, Combinational logic design: parity checker, half and full adders, demultiplexer, multiplexer, decoders, Encoders, PAL.

**UNIT-III: 16 hours**

RS flip-flops, clocked RS flip-flop, edge-triggering, JK flip-flop, D-type flip-flops, JK master slave flip-flop, design procedure; serial-in-serial out, serial-in-parallel out shift registers; asynchronous counters; decade counter (Mod 10 counter), design of counters - NE 555 timer in astable mode.

**UNIT-IV: 14 hours**

Memory concepts, read only memories (ROMs), simple application, Programmable ROMs (PROMs and EPROMs), Random access memories (RAMs): Static and Dynamic RAMs, memory expansions, Magnetic bubble memories.

**UNIT-V: 14 hours**

Principle of variable network and binary ladder type: four-bit D/A converter, A/D converter, counter method and successive approximation; resolution and accuracy of D/A and A/D converter, frequency counters, digital voltmeters and digital multimeters.

**Textbooks:**

1. Malvino & Leach, Digital Principles and Applications (Tata McGraw-Hill), 2004.
2. R.P. Jain, "Modern Digital Electronics" (Tata McGraw-Hill, New Delhi), 2003
3. Morris mano, M: "Digital logic and computer design" (Prentice Hall of India, New Delhi), 2004

**Reference Books:.**

1. Milliman & Halkias Integrated Electronics (Tata McGraw - Hill), 1976
2. Floyd L. Thomas; "Digital fundamentals" (Universal Book stall, New Delhi), 2004
3. A textbook of digital electronics - R.S. Sedha, 2004, S. Chand & Co.,
4. Digital Electronics - V.K. Puri, 2000, TMH.

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**V - Semester**

**Main Paper - XV**

**FUNDAMENTALS OF MICROPROCESSORS & COMPUTERS**

**(Paper Code A0215)**

**UNIT - I: 16 hours**

Evolution of Computers-Components of Computers: Central Processing Unit-Input and Output devices-Types of Computer memory-Storage devices-Magnetic tape-Magnetic Disc- Optical technology-Classification of Computers-Application of Computers-Education, Space research, Meteorology and communication. Software: System Software-Application software-Operating system-importance of operating system-popular operating systems- DOS, Windows, UNIX and LINUX. (Basic Ideas Only)

**UNIT - II: 14 hours**

Network fundamentals - Types of network- LAN, MAN & WAN. Internet and Intranet-History of Internet-Internet Tools-World Wide Web-Search Engine-Multimedia-Applications-Virus-Virus detection & Control Systems-Microsoft word, Excel, Power Point (Basic Ideas only)

**UNIT - III: 16 hours**

Programming Languages : Overview of Programming Languages -Development of Programming Languages- Applications-Advantages and Disadvantages of HLL.

“C” Language : Introduction to C- Data types-operators - expressions-control structures-arrays-functions - structure - union - simple programs - Adding two numbers-Converting from degrees to Fahrenheit (expression) - Finding the largest number among N numbers (array) - Finding factorial of a number using functions - To check whether a given string is a palindrome or not

**UNIT - IV: 14 hours**

Evolution of microprocessors & Architecture - 8085 microprocessor – internal architecture (Block diagram)- address, data & control bus lines - Classification of Instructions - Instruction formats -Addressing modes - Data transfer instructions-arithmetic & logical instructions - Loop instructions.

**UNIT - V: 12 hours**

Interrupts in 8085- Interrupt instructions – memory interface – A/D and D/A converters interfacing - simple programs: addition, subtraction, multiplication, division.

**Textbooks:**

1. S. Jaiswal, ‘Fundamentals of Information Technology’, Galgotia Publications Pvt. Ltd, New Delhi, 1999.
2. Byron S. Gottfried-Theory and Problems of Programming With C, Schaum’s Outline Series, TMH, New Delhi, 1996.
3. Ramesh S. Gaonkar, “Microprocessor Architecture, Programming and Applications with the 8085 / 8080A”, Wiley Eastern Ltd, New Delhi, 1989..

**Reference Books:**

1. S. Jaiswal, ‘Advanced Information Technology’, Galgotia Publications Pvt. Ltd, New Delhi, 2001.
2. Balagurusamy, E: Programming in ANSI C, TMH, New Delhi, 2000.
3. A.P. Mathur, “Introduction of Microprocessor”, Second Edition, Tata McGraw Hill Company Pvt. Ltd, New Delhi, 1988.
4. Fundamental of digital electronics and microprocessors - Anokh Singh and A.K. Chhabra - 2005, S. Chand & Co.,
5. Computer Networks - S.Revathi - 2003: Charulatha Publications, Chennai - 33.

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**  
**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**VI - Semester**

**Main Paper : XVI**

**ATOMIC PHYSICS AND RELATIVITY**

**(Paper Code A0216)**

**UNIT - I : 20 hours**

Frame of reference - Newtonian relativity - Galilean transformations - Lorentz transformations - application of G.T. to Mechanics and electromagnetism - Michelson - Morley experiment - Einstein's basic postulates - length contraction, simultaneity, synchronisation - Time dilation - Twin paradox Einstein's velocity addition rule - velocity of light and concept of tachyons

**UNIT - II: 20 hours**

Variation of mass with velocity - mass energy equivalence - relativistic formulae for momentum and energy - invariant mass - Minkowski's four-dimensional space - (Minkowski's space) time continuum - Four vectors - general theory of relativity - Applications - aberration of star light - synchrotron radiation (Basic concepts only) - Doppler effect in light - Magnetism as a relativistic phenomenon - Red shift and quasars.

**UNIT - III: 20 hours**

Sommerfield's atom model - elliptical orbit and relativistic correction – vector atom model – quantum numbers – coupling schemes – Pauli's exclusion principle - critical potential - excitation potential - Frank - Hertz experiment Electron spin - Stern and Gerlach experiment.

Fine structure of hydrogen lines - Intensity and selection rules - spectral notation and terms - Different series of alkali spectra - spectra of helium and alkaline earth elements - singlet and triplet series.

**UNIT - IV: 15 hours**

Normal and anomalous Zeeman effect - theory and experiment - gyro magnetic ratios for orbital and spin motions - Lande's 'g' factor - Paschen - Back effect - Simple Theory and experiment- Stark effect - (experimental study only).

**UNIT - V: 15 hours**

Continuous X-ray spectrum - Duane and Hunt limit - characteristic X-rays - Mosley's law and its importance - X-ray absorption spectra - absorption edges - comparison between optical and X-ray spectra - Compton effect - Theory and experiment.

**Textbooks:**

1. Modern Physics - R. Murugesan, 2005, (S. Chand & Co.,) (all units)
2. A primer of special relativity - P.L. Sardesai - 2004, New Age international (Unit I and II)

**Reference Books:**

1. Atomic Physics - J.B. Rajam, S. Chand & Co., 1976
2. Concepts of Modern Physics, A. Beiser, 2004, TMH.
3. Atomic spectra, White et al., TMH, 1998

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**VI - Semester**

**Main Paper : XVII**

**NUCLEAR PHYSICS**

**(Paper Code A0217)**

**UNIT - I: 15 hours**

Isotopes, isobars, isotones and isomers - nuclear size - radius and volume - nucleons and nuclear composition - Nuclear charge - Nuclear spin - Nuclear magnetic moment. Nucleons and nuclear composition - nuclear mass - Mass defect - Binding energy - stability of the nucleus – Packing fraction - semi-empirical mass formula.

**UNIT - II: 20 hours**

Types of nuclear forces - properties of nuclear forces - Meson theory of nuclear forces - Features of liquid drop model and shell model of the nucleus - merits and demerits - Magic numbers.

Nuclear fission - chain reaction - critical size - Nuclear reactors and their parts - Moderators - Power Breeder reactors.

**UNIT - III: 20 hours**

Types of particle accelerators - linear accelerator - Betatron - Electron and proton synchrotrons - Ionization chamber - G-M-counters - Scintillation counters emulsion techniques.

**UNIT - IV: 15 hours**

Nuclear reactions with examples - Q - value of the reactions - threshold energy - conservation laws - radioactive isotopes and their uses - production and detection of neutrons.

Particles and antiparticles - Types of nuclear particles and symmetry - Parity and parity violation.

**UNIT - V: 20 hours**

Types of quarks - Quark model - cosmic rays - discovery - positron - primary and secondary cosmic rays - Nuclear fusion - controlled thermo nuclear reactions - stellar energy - p-p cycle – CNO cycle – heavy element synthesis - Evolution of stars – white dwarf- neutron stars - black holes.

**Textbooks:**

1. Nuclear Physics - S.N. Ghosal - 2004, S. Chand & Co.,
2. Nuclear Physics - D.C. Dayal - 2002, Himalaya
3. Modern Physics - R. Murugesan - 2005, S. Chand & Co.,
4. An introduction to astrophysics - Baidyanath Nasu, PMI, 1997

**Reference Books:**

1. Nuclear Physics - Pandya and Yadav K. Nath, 1986
2. Nuclear physics - Keplan - TMH, 1976.
3. Nuclear physics - H.S. Hans - 2001, New Age.

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**VI - Semester**

**Main Paper : XVIII**

**ADVANCED ELECTRONICS - II**

**(Paper Code A0218)**

**UNIT - I: 20 hours**

Amplitude modulation, modulation index, sidebands, power output, Base modulation, theory of balanced modulator, SSB generation by phase shift method. Detection: Diode and transistor detectors, super-heterodyne receivers, double conversion receivers.

**UNIT - II: 20 hours**

Frequency modulation; theory, side bands, qualitative discussion of Bessel harmonics - band width, modulation percentage, direct FM transmitter, indirect- FM modulator, the reactance modulator, FM detectors, the slope detectors, the discriminator, ratio detector- digital modulation – PPM, PAM, PCM (basic ideas only).

**UNIT - III: 20 hours**

Image transmission principles, scanning, synchronization & blanking pulse; composite signal; TV camera: Image orthicon; B/W TV transmitter & receiver (block diagram); NTSC, PAL systems; transmission of colour information; colour TV transmitter & receiver (block diagram); colour picture tube - shadow mask tube; TV channels & their frequencies; cable TV (elementary ideas).

**UNIT - IV: 15 hours**

Ground waves propagation, line of sight distance, reflection of radio waves by earth's surface. Space wave propagation, effect of earth's curvature, duct propagation; sky waves, theory of Ionospheric refraction - bending of sky waves, expression for skip-distance & maximum usable frequency - ionospheric anomalies.

**UNIT - V: 15 hours**

Basic antenna action- antenna parameters- half-wave antenna (general ideas) - Yagi antenna - parabolic reflectors.

Theory of Geosynchronous Satellites - block diagram of satellite and the Earth station – transponders (block diagram) – uplink and downlink signals.

**Textbooks:**

1. Gupta & Kumar, Hand book of electronics (Pragati Prakashan), 2002.
2. M.L. Gupta, Electronics & Radio Engineering (Dhanpat Rai & sons), 1998.
3. Roody & Coolen, Electronic Communications (Printice Hall of India), 2003.
4. Satellite communications - D.C. Agarwal - Khanna Publishers, 2005.

**Reference Books:**

1. G. Kennedy, Electronics Communications Systems (Tata McGraw Hill, India), 1998.
2. Ramabhadran, Basic Telecommunication (Khanna Publishers), 1991
3. Ramabhadran, Telecommunications Principles - Circuits & Systems (Khanna Publishers), 1991.
4. Kiver, Kaufman, Television Electronics, Theory & Servicing (CBS publishers), 1986.

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**VI - Semester**

**Main Paper : XIX**

**ENVIRONMENTAL PHYSICS**

**(Paper Code A0219)**

**UNIT - I: 15 hours**

Physical basis of environment - Multidisciplinary nature of environmental studies - Definition , scope and importance - global environmental crisis - Need for public awareness - Institutions and human resources in environment - water resources - mineral resources - food resources - energy resources - Land resources.

**UNIT - II: 20 hours**

Definition of ecosystem - structural features and functions of ecosystem - Ecological pyramids - First and second laws of thermodynamics - energy flow in the ecosystem - water cycle - carbon cycles - oxygen cycle - nitrogen cycle - energy cycle - forest, grassland, desert and aquatic eco systems.

Biodiversity – bio-geographic classification of India - Importance of bio-diversity and its conservation – In-situ conservation and Ex-situ conservation - threats to biodiversity

**UNIT - III: 20 hours**

Air pollution - water pollution - soil pollution - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards - Electromagnetic pollution due to communication devices – electronic waste and disposal – plastic waste disposal - Role of individual in the prevention of pollution.

**UNIT - IV: 15 hours**

Structure of the atmosphere - composition - atmospheric pressure and its variation with altitude - insulation - Atmospheric temperature - factors affecting atmospheric temperature - global temperature - the greenhouse effect - effects of ozone depletion.

**UNIT - V: 20 hours**

Analysis of pollution and instruments: Ultraviolet spectrophotometer - atomic absorption spectrophotometer - Principle of particle induced X-ray emission (PIXE) and its application to environmental studies- vehicle emission meter – decibel meter.

Constitutional provisions: The environmental protection Act, 1986 - Wild life Act, 1972 - Forest conservation Act, 1980 and its amendment in 1992 - Water Act, 1974 - The Air act, 1981 – International conventions on environment and Koyoto protocol.

**Textbooks:**

1. Environmental studies - Erach Bharucha - 2005 - Universities Press. (For units I, II and III)
2. Atmosphere, weather and climate - K. Siddhartha - 2005, Kisalaya Publications (Unit IV)
3. Introduction to environmental engineering and science - G.M. Masters, 2004, PHI (Unit IV)
4. Environmental science and Bio-technology - A.G. Murugesan and C. Rajakumari - 2005, (MJP Publishers) (Unit V)
5. Environmental science and Engineering - Anubha Kaushik- 2006 - New Age International (Unit V)
6. Fundamentals of Ecology – Eugene P. Odum, 2003, Georgia University.

**Reference Books:**

1. Environmental studies - R. Rajagopalan - 2005- OUP.
2. Spectroscopy - B.K. Sharma - 2005 - Krishna Prakashan.
3. Environmental Chemistry - A.K.De - 2004, New Age International
4. Environmental Chemistry - B.K. Sharma - Krishna Prakashan, 1999.



**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**  
**Dept. of Physics**  
**B.Sc., (Physics)**  
**(For the students admitted from the academic year 2006 - 2007)**  
**V & VI - Semester**  
**Main Paper : Phys - XX**  
**PHYSICS PRACTICALS - III**  
**(Paper Code A0220)**

Choose any 20 experiments from the list given below.

**LIST OF EXPERIMENTS: 5 hours per week**

1. Newton's Rings: determination of refractive index of the material of the lens.
2. Air wedge: Determination of the thickness and insulation of the wire.
3. Spectrometer: Hartmann's Interpolation Formula - Determination of wavelength
4. Spectrometer:  $i_1 - i_2$  curve and determination of refractive index.
5. Spectrometer:  $i_1 - i_2$  curve for given angle of deviation.
6. Spectrometer: Small angled prism.
7. Spectrometer: Determination of Cauchy's constants.
8. Spectrometer: Dispersive power of the material of a prism.
9. Spectrometer: Grating - wavelength by normal incidence method.
10. Spectrometer: Dispersive and resolving power of a grating.
11. Young's modulus: Elliptical fringes method.
12. Ultrasonic velocity and compressibility of the liquids -Interferometer method.
13. Field along the axis of a circular coil - Determination of moment of a magnet
14. Field along the axis of a circular coil - Determination of BH using Searls's vibration magnetometer.
15. Temperature co-efficient of a Thermister.
16. Potentiometer: Verification of laws of resistance and resistivity of the material of a wire.
17. Potentiometer: Resistance of the potentiometer and calibration of low range voltmeter.
18. Potentiometer: Resistance of the potentiometer and measurement of emf of a thermocouple.
19. Potentiometer: Temperature coefficient of resistance of the material of a coil of wire.
20. E.G.: Internal resistance of a cell.
21. B.G: Current and voltage sensitivities.
22. B.G: Quantity or charge sensitivity.
23. B.G: Absolute capacity of a condenser.
24. B.G: Comparison of mutual inductance of two pairs of coils.
25. B.G: Absolute determination of mutual inductance.
26. Determination of refractive index: Abbe's refractometer.
27. Wien's bridge: Measurement of frequency.
28. Conductivity of electrolytic solutions using digital conductivity bridge.
29. Measurement of  $e$  by Milliken's method
30. Determination of Planck's constant
31. Diode laser: characteristic study
32. Measurement of wavelength of a laser beam
33. Obtaining the B-H curve of a ferromagnetic material (any method)
34. Study of plane of polarization using quarter and half wave plates
35. Characteristics of a solar cell
36. Hall probe in magnetic field measurement
37. Computer simulation of Lennard-Jones potential; binding parameters, elastic constants
38. Computer simulation of 1 -D and 2-D lattice vibrations
39. Simulation of 3-D models of a given kind of crystal and their study
40. Computer simulation of Nuclear chain reactions and nuclear energy

**Textbooks:**

1. D P Khandelwal: A Laboratory Manual for Physics for Undergraduate Students (Vani Publications, New Delhi)
2. B Saraf et al. "Physics through Experiments, Vol. n - EMF constant and varying" (Vikas Publications, New Delhi)

**Reference Books:**

1. Olon; "Experiments in Modern Physics"
2. R. M. Singru; "Introduction to Experimental Nuclear Physics" (Wiley Eastern)
3. V Y Rajopadhye and V L Purohit; Text book of experimental Physics



**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**V & VI - Semester**

**Main Paper : Phys - XXI**

**ELECTRONICS PRACTICALS**

**(Paper Code A0221)**

Choose any 20 experiments from the list given below.

**LIST OF EXPERIMENTS: 5 hours per week**

1. Junction diode and Zenor diode characteristics.
2. Transistor characteristics - common base.
3. Transistor characteristics - common emitter.
4. Power pack - construction with filter and Zenor regulator.
5. Bridge rectifier.
6. Single stage RC coupled CE amplifier - Frequency response curve.
7. Tuned collector oscillator - Frequency measurement by CRO and Frequency counter.
8. Tuned base oscillator - Frequency measurement by CRO and Frequency counter.
9. Hartley oscillator - Frequency measurement by CRO and Frequency counter.
10. Colpitt's oscillator - Frequency measurement by CRO and Frequency counter.
11. Astable multivibrator - Using Transistor and 555 Timer- Frequency measurements
12. Clipping and Clamping circuits using diodes.
13. Emitter follower.
14. Phase shift oscillator - Frequency measurement by CRO and Frequency counter.
15. Basic Logic and Universal gates using diodes and transistors components.
16. Basic and Universal logic gates using ICs
17. JFET characteristics.
18. Two stage RC coupled amplifier and study of its frequency and feed back
19. Transistor Amplitude modulator and measurement of percentage of modulation.
20. OP-AMP characteristics (741 IC) -parameter measurement
21. Basic OP-AMP circuits - Half-wave rectifier, Clipper, Clamper, Comparator,
22. OP-AMP addition, subtraction, multiplication, Integration and differentiation.
23. NAND and NOR as universal gates using ICs
24. Implementation of logic expression and their simplification
25. Arithmetic circuits using gates
26. Half-adder and full-adder
27. IC adder and subtractor
28. Parity generator / checker
29. 7-segment display decoder
30. Multiplexers
31. Demultiplexers
32. Flip-flop circuits using gates
33. RS, D, JK and Master Slave flip-flops
34. Shift Registers
35. Asynchronous counters using ICs
36. Base (AM) modulation using a transistor
37. Diode AM detection
38. Computer simulation ionosphere and sky wave reflection
39. Addition, subtraction, division and multiplication using microprocessor.
40. Designing simple traffic light controller using a microprocessor.

**Textbooks:**

1. Jain R.P, Anand M.M.S; "Digital electronics Practice Using Integrated Circuits" (Tata McGraw-Hill, 1999, New Delhi).
2. Zbar & Malvino, Basic Electronics-A Text Lab Manual (Tata McGraw-Hill, 1999, New Delhi).

**Reference Books:**

3. Malvino, Electronic principles, 6th Ed. (Tata McGraw-Hill, 1999, New Delhi).
4. Takheim, Digital electronics, 3rd Ed(McGraw-Hill International

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Physics)**

**(For the students admitted from the academic year 2006 - 2007)**

**I - Semester**

**ALLIED PHYSICS - I FOR CHEMISTRY MAIN**

**(Paper Code A0281)**

**UNIT - I: 12 hours**

Moment of inertia - radius of gyration - parallel and perpendicular axis theorem - calculation of moment of inertia of (a) ring (b) disc (c) hollow and solid spheres - angular momentum and torque and relation between them.

Simple harmonic motion, equation of SHM; Composition of two SHM at right angles, Lissajous figures.

**UNIT - II: 14 hours**

Young's modulus - bulk modulus - rigidity modulus and Poisson's ratio - derivation of the expression for bending moment of a beam in terms of its curvature of neutral axis - determination of Young's modulus of a rectangular bar - non-uniform bending - pin and microscope method - with theory - expression for couple per unit twist - determination of rigidity modulus - torsion pendulum.

**UNIT - III: 14 hours**

Surface tension and surface energy - interfacial surface tension - experimental determination of surface tension by drop weight method - variation of surface tension with temperature - Jaeger's method - streamline and turbulent motion - equation of continuity.

**UNIT - IV: 16 hours**

Newton's law of cooling - determination of specific heat of liquid - Barton's cooling correction in calorimetric experiments - specific heat capacity of gases - ratio of specific heat capacities - determination of the ratio of specific heats of gases - Clement and Desorme's method.

Coefficient of thermal conductivity of a bad conductor - Lee's disc method - determination of thermal conductivity by Forbes's method.

Black body radiation - Stefan's law - determination of Stefan's constant - second law of thermodynamics - Carnot cycle - indicator diagram - derivation of efficiency - Kelvin temperature scale.

**UNIT - V: 16 hours**

Interference - method of producing coherent sources - Fresnel's biprism - Newton's rings through transmission and reflection - Interferometers - Michelson's Interferometer - wavelength determination - Jamin's refractometer.

Diffraction - Fresnel's diffraction - Fraunhofer diffraction - half-period zones - rectilinear propagation of light - diffraction at a straight edge.

Polarization - optical activity - specific rotatory power - Polarimeter - Laurent's - determination of specific rotatory power - double refraction - optic axis.

**Textbooks:**

1. Dr. Sabesan and others, A Textbook of Allied Physics - Vol-I and Vol-II, 1998.
2. Ponnusamy and others, Ancillary Physics., Anuradha, 1998.
3. Kamalakannan and others, Ancillary Physics, S. Viswanathan, 2000

**Reference Books:**

4. Halliday, Resnik, Walker, Fundamentals of Physics, 5th Ed. (Asian Books Pvt. Ltd., New Delhi), 2002

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**  
**Dept. of Physics**

**B.Sc., (Maths & Chemistry)**  
**(For the students admitted from the academic year 2006 - 2007)**

**II - Semester**

**ALLIED PHYSICS -II FOR CHEMISTRY**  
**(Paper Code A0282)**

**UNIT - I: 12 hours**

Ultrasonics - magnetostriction - piezoelectric methods - properties of ultrasonic waves and applications.

**UNIT - II: 16 hours**

Gauss's law with proof - Electric intensity and potential due to a uniformly charged hollow conductor at a point outside, on the surface and inside a spherical conductor - capacity of a parallel plate condenser with and without a dielectric slab - capacity of spherical conductor - Biot & Savart's law - field along the axis of a circular coil carrying current - force on current carrying conductor placed in a magnetic field - theory of moving coil galvanometer.

**UNIT - III: 14 hours**

Magnetic properties of materials - relation between the three magnetic vectors - susceptibility and permeability - para, dia and ferro magnetism (qualitative ideas) - magnetic hysteresis - super conductivity - persistent current and Meissner Effect.

**UNIT - IV: 16 hours**

Breakdown of classical mechanics - photoelectric effect - Compton effect - Davison-Germer experiment - Matter waves - wave packets - de Broglie ideas - Heisenberg uncertainty principle.

Radioactive isotopes (production and uses) - particle accelerator - linear accelerator - particle detectors - Wilson cloud chamber - Scintillation counter - nuclear models - Liquid drop model - Fission and Fusion reaction - nuclear reactors.

**UNIT - V: 14 hours**

Rectifiers & filters (qualitative ideas) - Transistor characteristics - RC coupled amplifier - frequency response (without derivation) - bandwidth - basic principles of an oscillator - Hartley oscillator - working (without derivation) - elementary ideas about modulation - elementary ideas about TV transmission and reception.

**Textbooks:**

1. Dr.Sabesan and others, A Textbook of Allied Physics - Vol-I and Vol-II, 1998.
2. Ponnusamy and others, Ancillary Physics, 1998
3. Kamalakannan and others, Ancillary Physics, S. Viswanathan, 2000

**Reference Books:**

4. Halliday, Resnik, Walker, Fundamentals of Physics, 5th Ed.(Asian Books Pvt. Ltd., New Delhi), 2002

**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN (Autonomous)**

**Dept. of Physics**

**B.Sc., (Chemistry)**

**(For the students admitted from the academic year 2006 - 2007)**

**I & II - Semester**

**Allied Physics Practicals for Chemistry**

**(Paper Code A0283)**

Choose any 14 experiments from the list given below.

**LIST OF EXPERIMENTS: 2 hours per week**

1. Young's modulus - Non-Uniform bending - Pin & Microscope
2. Rigidity modulus - Torsional oscillations without masses.
3. Comparison of coefficient of viscosity.
4. Surface tension of a liquid and interfacial surface tension by drop weight method.
5. Spectrometer - Refractive index of a liquid - Hollow prism.
6. Spectrometer -Grating - N determination by normal incidence method..
7. Spectrometer -Grating - wavelength determination by minimum deviation method.
8. Newton's Rings.
9. Thermal conductivity of a bad conductor - Lee's disc method
10. Post office box - laws of resistance and specific resistance.
11. Melde's apparatus - Determination of frequency.
12. Meter Bridge - Temperature coefficient of the material of a coil of wire.
13. Potentiometer- calibration of low range voltmeter (0 - 1.5 V).
14. Potentiometer - calibration of ammeter (0-1.5 amps).
15. Figure of merit of a periodic moving coil galvanometer.
16. Field along the axis of the circular coil carrying current - Determination of  $B_H$ .
17. Newton's law of cooling and specific heat determination
18. Frequency measurement by forming Lissajous figures
19. Study of Half wave rectifier.
20. Transistor characteristics - CE mode - only transfer characteristics.

**Textbooks:**

1. Ouseph and V.Srinivasan, Practical Physics-Part-I & II, 2001.

**Reference Books:**

2. Mathchan, Lazarus and others - Practical Physics, 2001.