

**B.Sc. Second Year Physics Syllabus (Semester Pattern)**

**Semester III & IV**

(Revised New Syllabus Effective from June 2010)

Course Title	Paper	Semester	Periods	Marks	
				External	Internal
PHY201:Waves, Acoustics & Ultrasonics	VI	III	45	40	10
PHY202:Relativity , Nuclear Physics & Statistical physics	VII	III	45	40	10
PHY203: Optics & Lasers	VIII	IV	45	40	10
PHY204:Amplifiers, Oscillators & Multivibrators	IX	IV	45	40	10
PHY205:Practical Course	X	III & IV	80	50	-----
PHY206:Practical Course	XI	III & IV	80	50	-----

## ***B.Sc.II Year PHYSICS***

***Semester - III (PHY201: Waves, Acoustics and Ultrasonics)***

***Paper -VI***

***Periods: 45***

***Marks: 40 External + 10 Internal***

**Unit –I: Waves: (Book 1 and 2) (12 Periods)**

Wave velocity and particle velocity, Differential equation of wave motion, Energy of a plane progressive wave, Equation of motion of a vibrating string, Velocity of transverse waves along a string, Frequency and period of vibration of a string.

**Unit—II: Stationary waves: (10 Periods)**

Analytical treatment of stationary waves (closed end& open end pipe at the other end), Investigation of pressure and density changes at displacement Nodes and Antinodes, Distribution of Energy in a stationary wave, Energy is not transferred in a stationary wave. **(Book 1 and 2)**

**Unit–III: Acoustics: (12 Periods)**

Noise and Musical sounds, Loudness, pitch, Quality, Intensity of Sound, The Decibel, The Phon , Bel, Reverberation, Reverberation time, Absorption coefficient, Sabine's formula, Acoustical demands of good auditorium. Transducers and their characteristics, pressure microphone, moving coil loud speaker, process of recording and reproduction of sound in compact disc. **(Book 1 and 2)**

**Units–IV: Ultrasonics (11 Periods)**

Ultrasonics, properties of ultrasonic waves, Piezo-electric & magnetostriction effect, production of ultrasonic waves by Piezo electric & magnetostriction oscillator, Detection of ultrasonic waves, acoustic grating, Application of ultrasonic waves. **(Book 1 and 2)**

**Books Recommended:**

1. Waves and Oscillations – Brijlal and Subrahmanyam. (Vikas Publishing House)
2. Text Book of Sound - Khanna and Bedi.(Atma Ram & Sons)
3. A text book of Sound - N. Subrahmanyam, Brijlal
4. Sound - M. Ghosh
5. Text Book of Sound - Sharma & Saxena (New Age international publishers)
6. Physics of Vibrations & Waves - H.J.Pain (John Wiley & Sons)

## ***B.Sc.II Year PHYSICS***

***Semester - III***

***Paper – VII***

***(PHY202: Relativity, Nuclear Physics and Statistical Physics)***

***Periods: 45***

***Marks: 40 External + 10 Internal***

### **Unit I: Relativity**

**(10 Periods)**

Postulates of Special Theory of Relativity, Galilean Transformations, Lorentz Transformations, Length Contraction, Time dilation, Velocity addition, The relativity of mass, Mass energy relation. **(Book 1 and 2)**

### **Unit II: Properties of Nucleus**

**(14 Periods)**

Proton-Electron Theory, Binding energy, Semi-Empirical mass formula, Liquid Drop Model. **(Book 3 and 5)**

#### **Accelerators and Detectors**

Linear accelerator, Cyclotron, Synchrocyclotron, Geiger Muller counter, Cloud chamber, Ionization chamber. **(Book 3, 4 and 5)**

### **Unit III: Radioactivity and Kinematics**

**(Book 5 and 3)**

**(10 Periods)**

Alpha, Beta and Gamma Rays, Charge of Alpha particles, Range of  $\alpha$  - particles, Geiger-Nuttal law, Law of Successive Disintegration, Radioactive Equilibrium, The Age of the Earth, Nuclear Reaction, Kinematics, Q value of Nuclear Reaction

### **Unit IV: Statistical Physics**

**(11 Periods)**

Phase space, Micro and Macro states, Ensemble, Thermodynamic probability, Maxwell-Boltzmann statistics and Distribution law, Bose- Einstein statistics and Distribution law, Fermi- Dirac statistics and Distribution law. **(Book 7 and 8)**

### **Books Recommended:**

1. Perspectives of Modern physics – Arthur Beiser
2. Relativistic mechanics – Satya Prakash
3. Nuclear Physics – D.C.Tayal (Himalaya Publishing House)
4. Nuclear Physics – Irving Kaplan
5. Modern physics – R.Murugesan.(S.Chand & Co.XIth Revised edition)
6. Thermodynamics and Statistical Physics- S.L.Kakani(Sultan Chand & Sons)
7. Thermodynamics, Kinetic Theory, and Statistical Thermodynamics – Sears and Salinger, (Narosa Publishing House, New Delhi)
8. Heat and Thermodynamics – Brij Lal, N.Subrahmanyam, (Sultan Chand & Company Ltd.)

**Semester - IV**  
**Periods: 45**

**B.Sc.II Year PHYSICS**  
**(PHY203: Optics and Lasers)**

**Paper - VIII**  
**Marks: 40 External + 10 Internal**

**Unit–I: Geometrical Optics (Book 1) (08 Periods)**

Cardinal Points of an Optical System(six points), Newton’s formula , Nodal slide, Coaxial Lens System (equivalent focal length and cardinal points), Huygens Eyepiece, Ramsden Eyepiece and their cardinal points.

**Unit–II: Interference: (Book 1) (20 Periods)**

Interference due to Reflected and Transmitted light (Thin films), Newton’s Rings, Determination of wavelength of Sodium light, Michelson Interferometer, Determination of wavelength of monochromatic light, Difference in wavelength between two neighbouring spectral lines.

**Diffraction:**

Fresnel and Fraunhofer diffraction, Fraunhofer’s diffraction due to single and double slit, Plane diffraction grating, Determination of wavelength of Sodium light, Rayleigh criterion, Resolving power of grating, Resolving power of Prism

**Unit–III: Polarization (Book 1 and 2) (10 Periods)**

Polarization by Reflection, Brewster’s law, Malus law, Double refraction, Nicol prism, Nicol prism as an analyzer, Huygen’s explanation of double Refraction in Uniaxial crystals , Optic axis in the plane and inclined to the crystal surface, Elliptically and Circularly polarized light, Quarter wave plate, Half wave plate, Optical Activity , Specific rotation, Laurent’s half shade polarimeter.

**Units–IV: Lasers (Book 3) (07 Periods)**

Spontaneous & stimulated emission, absorption, Einstein coefficients (definitions), Population inversion, Optical & electrical pumping, Cavity resonators, Properties of lasers, Ruby laser, Helium-Neon laser, Applications of lasers.

**Books Recommended:**

1. A Text Book of Optics - Brijlal and Subrahmanyam. (S. Chand & Co.)
2. B.Sc.Physics Volume –I-- C.L.Arora (S.Chand)
3. Lasers and Nonlinear Optics – B.B.Laud (Willey .Eastern limited)
4. Optics and Atomic Physics – D.P. Khandelwal. (Himalaya Publishing House)
5. Optics (Second edition) – A.K.Ghatak
6. Geometrical & Physical optics by D. S. Mathur.

## ***B.Sc.II Year PHYSICS***

***Semester - IV***

***Paper -IX***

***(PHY204: Amplifiers, Oscillators and Multivibrators)***

***Periods: 45***

***Marks: 40 External + 10 Internal***

**Unit-I: Transistors**

**(18Periods)**

**Bipolar Junction Transistors (BJT): (Book 1, 2, 3)**

Introduction, Transistor biasing, voltage divider bias, Determination of h-parameters, common – emitter amplifier, Analysis of common emitter amplifier and common – collector amplifier using h-parameters (current gain, voltage gain, power gain, input resistance and output resistance)

**Field Effect Transistors: (Book 4,6)**

**JFET:** Principle of working, static characteristics, JFET parameters, Transfer characteristics, JFET as an amplifier.

**MOSFET:** Construction and working in Depletion and Enhancement mode, Types of MOSFET, Characteristics of MOSFET.

**Unit-II: Operational Amplifier: (Book 5, 6, 7) (10 Periods)**

Theory of differential amplifier, block diagram of Op-Amp, schematic symbol, ideal Characteristics, input offset voltage; input offset current, input bias current, input impedance, Output impedance, open loop gain, CMRR, slew rate.

**Applications of Op-Amp.:**

Inverting amplifier, non-inverting amplifier, Op-Amp as adder, Op-amp as subtractor, Op-amp as integrator, Op-amp as differentiator, Op-amp as comparator.

**Unit III: Oscillators: (Book 8) (10 Periods)**

Introduction to positive and negative feedback, requirement of an oscillator, Barkhausen Criterion, Hartley oscillator, Colpitt's oscillator, R-C Network, Phase shift oscillator, Crystal Oscillator (Derivation of frequency and condition for oscillation for all oscillators)

**Unit IV: Multivibrators: (Book 8) (07 Periods)**

Switching Characteristics of Transistor, Transistorized Astable multivibrator, Monostable multivibrator and Bistable multivibrator (Qualitative and quantitative analysis).

### **Books Recommended:**

1. Principles of Electronics – V. K. Mehta(S.Chand & Co.)
2. Electronic Principles-Malvino
3. Basic Electronics(Solid State) – B.L.Thereja(S.Chand & Co.)
4. Basic Electronics & Linear Circuits—N.N.Bhargava,D.C.Kulshreshtha(TMh)
5. Op-Amps and Linear Integrated Circuits-Ramakant Gayakwad, (PHI Delhi)
6. Electronic fundamentals and Applications – J. D. Ryder.(TMh publications).
7. Digital & Analogue Techniques—Navneet , Gokhale & Kale (Kitab Mahal)
8. Introduction to Electronics-K.J.M.Rao, (Oxford and IBH Publishing Co.).
9. Solid State Pulse Circuits-David A Bell, Fourth edition, (PHI)
10. Electronics and Radio Engineering-M.L.Gupta, (Dhanpat Rai and sons).
11. Linear Integrated circuits-K.C. Botkar

*Semester – III & IV*

***B.Sc.II Year PHYSICS***  
***(PHY205: Practical Course)***

*Paper –X*

***Periods: 80***

***Marks: 50***

1. Moment of Inertia of a flywheel
2. Kater's pendulum
3.  $\gamma$  by Cantilever (Oscillation method)
4.  $\eta$  by torsional pendulum
5.  $\gamma$  and  $\eta$  by Searle's method
6. Coefficient of viscosity by Searle's viscometer
7. Surface tension by Fergusson method
8. Frequency of A.C. by Sonometer
9. Determination of ' $\mu$ ' by  $i$ - $\delta$  curve using spectrometer
10. Determination of  $\lambda$  of Sodium light by Newton's ring
11. Diffraction grating minimum deviation
12. Diffraction grating normal incidence
13.  $\lambda$  by Biprism
14.  $\lambda$  by Lloyd's single mirror
15. Resolving power of Telescope
16. Resolving power of grating
17. Thermal conductivity by Searle's method
18. Specific rotation by Laurent's half shade polarimeter
19. Velocity of sound in air by Kundt's tube and A.F. Oscillator.
20. Velocity of sound in air by Resonating bottle.
21. Wavelength measurement of LASER by diffraction grating

**B.Sc.II Year PHYSICS**

**Semester – III & IV**  
**Periods: 80**

**(PHY206: Practical Course)**

**Paper –XI**  
**Marks: 50**

1. I-H curve by magnetometer method
2. Potentiometer- measurement of Low resistance
3.  $C_1/C_2$  by Desauty's method
4. Maximum velocity of electron using photocell
5.  $h/e$  by Photocell
6. Solar cell characteristics
7. LDR-LED characteristics
8. Photodiode characteristics
9. Transistor characteristics (C-B mode)
10. Transistor characteristics (C-E mode)
11. Characteristics of photo transistor
12. Absolute capacity of a condenser.
13. Study of transistorized CE amplifier (Frequency response, gain & 3db band width.)
14. Op-Amp as inverting amplifier(Study of DC gain verification)
15. Op-Amp as Inverting amplifier (Frequency response, gain & 3db band width.)
16. Op-Amp as Non inverting amplifier (Frequency response, gain & 3db band width.)
17. Op-Amp as adder
18. Op-amp as subtractor.
19. Op-amp as integrator
20. Op Amp as comparator
21. Hartely oscillator. Measurement of frequency and amplitude of waveforms.
22. Colpitt's oscillator. Measurement of frequency and amplitude of waveforms.
23. Phase shift oscillator. Measurement of frequency and amplitude of waveforms.
24. Astable multivibrator.( Measurement of Pulse width, space width, time Period, frequency and duty cycle)
25. Mono stable multivibrator.( Measurement of gate width)
26. Bistable multivibrator.

**Note:** 1. Each student appearing for examination must produce a journal showing that he has completed not less than **15** experiments in each practical course during the year.  
2. Internal marks should be given for student's performance in Unit test, Tutorial, oral exam, seminar etc.