INSTITUTE OF SCIENCE, NAGPUR.

(An Autonomous Institute of Government of Maharashtra)

DEPARTMENT OF PHYSICS

Syllabus

Bachelor of Science (B.Sc.) Semester Pattern

Physics

(PHY/UG/2021/01)

(To be Implemented from 2021-2022)

B.Sc. (Semester Pattern) Syllabus

Semester wise Name of Papers

Subject - Physics

Semester	Paper	Name of the Paper	Paper Code
I	I	Properties of Matter and Mechanics	**BPFS11**
	II	Electrostatics, Time varying fields & Electric Currents	**BPFS12**
	III	Physics Practical (Lab-I)	**BPFS13**
II	I	Oscillations, Kinetic theory of gases and Thermodynamics	**BPFS21**
	II	Gravitation, Astrophysics, Magnetism and Magnetostatics	**BPFS22**
	III	Physics Practical (Lab-II)	**BPFS23**
III	I	Sound waves, Applied acoustic, Ultrasonic and Power supply	**BPSS31**
	II	Physical optics and Electromagnetic waves	**BPSS32**
	III	Physics Practical (Lab-III)	**BPSS33**
IV	I	Solid state physics, X-ray and Laser	**BPSS41**
	II	Solid state electronics, and Molecular physics	**BPSS42**
	III	Physics Practical (Lab-IV)	**BPSS43**
V	I	Atomic physics, free electron theory and Statistical physics	**BPTS51**
	II	Quantum mechanics, Nanomaterials and Nanotechnology	**BPTS52**
	III	Physics Practical (Lab-V)	**BPTS52**
VI	I	Relativity, Nuclear physics and Bio-Physics	**BPTS61**
	II	Electronics, Fiber optics, Communication and Digital electronics	**BPTS62**
	III	Physics Practical (Lab-VI)	**BPTS63**

Ex. BPSS32 : B -B.Sc, P-Physics, S-Second Year, S3- Semester-3, 2- Subject Paper-2

Marking Scheme of Syllabus

Faculty of Science B.Sc. Semester-I to VI (Physics)

Semester	Paper	Total Periods / Week	Marks		Total Marks	Total Marks
			Theory / Practical	Internal		
I to VI	I	03	50	10	60	150
	II	03	50	10	60	
	III	06	30	--	30	

SUBJECT: PHYSICS

B.SC. –I SEMESTER - I

BPFS11: PAPER- I (PROPERTIES OF MATTER AND MECHANICS)

Marks- 50 **Time- 30 hours**

OBJECTIVES:

1. To disseminate the knowledge of intrinsic and extrinsic properties of solids and liquids such as elasticity, viscosity and surface tension
2. To disseminate the fundamental knowledge of classical laws of motions
3. Provide opportunities for scientific study and creativity within a global context that will stimulate and challenge the students.

OUTCOMES:

1. Students gain knowledge and skill in elasticity, viscosity and surface tension
2. They analyze Newtonian mechanics and dynamics
3. Apply the knowledge to solve problems based on above properties to strengthen their basics

Unit-I **(7.5 Hrs)**

Elasticity: Introduction, Hooke's law, Elastic constants (Y, K, η) and relation between them, Poisson's ratio, Elastic limit, Work done in stretching a wire, Bending of beam, Bending moment, External and internal bending moment, Cantilever supported at one end and at both end, Torsional pendulum, and Maxwell needle.

Unit II: **(7.5 Hrs)**

Viscosity: Streamline and turbulent flow, Coefficient of viscosity, Equation of continuity, Euler's equation, Bernoulli's theorem and its applications (Lift of an Airplane, Atomizer) , Poiseuilli's formula, Reynolds number, Terminal velocity, Stokes law by the method of dimension, Variation of viscosity with temperature.

Unit III: **(7.5 Hrs)**

Surface tension: Introduction, Angle of contact and wetting, Surface energy, Surface tension by Jaeger's, Quincke's and Capillary rise methods.

Mechanics: Newton's law of motion, motion in a plane, components of velocity and acceleration in different coordinate system, Centripetal acceleration, Coriolis force and its applications.

Unit IV: **(7.5 Hrs)**

Mechanics: System of particles, Center of mass, Equation of motion, Conservation of linear and angular momentum, Conservation of energy, Single stage and multistage rockets, Elastic and inelastic collisions, Moments of inertia and their products, Moment of inertia of cylinder and sphere, Principal moments and axes.

References & Text books:

1. Applied Fluid Mechanics, by Mott Robert, Pearson Benjamin Cummir, VI Edition, Pearson Education/Prentice Hall International, New Delhi
2. Properties of Matter, by D. S. Mathur, Shamlal Chritable Trust New Delhi
3. Properties of matter, by Brijlal
4. Physics for Degree Students B.Sc.-Part-I, by- C. L. Arora, Dr. P. S. Hemne, S Chand & Company.
5. General Properties of matter, by J. C. Upadhyay, Ram Prasad & Sons
6. Mechanics, by D. S. Mathur, S Chand.
7. Mechanics, by B. M. Roy, Das Ganu Publications.
8. Mechanics & Electrodynamics, by Brijlal & Subramaniam.
9. A text book of properties of Matter, by N. S. Khare& S. Kumar.
10. Mechanics & Properties of Matter, by J. C. Upadhyaya.

SUBJECT: PHYSICS

B.SC. –I SEMESTER - I

BPFS12: PAPER- II (Electrostatics, Time varying fields & Electric Currents)

Marks- 50 **Time- 30 hours**

OBJECTIVES:

1. To disseminate the knowledge of electrostatic and dielectrics
2. To disseminate the fundamental knowledge of time varying field transformer and a.c. circuits
3. Provide opportunities for scientific study and creativity

OUTCOMES:

1. Students gain knowledge of electrostatic and dielectrics
2. They gain knowledge of time varying field transformer and a.c. circuits
3. Apply the knowledge to solve problems based on above properties to strengthen their basics

Unit I: **7.5 hrs.**

Electrostatics: Coulombs law in vacuum in vector form, Force between two charges, Electric field intensity, Electric potential, Electric field intensity due to a point charge, Electric dipole, Electric dipole moment, Electric field intensity due to an electric dipole, Electric field as a negative gradient of potential, Conservative nature of the electric field.

Unit II: **7.5 hrs.**

Dielectric: Introduction, definition of polar and non polar molecules, Polarization of charges in a dielectric, Clausius - Mossotti equation, Three electric vectors D, E and P and relation between them, Concept of capacitance, Parallel plate capacitor without and with dielectric, application of Gauss's law to parallel plate capacitor.

Unit III: **7.5 hrs.**

Time varying fields: Electromagnetic induction, Faradays laws in differential and integral form, Lenz's law, self and mutual induction, **Transformer**: Construction, working and its parameters, Energy losses.

Electric Currents: Current density, Equation of continuity, Kirchhoff's law, Rise and decay of current in LR and CR circuits, Decay of charge in LCR circuits.

Unit IV: **7.5 hrs.**

Electric Currents: Application of complex number in solving an a. c. circuit: j- operator method, A.C. applied to pure resistive, pure inductive and pure capacitive circuit, application of j- operator in LR, CR and LCR circuit, Resonance, Sharpness of resonance, Series resonance circuit (Calculate I, Z, Φ and f_r), Q factor, Power in an a. c. circuit, Power factor.

References and Text books:

1. Electricity and Magnetism, by Brijlal , Subramanyam.
2. Fundamental of Magnetism and Electricity, by D. N. Vasudiva.
3. Electricity and Magnetism with Electronics, by K. K. Tewari.
4. Electricity and Magnetism, by K.K. Tewari.
5. Elements of Electronics, by M. K. Bagde, S. P. Singh, K Singh (S. Chand.)
6. Solid State Physics and Electronics, by R. K. Puri, and V. K. Babbar.
7. Solid state Electronic Devices II Edition, by B. G. Stretman.
8. Introduction to Electrodynamics, by D. J. Griffiths.
9. Electromagnetic fields, by T. V. S. Arun Murthy.
10. Electronics Fundamental and Applications II nd Edition, by J. D. Ryder.

SUBJECT: PHYSICS

B.SC. –I SEMESTER - I

BPFS13: PAPER- III PHYSICS PRACTICAL (LAB-I)

1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of practical examination in 6 hours.
2. The distribution of practical/laboratory work of 30 marks is:

Two experiments (9 Marks each)	- 18 Marks
Record book	- 06 Marks
Viva Voce	- 06 Marks

Total	30 Marks

OBJECTIVES:

1. To disseminate the practical knowledge of elasticity, viscosity and surface tension
2. To disseminate the practical knowledge of electrostatics, transfer and various a.c circuits
3. Provide opportunities for scientific study, experimentally

OUTCOMES:

1. Students develop experimental skill in elasticity, viscosity, surface tension, electrostatics, and various a.c. circuits
2. They analyze experimental limitations and precautions
3. They become skillful to design and perform experiments with good accuracy

List of the experiments:

1. Range and least count of Instruments, measurements using various instruments and error analysis (vernier callipers, screw gauge, traveling microscope, spectrometer etc.)
2. Young's modulus by cantilever.
3. Young's modulus by bending of beam.
4. Young's modulus by vibrational method.
5. Modulus of rigidity by Torsional pendulum.
6. Modulus of rigidity by Maxwell's needle.

7. Determination of η by statical method.
8. To determine Coefficient of Viscosity of water by Poiseulle's method.
9. Surface tension of a liquid by Quincke's method.
10. Surface tension of a liquid by Jaegers method.
11. Surface tension of a liquid by Capillary rise method.
12. To determine the moment of inertia of a body using torsion pendulum.
13. To determine the moment of inertia of a fly-wheel.
14. Measurement of Inductance by phasor diagram method.
15. Measurement of Capacitance by phasor diagram method.
16. To study charging and discharging of a condenser through a resistor R.
17. To study growth/decay of current in LR circuit.
18. Study of growth of current in CR Circuit using microammeter.
19. Frequency of A.C. Mains by sonometer.
20. Study of frequency response of series LCR circuit and determination of Q- factor.
21. Study of Transformer (parameters determination).
22. Verification of Kirchhoff's laws, using electrical network.
23. To calculate low resistance by potentiometer.
24. Calibration of an ammeter by potentiometer.
25. Determination of dielectric constant of a solid.

SUBJECT: PHYSICS

B.SC. –I SEMESTER - II

BPFS21: PAPER- I (Oscillations, Kinetic theory of gases and Thermodynamics)

Marks- 50 **Time- 30 hours**

OBJECTIVES:

1. To disseminate the knowledge of various kinds of oscillations
2. To disseminate the fundamental knowledge of thermodynamics
3. Provide opportunities for scientific study and creativity within a global context that will stimulate and challenge the students.

OUTCOMES:

1. Students gain knowledge of free, forced and damped oscillations
2. They understand the kinetics of gases and thermodynamics laws
3. Apply the knowledge to solve problems based on above properties to strengthen their basics

Unit I: **7.5 hrs.**

Free oscillations: Introduction to linear and angular S.H.M., Differential equation of S.H.M. and its solution, Composition of two perpendicular linear S.H.M.s for 1:1 and 1:2 (analytical method), Lissajous's figure.

Damped oscillations: Differential equation of damped harmonic oscillator and its solution, Energy equation of damped oscillations, Power dissipation and quality factor.

Unit II: **7.5 hrs.**

Forced oscillations: Forced oscillation with one degree of freedom, Differential equation of forced oscillation and its solution, Resonance (Amplitude), Sharpness of resonance, Power dissipation, Quality factor and bandwidth.

Kinetic theory of gases: Assumptions, Boyle's law, Equipartition of energy, Molecular collision, Mean free path and collision cross section, Estimate of molecular diameter and mean free path.

Unit III: **7.5 hrs.**

Transport phenomenon in gases: Transport of mass, momentum, energy and their relationship, dependence on temperature and pressure, Van der wall's gas (Real gas, Equation of state), Critical constants. **Thermodynamics:** Thermodynamic variables, Thermal equilibrium and temperature,

Zeroth law of thermodynamics, Thermodynamic processes (Reversible and Irreversible), Indicator diagram, First law of thermodynamics, Carnot's cycle and it's efficiency, Carnot's theorem.

Unit IV: **7.5 hrs.**

Thermodynamics: Entropy, Second law of thermodynamic, Thermodynamic scales of temperature, Third law of thermodynamics, Maxwell general relationship [$\delta(T, S)/\delta(x, y) = \delta(P,V)/\delta(x, y)$] and it's applications, Joules coefficient, Porous plug experiment, Liquefaction of gases-Boyle's temperature and inversion temperature, Liquefaction of Helium, Air conditioning (Concept only).

References and Text books:

1. Waves and Oscillations, by Stephenson.
2. A Text Book of Oscillations, waves and Acoustic, by Dr. M. Ghosh, Dr. D. Bhattacharya.
3. Oscillation, waves and sound, by Sharma and Saxena.
4. Waves and oscillation, by N. Subrahmanyam and Brijlal.
5. The Physics of waves and oscillation, by N. K. Bajaj, Tata McGraw-Hill, publishing co. ltd.
6. Heat, Thermodynamics and Statistical Physics, by Pragati Prakashan , Singhal, Agrawal.
7. Heat and Thermodynamics, by Brijlal, Subramanyam.
8. A Text Book of Heat, by J. B. Rajam.
9. Heat, thermodynamics and statistical physics, by Brijlal, Subramayam and Hemne.
10. Heat and thermodynamics, by C. L. Arora.
11. Treatise on heat, by Shah, Srivastava.

SUBJECT: PHYSICS

B.SC. –I SEMESTER - II

BPFS22: PAPER- II (GRAVITATION, ASTROPHYSICS, MAGNETISM AND MAGNETO-STATICS)

Marks- 50 **Time- 30 hours**

OBJECTIVES:

1. To disseminate the knowledge of gravitations and astrophysics
2. To disseminate the fundamental knowledge of magnetism and magnetostatics
3. Provide opportunities for scientific study and creativity

OUTCOMES:

1. Students gain knowledge of gravitations and astrophysics
2. They gain knowledge of magnetism and magnetostatics
3. Apply the knowledge to solve problems based on above properties to strengthen their concepts

Unit I: **7.5 hrs.**

Gravitation: Kepler's laws of Planetary motion (statement only), Newton's law of gravitation, Relation between G and g, Gravitational field, Gravitational potential, Gauss's theorem, Gravitational potential and intensity due to uniform solid sphere at a point inside and outside the sphere, Gravitational self energy of a galaxy.

Unit II: **7.5 hrs.**

Astrophysics: The constituents of universe (Solar system, Stars, Galaxies), Introductory study of solar systems, To measure size of a planet ($d=D.\alpha$), To measure distance of a planet by parallax method ($D=b/\theta$), Mass of the sun and the planets($M=4\pi^2r^3/GT^2$), Structure of sun, Solar interior, surface temperature of sun ($T=[R/r]^{1/2}.[S/\sigma]^{1/4}$), Solar luminosity, Stellar spectra, The Milky way (shape, size, clusters), Cosmological theories of the universe (Concept only).

Unit III: **7.5 hrs.**

Magnetism: Introduction, Magnetic materials, Langevin's theory of diamagnetism, its application as superconductor, Critical magnetic field and Meissner effect, Langevin's theory of para

magnetism, Ferromagnetism, Ferromagnetic domain, Curie temperature, Ferrimagnetism, Ferrites and its applications, Antiferromagnetism, Neel temperature.

Unit IV: **7.5 hrs.**

Magnetostatics: Concept of magnetic field, Lorentz force equation, Magnetic dipole moment, angular momentum and gyromagnetic ratio, Biot- Savart's law, It's applications (B due to steady current in a long straight wire, B along the axis of circular coil), Ampere's law, It's applications(B for a solenoid, A Toroid), Magnetization current, Magnetic vectors, Gauss law of magnetization.

References and Text books:

1. Modern's abc of physics, Vol. II, by Satish K. Gupta. (For Astro Physics, Unit 13).
2. The Great Universe, by G. K. Sasidharan, S Chand publications.
3. University physics, by- H. D. Young, R. A. Freedman.
4. Astronomy structure of the universe, by A. E. Roy, D. Clarke, Adam Hilger Pub.
5. Electricity and Magnetism, by D. C. Tayal
6. Electricity and Magnetism, by Rakshit, Chottopadhay
7. Electricity and Magnetism, by S. S. Atwood.
8. Electricity and Magnetism, by K. K. Tewari.
9. University physics, by J. C. Upadhyay, Himalaya publications.
10. Foundation of Electrodynamics, by Theory, Rietz and Millford.

SUBJECT: PHYSICS

B.SC. –I SEMESTER - II

BPFS23: PAPER- III PHYSICS PRACTICAL (LAB-II)

1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of practical examination in 6 hours.
2. The distribution of practical/laboratory work of 30 marks is:

Two experiments (9 Marks each)	- 18 Marks
Record book	- 06 Marks
Viva Voce	- 06 Marks

Total	30 Marks

OBJECTIVES:

1. To disseminate the practical knowledge of gravitations and astrophysics
2. To disseminate the practical knowledge of magnetism and magnetostatics
3. Provide opportunities for scientific study, experimentally

OUTCOMES:

1. Students develop experimental skills in gravitations, astrophysics, magnetism and magnetostatics
2. They analyze experimental limitations and precautions
3. They become skillful to design and perform experiments with good accuracy

List of the experiments:

1. Acceleration due to gravity by compound pendulum.
2. To study damping of a bar pendulum.
3. To study oscillations of a rubber band and to draw potential energy curve for it.
4. To study the oscillation in a bifilar suspension arrangement.
5. To determine acceleration due to gravity by Kater's reversible pendulum.
6. Study of Lissajous's figure
7. To determine the pressure coefficient of air by constant volume air thermometer.
8. To verify the Stefan's law of radiation by using an incandescent lamp.

9. Thermal conductivity of a metal rod using Forbes method.
10. Thermal conductivity of a bad conductor by Lee's disc method.
11. To determine the critical temperature and critical pressure of a gas.
12. To determine the coefficient of thermal conductivity of glass in the form of a tube.
13. To determine specific heat of a given liquid by method of cooling.
14. To find Y ratio of specific heat of gas by Clamert and Desormi's method.
15. Mechanical equivalent of heat by Calender- Barne's constant flow method.
16. To determine the mechanical equivalent of heat (J) with the help of Joule's calorimeter.
17. To determine temperature coefficient of resistance of platinum using platinum resistance thermometer
18. Study of heating efficiency of electrical kettle with varying voltages.
19. To study the variation of total thermal radiation with temperature using the torch bulb filament.
20. To determine height of a building, altitude of sun and angular diameter of sun with the help of a sextant.
21. To determine the horizontal component of Earth's magnetic field and magnetic moment of the magnet.
22. To study the variation of magnetic field along the axis of a current carrying circular coil.
23. Study of magnetic field by vibration magnetometer.
24. To determine the dipole moment of a given liquid.
25. To determine magnetic susceptibility of $FeCl_3$.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - III

BPSS31: PAPER- I (SOUND WAVES, APPLIED ACOUSTIC, ULTRASONIC AND POWER SUPPLY)

Marks- 50 **Time- 30 hours**

OBJECTIVES:

1. To disseminate the knowledge of Sound waves and acoustics
2. To disseminate the fundamental knowledge of rectifiers
3. Provide opportunities for scientific study and creativity within a global context that will stimulate and challenge the students.

OUTCOMES:

1. Students gain knowledge of Sound waves and acoustics
2. They understand the design of various kinds of power supply
3. Apply the knowledge to solve problems based on above properties to strengthen their basics

Unit I: **7.5 hrs.**

Waves in media: Speed of transverse wave on a string, Group velocity and phase velocity and their relation and measurement, Standing waves, Harmonics, Quality of sound, Human ear and its response (Diagrammatic introduction only), Limit of human audibility, Intensity and loudness, bel and decibel, the musical scale, Temperaments and musical instruments.

Unit II: **7.5 hrs.**

Applied acoustic: Transducers and their characteristics (Crystal microphone, Moving coil loud speaker), Recording and reproduction of sound (Magnetic tape, Cine film, Compact disc), Acoustic of building, Reverberation and reverberation period, Sabine's formula, Factors affecting the acoustics of building, Requirements for good acoustics.

Unit III: **7.5 hrs.**

Ultrasonic: Introduction, Properties and production of ultrasonic waves, piezoelectric effect, piezoelectric generator, Magnetostriction effect and oscillators, Frequency of ultrasonic waves, Application of ultrasonic waves (measurement of depth of sea, SONAR system and Medical science).

Unit IV: **7.5 hrs.**

Power supply-Introduction, rectification using half wave and full wave rectifiers (Find I_{dc}, V_{dc}, I_{rms}, η and ripple factor), Working of Full wave bridge rectifier, Filters, Difference

between regulated and unregulated power supply, line and load regulation, voltage stabilization, Zener diode as voltage regulator, IC voltage regulation.

References and Text books:

1. A Text Book of sound, by Khanna , Bedi
2. A Text Book of sound, by L. P. Sharma, Saxena (S. Chand)
3. Properties of Matter and Acoustics, by R. Murugeshan, Kiruthign Sivaprakash.
4. Fundamental of Acoustics 4th Edition, by Kinsler , John Wiley and Sons.
5. Basic Acoustics, by D. E. Hall, Oxford University Press.
6. A Text Book of Oscillations, Waves and Acoustics, by Dr. M. Ghosh, Dr. D. Bhattacharya (S. Chand)
7. Oscillation, Waves and Sound, by Sharma and Saxena.
8. Science and Technology of Ultrasonics, by Baldevraj, Narosa.
9. Elements of Electronics, by M. K. Bagde, S. P. Singh, K Singh S- Chand.
10. Solid State Physics and Electronics, by- R. K. Puri, and V. K. Babbar.
11. Solid State Electronic Devices II Edition, by B. G. Strretman

SUBJECT: PHYSICS

B.SC. –II SEMESTER - III

BPSS32: PAPER- II (PHYSICAL OPTICS AND ELECTROMAGNETIC WAVES)

Marks- 50 **Time- 30 hours**

OBJECTIVES:

1. To disseminate the knowledge of optical phenomenon
2. To disseminate the fundamental knowledge of electromagnetic waves
3. Provide opportunities for scientific study and creativity

OUTCOMES:

1. Students gain knowledge of interference, diffraction and polarization
2. They gain knowledge of e.m. wave
3. Apply the knowledge to solve problems based on above properties to strengthen their concepts

Unit I: **7.5 hrs.**

Interference of light: Introduction, Interference in equal thickness thin film, Phase change on reflection, refraction and transmitted system. Newton's ring and its application to determine the wavelength and refractive index, Michelson Interferometer and its application to wavelength determination and wavelength difference, Fabry- Parrot Interferometer and its application.

Unit II: **7.5 hrs.**

Diffraction of light: Introduction, Fresnel's diffraction: Half period zones, Zone plates, Diffraction due to straight edge and due to narrow slit.

Fraunhoffer diffraction: Fraunhoffer diffraction at a single slit, at circular aperture, Plane diffraction grating and its application, Resolving power of grating, Rayleigh's criterion for resolution.

Unit III: **7.5 hrs.**

Polarization: Introduction, Brewster's law, Polarization by scattering (concept only), Blue color of the sky (only idea), Uniaxial and biaxial crystal, positive and negative crystal, ordinary and extraordinary rays, Nicol prism, its application as an analyzer and polarizer,

Double refraction in uniaxial crystal, phase retardation plate (Half and Quarter wave), Double prism.

Unit IV: **7.5 hrs.**

EM Waves: Introduction to EM spectrum related to wavelength, origin and characteristics of EM waves, Physical significance of Maxwell's equations, EM wave equations (in conducting medium and in free space), It's transverse nature, Plane polarized EM wave ($E_0/H_0=\sqrt{\frac{\mu}{\epsilon}}$), Characteristics impedance of dielectric, Poynting vector, Poynting theorem.

References and Text books:

1. Physics for Degree students for B. Sc. Second year, by C. L. Arora, Dr. P. S. Hemne.
2. Optics and Spectroscopy, by R. Murugeshan , Kiruthign Sivaprakash.
3. Optics, by Brijlal and Subramayam.
4. Optics, by Ajay Ghatak.
5. A text book of optics, by Dr. Subrahmanyam, Brijlal and M. N. Avadhanulu.
6. Optics, by- J. K. Sharma, K. K. Sarkar.
7. Fundamentals of optics, by Jenkins and white.
8. Optics, by D. P. Khandelwal.
9. Electromagnetic field and waves, by Paul Lorrain and Dale R. Corson.
10. Foundation of Electromagnetic theory, by John R. Retitz, Fredrick, J. Milford.
11. Electromagnetic, by B. B. Laud.
12. Electrodynamics, by Jordon

SUBJECT: PHYSICS

B.SC. –II SEMESTER - III

BPSS33: PAPER- III PHYSICS PRACTICAL (LAB-III)

1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of practical examination in 6 hours.
2. The distribution of practical/laboratory work of 30 marks is:

Two experiments (9 Marks each)	- 18
Marks Record book	- 06
	Marks
Viva Voce	- 06 Marks

Total	30 Marks

OBJECTIVES:

1. To disseminate the practical knowledge of interference, diffraction and polarization
2. To disseminate the practical knowledge of piezoelectric and electronic components
3. Provide opportunities for scientific study, experimentally

OUTCOMES:

1. Students develop experimental skills in of acoustics, rectifiers, interference, diffraction and polarization
2. They analyze experimental limitations and precautions
3. They become skillful to design and perform experiments with good accuracy

List of the experiments:

1. Study the speed of waves on stretched string.
2. Determination of velocity of sound using volume resonator.
3. To determine frequency of A. C. Mains with a Sonometer using single/two magnetic wire.
4. To determine unknown frequency and to verify the law of inverse variation of frequency and volume of air by Helmholtz resonator.
5. To determine the velocity of sound wave in air (gas) with Kundt's tube.
6. To determine the radius of curvature of the lower surface of a plano-convex lens by using Newton's ring apparatus.
7. Study of wavelength of light using Newton's ring.
8. To study the variation of the fine width with color of light.
9. To study the characteristics of micro phone.
10. Study of loudspeaker (woofer, squawker, tweeter) as a transducer.

11. Study of Piezoelectric effect.
12. To Study the current regulation and ripple factor of half wave / full wave rectifier using semiconductor diodes with L and Π type filter.
13. To study the characteristics of zener diode.
14. To study the zener diode voltage regulating characteristics.
15. To study the regulation characteristics of zener regulated and IC 741 regulated power supply.
16. To determine the velocity of ultrasonic waves in a given liquid.
17. To produce interference pattern using Lloyd's mirror and to determine the wavelength of sodium light.
18. To determine the dispersive power of a prism.
19. Study of polarization of light by reflection (Brewster's law).
20. To find R.I. of glass by using Brewster's law.
21. To determine the resolving power of a grating.
22. To study diffraction at straight edge and to determine the wavelength of monochromatic light.
23. To determine the resolving power of a telescope.
24. Study of wavelength of light using plane diffraction grating.
25. To determine the wavelength of prominent lines of mercury by plane transmission grating.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - IV

BPSS41: PAPER- 1 (SOLID STATE PHYSICS, X-RAY AND LASER)

Marks- 50 **Time- 30 hours**

OBJECTIVES:

1. To disseminate the knowledge of solid-state physics
2. To disseminate the fundamental knowledge of LASER
3. Provide opportunities for scientific study and creativity within a global context that will stimulate and challenge the students.

OUTCOMES:

1. Students gain knowledge of solid-state physics
2. They understand the design, principle and working of LASER
3. Apply the knowledge to solve problems based on above properties to strengthen their basics

Unit I: **7.5 hrs.**

Solid State Physics: Introduction, Crystal structure, periodicity, lattices and basis, fundamental translation vector, unit cell and primitive cell, Miller indices, allowed rotations, lattice types, lattice planes, Bravais lattices, packing fraction, coordination number, Inter-planer distances, Crystal structures-Na Cl, diamond, CsCl, ZnS etc.

Unit II: **7.5 hrs.**

X-ray: Introduction, discrete and continuous X-ray spectra, Main feature of continuous X-ray spectra, Characteristics X-ray spectra, Duane-Hunt law, X- ray emission spectra, Moseley law its importance and applications, Auger effect, X-ray absorption spectra, applications of X-rays in **various fields.**

Unit III: **7.5 hrs.**

Solid State Physics: Reciprocal lattice, Wigner Seitz cell, Geometrical relation between direct and reciprocal lattice, Laue's theory of X-ray diffraction, Bragg's law and Bragg's diffraction conditions in direct and reciprocal lattice, Laue's pattern, Bragg's spectrometer and its applications (wavelength determination and simple cubic structure determination).

Unit IV: **7.5 hrs.**

LASER: Introduction to LASER, purity of spectral line, spatial and temporal coherence, Einstein's relation, absorption, spontaneous and stimulated emission, Population inversion,

Optical pumping, characteristics of laser beam, three level and four level laser system, Ruby laser, He-Ne laser, Semiconductor laser, Application of lasers.

References and Text books:

1. Solid State Physics, by S. U. Pillai.
2. Cryptography Applied to SSP, by O. N. Shrivastava
3. Solid State Physics, by Gupta Kumar.
4. Introduction to Solid State Physics, by C. Kettel.
5. Modern Physics, by R. Mugadesham
6. Modern Physics, by J. B. Rajam
7. Modern Physics, by Kumar , Krishane, Nandeem
8. A Text Book of Modern Physics, by K. C. Lal, S. T. Ahmad.
9. Modern Physics, by Arthur Beiser.
10. Lasers and Non linear optics. By B. B. Laud
11. LASERS- Theory and Applications, by Thyagarajan and A. K. Ghatak
12. Optics and LASER, by V. K. Sewane
13. Introduction to Lasers, by Dr. Avadhanulu, Dr. P. S. Hemne.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - IV

BPSS42: PAPER-2 (SOLID STATE ELECTRONICS, AND MOLECULAR PHYSICS)

Marks- 50 **Time- 30 hours**

OBJECTIVES:

1. To disseminate the knowledge of solid-state electronics
2. To disseminate the fundamental knowledge of molecular spectroscopy
3. Provide opportunities for scientific study and creativity

OUTCOMES:

1. Students gain knowledge of solid-state electronics
2. They gain knowledge of molecular spectroscopy
3. Apply the knowledge to solve problems based on above properties to strengthen their concepts

Unit I: **7.5 hrs.**

Solid State Electronics: Light emitting diode, Solar Cell, Photovoltaic cell,

Bipolar transistor: Construction and working, transistor characteristics in CE and CB Mode, Graphical analysis of CE configuration. Hybrid parameters, Equivalent circuit at low frequency in CE mode, Thermal Runaway, Stabilization, Heat sink, Stability factor, Bias stabilizing circuits.

Unit II: **7.5 hrs.**

Field Effect Transistor: Construction, and working principal of JFET, Difference between BJT and JFET, Characteristics of JFET, Parameters, JFET as an amplifier (input and output impedance, voltage gain), Advantage of JFET over BJT. **MOSFET**: Types of MOSFET, Construction and working of MOSFET, Characteristics of MOSFET, Special features of MOSFET.

Unit III: **7.5 hrs.**

Molecular physics: Quantization of vibrational and rotational energies, types of molecules based on moment of inertia, rigid diatomic molecules, Intensity distribution in rotational levels, Diatomic molecules as harmonic and anharmonic oscillator, Rotational-vibrational spectra, Born Oppenheimer approximation.

Unit IV: **7.5 hrs.**

Raman spectroscopy: Raman effect, Classical and quantum explanation, Experimental set up, Raman spectra and molecular structure, Applications of Raman effect, electronic spectra, Dissociation energy, Frank-Condon principle, Elementary ideas of NMR and ESR and their applications in spectroscopy.

References and Text books:

1. Elements of Electronics, by M. K. Bagde, S. P. Singh, K Singh S- Chand.
2. Solid State Electronic Devices II Edition, by B. G. Strretman
3. Electronics Fundamentals and Applications II Edition, by J. D. Ryder
4. Principals of Electronics, by V. K. Mehta, Rohit Mehta.
5. Basic Electronics (Solid State) by B. C. Theraja.
6. Atomic and Molecular Physics, by ULP publications, Prof. C. Mande.
7. Elements of Spectroscopy, by Pragati prakashan, Gupts kumar Sharma.
8. Optics and Spectroscopy, by R. Murugeshan and Kiruthiga Sivaprakash, S Chand publication.
9. Advanced Molecular Physics, by Shriram and Sharma.

SUBJECT: PHYSICS

B.SC. –II SEMESTER - IV

BPSS43: PAPER- III PHYSICS PRACTICAL (LAB-III)

1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of practical examination in 6 hours.
2. The distribution of practical/laboratory work of 30 marks is:

Two experiments (9 Marks each)	- 18
Marks Record book	- 06
Marks	
Viva Voce	- 06 Marks

Total	30 Marks

OBJECTIVES:

1. To disseminate the practical knowledge of cell structure and applications of LASER
2. To disseminate the practical knowledge of solid state electronic devices
3. Provide opportunities for scientific study, experimentally

OUTCOMES:

1. Students develop experimental skills in of cell structure and applications of LASER and various solid state electronic devices.
2. They analyze experimental limitations and precautions
3. They become skillful to design and perform experiments with good accuracy

List of the experiments:

1. To determine wavelength of LASER beam using plane diffraction grating or cylindrical obstacle.
2. To study the divergence of a LASER beam.
3. To study LASER as a monochromatic coherent source.
4. Study of total internal reflection using LASER.
5. Measurement of the focal length of a given convex lens using LASER.
6. Goniometric study of crystal faces using models.
7. To construct SC, BCC, FCC and to find packing fraction, coordination number.
8. To determine lattice parameter ‘a’ of a unit cell of a cubic crystal using X-ray diffraction film.

9. To determine the energy gap of a semiconductor using four probe method.
10. To determine energy gap of a semiconductor using PN junction diode in reverse bias mode.
11. To determine the dielectric constant of a solid and its polarisability by resonance method.
12. Study of IR Spectra of HCl molecule.
13. Identification of unknown element from line emission spectra.
14. To determine the Rydberg constant for Hydrogen.
15. Study of characteristics of LED.
16. To study the characteristics of photo diode and use as light sensor (LDR).
17. Study of Solar cell as a Photo voltaic cell.
18. Study of characteristics of transistor in common base mode.
19. Study of characteristics of transistor in common emitter mode.
20. To study the variation of gain with frequency of single stage common emitter amplifier.
21. To study the frequency response of a single stage transformer coupled transistor amplifier.
22. To study variation of gain of CE amplifier with load at fixed frequency.
23. Study of characteristics of field effect transistor.
24. Study of FET as an amplifier.
25. To determine the Hybrid parameters of a transistor.

SUBJECT: PHYSICS

B.SC. –III SEMESTER - V

BPTS51: PAPER-1 (ATOMIC PHYSICS, FREE ELECTRON THEORY AND STATISTICAL PHYSICS)

Marks- 50 **Time- 30 hours**

OBJECTIVES:

1. To disseminate the knowledge of atomic physics and free electron theory
2. To disseminate the fundamental knowledge of statistical physics
3. Provide opportunities for scientific study and creativity within a global context that will stimulate and challenge the students.

OUTCOMES:

1. Students gain knowledge of atomic physics and free electron theory
2. They understand the basics of statistical physics
3. Apply the knowledge to solve problems based on above properties to strengthen their basics

Unit I: **7.5 hrs.**

Atomic physics: Introduction (Revision of Bohr's model, Sommerfeld and Chadwick), Vector atom model, Stern-Gerlach experiment, Spinning of electron, Space quantization, Selection rules, Quantum numbers, LS and JJ -Coupling, Pauli's exclusion principle, Hunds rule, Zeeman effect, Normal Zeeman effect, Anomalous Zeeman effect, Stark effect.

Unit II: **7.5 hrs.**

Free electron theory: Drude Lorentz model, Mean free path, Electrical and thermal conductivity, Wiedemann Franz law (Derivation), Density of states, Fermi energy, Fermi temperature. **Band theory of solids**: Bloch theorem (statement only), Kronig Penny model, Concept of hole, Hall effect, Energy bands in solid, distinction between metal, semiconductor and insulator.

Unit III: **7.5 hrs.**

Statistical physics: μ- space, Gamma space, probability distribution, thermodynamic probability, Principle of a priori probability, Boltzmann's entropy relation, accessible and inaccessible estates, macro and micro states, Maxwell- Boltzmann distribution law, its application to molecular speed, distinction between mean, r. m. s. and most probable speed values.

Unit IV: **7.5 hrs.**

Statistical physics: Bose-Einstein statistics, its application to black body radiation, Planck's radiation law, Estimation of temperature of sun, Bose- Einstein condensation. Fermi-Dirac distribution and its application to free electrons in a metal, concept of negative temperature, Fermi level and Fermi temperature, comparison between MB, BE and FD statistics.

References and Text books:

1. Atomic and Molecular Physics, by ULP publications, Prof. C. Mande.
2. Introduction of Atomic Physics, by White
3. Atomic and Nuclear Physics, by T. A. Littlefield, N. Thorley
4. Atomic and Nuclear Physics, by S. N. Ghoshal.
5. Atomic Physics (Modern Physics), by S. N. Ghoshal.
6. Atomic Physics, by J. B. Rajam.
7. Solid state physics, by R. K. Puri, V. K. Babbar, S Chand.
8. Atomic and Nuclear Physics, by N. Subramanyam, Brijlal.
9. Statistical Mechanics, by Kamal Singh
10. Quantum Mechanics ,Statistical Mechanics and Solid state physics, by Chattopadhyay and P. C. Rakshit
11. Heat, Thermodynamics and Statistical Physics, by Pragati Prakashan , Singhal, Agrawal.
12. Fundamental of Statistical Mechanics, by B. B. Laud, New Age International publications.

SUBJECT: PHYSICS

B.SC. –III SEMESTER - V

BPTS52: PAPER-2 (QUANTUM MECHANICS, NANOMATERIALS AND NANOTECHNOLOGY)

Marks- 50 **Time- 30 hours**

OBJECTIVES:

1. To disseminate the knowledge of quantum mechanics
2. To disseminate the fundamental knowledge of nanotechnology
3. Provide opportunities for scientific study and creativity

OUTCOMES:

1. Students gain knowledge of quantum mechanics
2. They gain knowledge of nanotechnology
3. Apply the knowledge to solve problems based on above properties to strengthen their concepts

Unit I: **7.5 hrs.**

Quantum mechanics: Failure of classical physics to explain black body spectra, Planck's radiation law, Compton Effect, Wave particle duality, de Broglie's hypothesis, Concept of wave and group velocity, Experimental demonstration of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle and Thought experiment.

Unit II: **7.5 hrs.**

Quantum mechanics: Schrodinger's equation (Time dependent and time independent equations), Physical significance of wave function Ψ, Operators, Expectation values of a dynamical quantities, Ehrenfest's theorem, Eigen value and Eigen functions, Particle in a box, Application to free particle in a one and three dimension.

Unit III: **7.5 hrs.**

Nanomaterials: Introduction to Nanoscience and Nanotechnology, Difference between nanomaterials and bulk materials, Reduction of dimensions 3D, 2D, 1D, 0D materials, various morphologies of nanomaterials, Bottom up and top down approaches, size dependent physical properties, Nanocluster.

Unit IV: **7.5 hrs.**

Nanotechnology: Different methods of synthesis of nanomaterials (Wet chemical, Sol-gel, and HCR Technique), Determination of size of nanoparticles by particle analyzer(BET) and

Debye- Scherer's formula, Characterization technique of SEM and TEM , application of nanomaterials in various fields (General).

References and Text books :

1. Quantum Mechanics, Statistical Mechanics and SSP, by D. Chattopadhay, P. C. Rakshit.
2. Fundamentals of Quantum Mechanics, by P. R. Waghmare
3. Quantum Mechanics, by John L. Powel, Bernd Crasemann.
4. Quantum Mechanics, by Mathews and Venketesan.
5. Quantum Mechanics, by A. K. Ghatak, S. lokanathan.
6. Quantum Mechanics, by S. P. Singh, M. K. Bagde and Kamal Singh.
7. Quantum Mechanics, by Chatwal, Anand, Himalaya publications.
8. Advanced Quantum Mechanics, by- Satya Prakash, Pragati Publications.
9. Introduction to Nano Technology, by C. P. Poole, Jr. F. J. Owens.
10. Nano Technology, by T. J. Daming.
11. Nano Structure and Nano Materials, by M. Balkrishanarao, K. Krishana Reddy.
12. Nano Technology by Rakesh Rathi.

SUBJECT: PHYSICS

B.SC. –III SEMESTER - V

BPTS53: PAPER- III PHYSICS PRACTICAL (LAB-III)

1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of practical examination in 6 hours.
2. The distribution of practical/laboratory work of 30 marks is:

Two experiments (9 Marks each)	- 18
Marks Record book	- 06
	Marks
Viva Voce	- 06 Marks

Total	30 Marks

OBJECTIVES:

1. To disseminate the practical knowledge of photon related experiments
2. To disseminate the practical knowledge of atomic spectra
3. Provide opportunities for scientific study, experimentally

OUTCOMES:

1. Students develop experimental skills in photon related experiments and atomic spectra
2. They analyze experimental limitations and precautions
3. They become skillful to design and perform experiments with good accuracy

List of the experiments:

1. To study the absorption spectra of iodine vapour and to determine its dissociation energy and force constant.
2. To estimate the temperature of sodium flame by studying the reversal of the spectral lines

(D- line).

3. To determine the electric charge of an electron by Millikan's oil drop method.
4. To determine the value of e/m of an electron by Busch's helical beam method.
5. To determine the value of e/m of an electron by Thomson method.
6. To determine electronic charge and work function of the cathode material using photocell.
7. To determine the plank's constant 'h' by vacuum type photocell using DPMS.
8. To determine Planck's constant by photocell.
9. To determine Planck's constant by solar cell.
10. To determine Hall coefficient and mobility of charge carriers in a semiconductor.

11. To verify the laws of probability distribution throwing one coin, two coins and ten coins.
12. Study of statistical distribution from the given data and to find most probable, average value and RMS value.
13. Study of random decay of nuclear disintegration and determination of decay constant using one colored face dices.
14. To show that deviation of probability of an event from theoretical value decreases with increase in number of events.
15. Determination of average grain size of a particle from X-Ray diffraction spectra using Debye- Scherrer Formula.
16. Study of particle size of nano particles by SEM /TEM method.
17. Determination of size of nano particles by particle analyzer (BET).
18. To determine the transmission coefficient of a transmitting plate using photometer.
19. To determine the electro-chemical equivalent of hydrogen using Hoffman's tube.
20. To measure A. C. / D. C. voltage using a C. R. O. and to calculate it's deflection sensitivity.
21. To determine the unknown frequency /to compare the frequency of two unknown signals using C. R. O.
22. To study and trace different wave forms of oscillator using C. R. O.
23. Measurement of thermo emf.
24. To determine the concentration of sugar solution by half shade polarimeter.
25. Measurement of global and diffuse radiation using pyranometer.

SUBJECT: PHYSICS

B.SC. –III SEMESTER - VI

BPTS61: PAPER-I (RELATIVITY, NUCLEAR PHYSICS AND BIO PHYSICS)

Marks- 50 **Time- 30 hours**

OBJECTIVES:

1. To disseminate the knowledge of theory of relativity and nuclear physics
2. To disseminate the fundamental knowledge of biophysics
3. Provide opportunities for scientific study and creativity within a global context that will stimulate and challenge the students.

OUTCOMES:

1. Students gain knowledge of relativity and nuclear physics
2. They understand the basics of biophysics
3. Apply the knowledge to solve problems based on above properties to strengthen their basics

Unit I: **7.5 hrs.**

Relativity: Frame of reference, Inertial and non inertial frames, Galilean transformation equations, Galilean invariance, Michelson-Morley experiment, Postulates of the special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, , Variation of mass with velocity, Mass energy equivalence.

Unit II: **7.5 hrs.**

Nuclear physics: G. M. counter, Wilson cloud chamber, Cyclotron, Linear accelerator, Nuclear reaction, Discovery of neutron, Packing fraction, Mass defect and binding energy, Nuclear fission, Liquid drop model, Chain reaction, Nuclear reactors, Nuclear fusion, Cosmic ray, Elementary particles, Shell model of the nucleus.

Unit III: **7.5 hrs.**

Nuclear physics: Alpha decay, Range of α particle, Geiger Nuttal law, Magnetic spectrometer for energy of α particle, Tunneling, Gamow's theory of α decay, β- decay, Measurement of energy of β particle and end point energy, Neutrino theory of β- decay, γ-decay, Energy of γ photon.

Unit IV: **7.5 hrs.**

Bio physics: History of bio physics, Bio Potential- compound action Potentials of the human body, Electrocardiogram for heart (ECG), Electroencephalogram for brain (EEG), Electroretinogram for eye retina (ERG), Electromyogram for muscle (EMG) and Sonography (Working mechanism).

Bioinstruments: Basic principle, construction and working of colorimeters, Spectrophotometer, PH-Meter and centrifuge measurement.

Reference and Text books:

01. Nuclear Physics, by S. N. Ghoshal.
02. Atomic and Nuclear physics, by N. Subramanyam, Brijlal.
03. Introduction to Nuclear physics, by H. A. Enge.
04. Atomic and Nuclear physics, by T. A. Littlefield, N. Thorley.
05. Introduction to special theory of Relativity, by Shrivastava
06. Elements of special theory of Relativity, by S. P. Singh and M. K. Bagde.
07. Introduction to theory of Relativity, by P. G. Bergmann
08. Introduction to Bio Physics, by P. Narayanan, New Age Publications.
09. Medical Instrumentation, by Khandpur TMH.
10. Text Book of Bio Physics, by R. N. Roy
11. Laboratory manuals of Bio Physics Instruments, by P. B. Vidyasagar.
12. Bio physics, by Vatsala Piramal, Dominant Publications and Distributions, New Delhi.

SUBJECT: PHYSICS

B.SC. –III SEMESTER - VI

BPTS62: PAPER-II (ELECTRONICS, FIBER OPTICS, COMMUNICATION AND DIGITAL ELECTRONICS)

Marks- 50 **Time- 30 hours**

OBJECTIVES:

1. To disseminate the knowledge of amplifiers and fiber optics
2. To disseminate the fundamental knowledge of digital and communication electronics
3. Provide opportunities for scientific study and creativity

OUTCOMES:

1. Students gain knowledge of amplifiers and fiber optics
2. They gain knowledge of digital and communication electronics
3. Apply the knowledge to solve problems based on above properties to strengthen their concepts

Unit I: **7.5 hrs.**

Amplifiers: Classification of amplifiers, multistage amplifiers**, Operational amplifier**-parameters, Basic idea of IC-741, Application of Op. Amp. as inverting, Non inverting, Adder, Subtractor, Integrator and Differentiator, **Oscillators**: Concept of feedback, Physical consideration of tuned circuits, Phase shift oscillator, Hartley oscillator, Colpitts oscillator.

Unit II: **7.5 hrs.**

Fiber optics: Importance of optical fiber, Propagation of light waves in optical fiber, Basic structure, Stepped index monomode fiber, Graded index fiber, Acceptance angle and acceptance cone, Numerical aperture, Fiber losses and their units (basic concept), Electrical and optical band width, bandwidth length product, Dispersion in optical fiber.

Unit III: **7.5 hrs.**

Communication: Introduction, amplitude modulation - Frequency spectrum, Modulation factor, over modulation, Percentage modulation, Expression for Power and Currents in AM wave, disadvantages, **Frequency modulation** : Frequency deviation, Carrier swing, Modulation index, Deviation ratio, Expression for FM wave, Frequency spectrum, significant side band terms, FM band width, Merits and demerits.

UNIT IV: **7.5 hrs.**

Number Systems: Unitary systems, Binary, decimal, octal, hexadecimal and their interconversions, Binary coded decimal (BCD), Addition and subtraction of binary numbers, 1S, 2S and 10S compliment, basic logic gates, NOR, NAND, Ex-OR, Ex-NOR and their truth table, Half adder, Full adder, Half subtractor and full subtractor, Boolean equations, De Morgan's theorem and its verification.

References and Text books :

1. Op. Amps and Linear Intergated circuits 2nd Edition, by Ramakant Gaikwad,(PHI)
2. Digital and Analog Technique 1st Edition, by Navneet, Gokhale, Kale, (Kitab Mahal Nagpur)
3. Basic Electronics (Solid State), by B. C. Theraja.
4. Optoelectronics and fiber optics communication, by C. K. Sarkar, D.C. Sarkar.
5. Laser and Optical fiber communication, by P.Sarah.
6. An introduction to fiber optics, by R. Allen Shotwell.
7. Optical fiber communication, by John M. Senior.
8. Communication Electronics, by A. Kumar
9. Digital Electronics, by V. K.Jain
10. Digital Principle and Application, by Malvino and Leach
11. Digital Electronics and It's Application, by R. P. Jain
12. Digital computer Electronics, II nd Edition, by Malvino, (TMH)

SUBJECT: PHYSICS

B.SC. –III SEMESTER - VI

BPTS63: PAPER-III PHYSICS PRACTICAL

1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of practical examination in 6 hours.
2. The distribution of practical/laboratory work of 30 marks is:

Two experiments (9 Marks each)	- 18
Marks Record book	- 06
Marks	
Viva Voce	- 06 Marks

Total	30 Marks

OBJECTIVES:

1. To disseminate the practical knowledge of amplifiers and fiber optics
2. To disseminate the practical knowledge of digital and communication electronics
3. Provide opportunities for scientific study, experimentally

OUTCOMES:

1. Students develop experimental skills in amplifiers, fiber optics, digital circuits and communication devices
2. They analyze experimental limitations and precautions
3. They become skillful to design and perform experiments with good accuracy

List of the experiments:

1. To draw the histogram of theoretical Gaussian curve.
2. Recording and analysis of ECG Signals.
3. Verification of Beer's- Lambert's law.
4. To determine pH value of Amino acids.
5. Measurement of BP and recording of Kortov sound.
6. Measurement of body temperature using GSR and thermister probe.
7. Measurement of skin resistance using GSR.
8. To draw the plateau curve of a given Geiger Muller counter
9. Study of Op. Amp. as an Inverting and Non Inverting amplifier.

10. Study of Op. Amp. as an Adder and Subtractor.
11. Study of Op. Amp. as an Integrator and differentiator.
12. To construct and study the working of a phase shift oscillator.
13. Study of Hartley Oscillators.
14. Study of Colpitts Oscillators.
15. Study of Amplitude modulation.
16. Study of diode as an AM detector.
17. Study of diode as clipper, clamper and voltage doublers.
18. Study of Frequency modulation using IC.
19. Study of F M detector using IC.
20. Study of basic gates (AND, OR, NOT)
21. Study of logic gates (using IC) and verification of De Morgan's theorem.
22. To study the characteristics of NAND/NOR gate and its use as a universal gate.
23. Verification of laws of Boolean algebra using NAND gate.
24. Study of Ex- OR gate as a half adder and full adder.
25. Study of Ex- OR gate as a half subtractor and full subtractor.

Books for Experimental Physics :

1. B. Sc. practical physics, by Harnam Singh, DR. P.S. Hemne , S Chand Publications
2. Practical Physics, Volume-I, II by Gupta and Kumar.
3. Advanced practical physics, Volume I, II by DR. S. P. Singh.
4. Advanced Viva- Voce in physics, Volume I, II by Gupta and Narain.
5. Laboratory Physics, Part A and B, by Berkeley Physics Laboratory.
6. Laboratory Physics (Laser Exp.), by Berkeley Physics Laboratory.
7. University Practical Physics with Viva Voce, by C. K. Bhattacharya (C. B. S. Publications, Delhi).
8. A Textbook of Practical Physics, by Brijlal and Subramanyam.
9. Introduction to Experimentation, by B. J. Brinkwork (The English University Press Ltd.).
10. Advanced Practical Physics, Vol. I and II, by M. S. Chauhan, S. P. Sinha.
11. Experimental Physics, by C. Daish (Hodder and Sons, 1970).
12. Practical Physics for B. Sc., by A. Dhanalaxmi , A Williams .
13. Experiments in Electronics, by Paunik S. Jabbar.
14. Digital Electronics Practice, by Jain, Anand Integrated Circuits, (Tata Mc Graw Hill).
15. A Laboratory Manual of Physics for Undergraduate Classes, by D. P.

Khandelwal (Vani Publishing House, New Delhi).

16. Experiments in Modern Physics, by Olon.
17. B. Sc. Practical Physics, by K. Hanumantha Rao, D. P. Siva Ramrah, V. Krishna Murthy.
18. Advanced Practical Physics, by S. S. Sharma (Business Promotion Bureau, Delhi).
19. B. Sc. Practical Physics by Harnam Singh (S Chand).
20. Advanced Practical Physics, by S. P. Singh (Pragati Prakashan).
21. Experiments in Electronics, by S. V. Subramanyam (Macmillan India Ltd.).
22. Experimental Crystal Physics, by W. A. Wooster, A. Breton.
23. Introduction to Biomedical Electronics, by Joseph Bovy (Mc Graw Hill).
24. Handbook of Biomedical Instrumentation, by R. S. Khandpur.
25. Acoustic Measurement, by L. Beranek.
26. Fundamentals of Acoustics, by Kinsler, Frey.
27. Solar Cells, by M. A. Green.
28. Electronic Communication, by Roddy Coolen.