# Karnataka State Women's University Bijapur

# Syllabus for B.Sc course (Sem-I to VI) in Physics Subject

## B.Sc. I – Semester

Paper 1.1: Mechanics and properties of matter

### Units – 1

**1. Frames of reference:-** (7 Hrs)

Inertial frame, Galilean principle of relativity Galilean transformation equations: Transformation of position, distance, velocity and acceleration. Conservation of Momentum and Energy 'Non inertial frames, fictitious force, Rotating frame of reference, concept of carioles forces, (derivation), Center of mass, motion of Center of mass, Center of mass as a frame reference.

**2. Elements of satellite motion:** (5 Hrs)

Expression for orbital velocity, time period and escape velocity of a satellite. Expression for closed and open orbits, Geo-stationary satellite, Weightlessness, artificial Gravity in space station.

**3. Rigid bodies:** (10 Hrs)

Rotational motion about an axis, angular momentum and rotational energy. Derivation of expression for K E energy of rotation. Theorems on moment of inertia: Examples of MI: circular disc, annular ring, rectangular rod, hollow and solid cylinders (all cases). Theory of compound pendulum (Expression for time period). Inter changeability of center of suspension and oscillation. Four collinear point about which periods are same. Condition for maximum and minimum time period. Determination of 'g', using bar pendulum.
L Vs T and $L^2$ Vs $LT^2$ graph.

### Unit - 2

**4. Angular Motions:-** (5 Hrs)

Motion along a circular path, centripetal and centrifugal force (with derivation). Motion along a curved path: Expression for radial and transverse components of velocity and acceleration.

**5. Conservation Laws:-** (17 Hrs)

a) Linear momentum: Law of conservation of linear momentum for a system of particles . Collision between two particles, Inelastic collision and elastic collision in one dimension in laboratory and center of mass frame of reference, Conservation of momentum in case of variable mass: Example Single stage rocket -Expression for velocity (taking weight into consideration),
b) Angular momentum: Definition of angular momentum its relation of angular velocity and torque. Conservation of angular momentum, central force, Kepler's laws of planetary motion (with derivation).
c) Energy: Conservation of energy as a basic principle, Illustration with derivation: S.H.M of a light spiral spring.

### Unit - 3

**6. Elasticity:** (7 Hrs)

Modulii of elasticity for isotropic materials, relation between elastic constants (with derivation). Poisson ratio, expression for work done per unit volume in three type of strain (with derivation). Bending of beam: Neutral axis, Expression for bending moment, theory of light cantilever (wt. of the beam is not taken into account). Torsion: Tortional pendulum, Expression for couple per unit twist.

**7. Gravitation:** (3 Hrs)

Newton's law of gravitation – statement and derivation. Gravitaional potential

**8. Surface Tension:** (3 Hrs)

Cohesive and adhesive forces. Surface tension, angle of contact and surface energy. Effect of temperature and impurity. Pressure with in a curved surface with example.

**9. Viscosity:** (3 Hrs)

Streamline and turbulent motion: Derivation of Poiseulle's Equation, Stoke's law. Effect of temperature on viscosity.

**Reference Books:**

1. Mechanics by D.S Mathur.
2. Mechanics by J.C. Upadhaya.
3. Properties of matter by D.S. Mathur
4. Properties of matter by Brijilal and Subramanyam.

Paper 1.2: Physics Practical

Note:

- Each experiment is of 3 hours duration.
- Two practical sessions per week
- Minimum of 12 experiments are to be carried out.

Lab Experements:

1. Bar pendulum L Vs T graph.
2. Bar pendulum $L^2$ Vs $LT^2$ graph.
3. Spiral spring – determination of 'g' and unknown mass.
4. M.I. of a fly-wheel by graphical method.
5. Tensional pendulum - rigidity modulus.
6. M.I. of an irregular body.
7. Verification of parallel axes theorem of M.I.
8. Verification of perpendicular axes theorem of M.I.
9. Y – by stretching and determination of unknown mass.
10. Verification of Hook's law.
11. Y – by uniform bending – load depression graph.
12. Y – by cantilever – load depression graph.
13. Y – by cantilever by oscillation method – (graphical method)
14. Rigidity modulus – static torsion.
15. Searle's double bar determination of Y, n and K.
16. Interfacial surface tension.
17. Co-efficient of viscosity by Stocke's method.
18. Detraction of critical pressure for streamline flow.
19. Surface tension by drop weight method.
20. Poission ratio of rubber tube.
21. Viscosity by Poiseuille's method.
22. Radius of capillary tube by mercury pellet method.
23. Y – by Koening's method – (Determination of unknown load)

Reference:

1. Experimental physics - M.A. Hippargi.
2. Experimental physics – Gadad & Hiregoudar.
3. Practical physics - C. L. Arora.
4. Advanced practical physics – Worsnop and Flint.
5. Practical physics – Gupta & Kumar Vol I, Vol II

B.Sc II – Semester

Paper 2.1 - Heat, Thermodynamics, Wave and oscillations

## Unit - 1

**1. Kinetic Theory:** (6 Hrs)

Maxwell's law for distribution of molecular velocity (no derivation) mean free path, rms velocity, Degrees of freedom, principle of equi partition of energy, application to the specific heat of gases.

**2. Thermodynamics:** (14 Hrs)

First law of thermodynamic. Isothermal and adiabatic changes, work done in isothermal and adiabatic changes. PV diagrams. Second law of thermodynamics,Heat engine, expression for efficiency of Carnot's cycle, reversibility of Carnot's cycle. Principle of refrigeration. Carnots theorem. Entropy: change of entropy in reversible cycle, principle of increase of entropy in irreversible process. Entropy of universe, temperature- entropy diagram, entropy of perfect gas, Third law of thermodynamics. Clausius and Clayperon equation for variation of melting and boiling points.

## Unit - 2

**3. Low temperature physics:** (10 Hrs)

Ideal and real gases, Andrew's experiments, porous plug experiment, expression for temperature of inversion, principle of regenerative cooling. Liquefaction of air, Oxygen and helium. Production of low temperatures by an adiabatic demagnetization (qualitative)

**4. Radiation:** (10Hrs)

Black body radiation, Stefan's law(derivation), Distribution of energy in black body spectrum, statement of Wein's and Rayleigh – Jean's Law. Plank's quantum theory of radiation, derivation of Plank's law. Wein's and Rayleigh – Jean's Law from Plank's radiation law. Radiation momentum and pressure, Croke' radiometer.

## Unit - 3

**5. Waves and oscillations:** (15 Hrs)

Progressive wave: Equation for wave in one dimension (general form), differential equation for wave motion. Expression for relation between amplitude and intensity. Expression for velocity of progressive wave in a medium, Newton's formula with derivation. Leplace's correction. Expressin for stationary longitudinal vibration in a rod. Expression for harmonics in fixed at both ends and free at both ends of the rod. Vibration of a stretched string harmonics. Super position of SHM's Lissajou's figure, composition of two SHM of equal periods at right angle (Analytica treatment) beats, Expression for beat frequency.

Forced Vibration: Equation for damped vibrations, forced vibration solutions in exponential form. Resonance expression for amplitude and phase at resonance.

**6. Applied acoustics:** (5 Hrs)

Sound transducer's and their characteristics Microphone and speaker (principle of operation), requisites of good auditorium, reverberation time. Sabine's formula (with derivation).

Reference:
1. Sound by Khanna and Bedi
2. Wave and oscillations by A.P. Frech.
3. Text book of sound by Brijilal and Subramanyam.
4. Text book of Heat by D.S. Mathur.
5. Heat and thermodynamics by J.B. Rajam
6. A treatise on heat by Sha and Shrivastave.
7. Heat and thermodynamics by Brijilal and Subramanyam.

## Paper 2.2 : Physics Practical

Note:

- Each experiment is of 3 hours duration..
- Two practical sessions per week
- Minimum of 12 experiments are to be carried out.

Lab Experements:

1. Specific heat by cooling – graphical mthod.
2. Emissive of surface.
3. Thermal conductivity of good conductor by Searle's method.
4. Thermal conductivity of bad conductor by Lee's and Charlaton's method.
5. Determination of Stefan's constant for Black body radiation.
6. Diameter of molecule by Monte carle method
7. $\gamma$ - by Clement and Desorme's method
8. Verification of Stefan's – Boltzmans law
9. Thermal conductivity of rubber tube.
10. J – by Electrical method (applying radiation correction by graphical method),
11. Measurement of temperature using thermo couple.
12. Helmholtz resonator.
13. Velocity of sound through a wire using Sonometer.
14. Determination of frequency of a n electrically maintained tuning fork .
15. Determination of Latent heat of a vaporization of a liquid.
16. To verify the laws of transverse vibration using sonometer.
17. To verify the laws of transverse vibration using Melde's apparatus.
18. To compare the mass per unit length of two strings using Melde's apparatus.
19. Frequency of AC by using sonometer.
20. J – by continuous flow method.
21. velocity of sound using Kunds tube.

Reference:
1. Experimental physics - M.A. Hippargi.
2. Experimental physics – Gadad & Hiregoudar.
3. Practical physics - C. L. Arora.
4. Advanced practical physics – Worsnop and Flint.
5. Practical physics – Gupta & Kumar Vol I, Vol II

**B.Sc.** III – Semester

Paper 3.1 – Optical instruments, Laser and Electrodynamics

## Unit - 1

**1. Optical Instruments:** (10 Hrs)

Cardinal points of a lens system- two thin lenses separated by a distance (derivation) Spherical aberration – reducing spherical aberration. Chromatic Aberration in lens, Achromatic combination of lenses in contact, and separated by a distance(calculus method) Huygen's and Ramsden eye pieces. Resolving power of telescope and microscope.

**2. Lasers:** (10 Hrs)

General principles of lasers – Properties of lasers action spontaneous and stimulated emission of radiation, population inversion, optical pumping. He-Ne laser (Principle and working) Semiconductor laser, Laser applications, Holography.

## Unit - 2

**3. Vector analysis:** (12 Hrs)

Scalar and vector fields, gradient, divergence and curl (qualitative) and their physical significance, vectors identities-

- Div(grad S)=$\nabla^2$S
- Curl (grad S)= 0
- Curl curl **A** = grad (div A) - $\nabla^2$**A**
- Div curl **A** = 0
- Curl (**A** x **B**) = **A** div **B** – **B** div **A**
- Prove that $\nabla(\varphi + \psi) = \nabla\varphi + \nabla\psi$
- If **r** is the position vector of a point, Prove that curl **r** = 0

. Statement and proof of theorems of Gauss and Stokes.

**4. Electrostatics:** (4 Hrs)

Static electric charge, Columbs law , the electrostatic field and Gauss's law, the electric potential, poison and Laplace equation (vector notation). Application of Gauss law: Field outside a charged sphere and cylinder.

**5. Magneto static:** (4 Hrs)

Study current, Boit – Savart law, Magnetic field at a point due to a straight current carrying conductor, magnetic filed at any point on the axis of a circular coil carrying current, field at the center of the coil, and magnetic field on the axis of a solenoid (at the centre and at one end).

## Unit - 3

**6. Electro magnetism:** (20 Hrs)

Non –steady currents and charges, Faraday's laws of electro magnetic induction, concept of dipole, Ampere's circuital law, current loop as a dipole, torque on a dipole, Maxwell's field equations (derivation) Equation of continuity, displacement current.Equation for a plane electro magnetic waves: 1) Electromagnetic waves in free space 2) electromagnetic waves in isotropic non-conducting medium.(dilectric) Pointing vector (derivation,).. Production of electromagnetic waves - Hertz experiment

Reference Books:

1. Electricity and magnetism by K.K Tiwari.
2. Electricity and magnetism by D.N. Vasudev
3. Vector Analysis by D.N. Chatarjee.
4. Vector Analysis by Shyam series.
5. Introduction to Electrodynamics by Devid. F. Griffiths.
6. College Physics Vol II by N. Sunderajan & others.
7. Electricity and magnetism by Brijilal & Subramnyam.

## Paper 3.2 : Physics Practical

Note:

- Each experiment is of 3 hours duration.
- Two practical sessions per week
- Minimum of 12 experiments are to be carried out.

Lab Experiments:

1. Types of error (examples of from any of the experiments)
2. Analysis of random error (Binomial Distribution coin tossing)
3. Analysis of random error (Gaussian Distribution Length/distance)
4. Damped Oscillations.
5. $B_H$ using Helmholts Galvanometer.
6. Measurements of low resistances using potentiometer.
7. Field along the axis of a circular coil.
8. Determination of specific conductance of electrolyte.
9. Plot a graph of temperature difference between the two junctions and thermo e.m.f of thermo couple using potentiometer.
10. Desauty's bridge using B.G./Spot galvanometer/head phone.
11. Dispersive power of a prism.
12. Cauchy's Constant.
13. R.P. of grating
14. R.P. of telescope
15. L.B. Photometer
16. Searles goniomerer.
17. Verification of Newton's formula for a lens separated by a distance.
18. Liquid lens (R.I.)
19. Determination of R.I. using Laser.
20. Determination of $\mu_o$ and $\mu_e$ using Laser/Monochromatic source.
21. Diffraction grating using Laser (Determination of $\lambda$)
22. Diameter of a wire using Laser.

Reference:

1. Experimental physics - M.A. Hippargi.
2. Experimental physics – Gadad & Hiregoudar.
3. Practical physics - C. L. Arora.
4. Advanced practical physics – Worsnop and Flint.
5. Practical physics – Gupta & Kumar Vol I, Vol II

B.Sc IV – Semester
Paper 4.1 – Physical optic and Electricity

## Unit - 1

**1. Theories of light:** (7 Hrs)

Corpuscular theory, Wave theory: Huygen's principle, explanation of laws of reflection & refraction.(plane wave front at plane surface )Group velocity & wave velocity - relation between them. Quantum nature, concept of Photon.

**2. Interfereence:** (13 Hrs)

Coherent sources interference by division of wave front, Young's double slit-theory and experiment, Freshel's Bi – prism –theory and experiment (determination of $\lambda$) Lloyd's mirror interference by division of amplitude, thin film of uniform thickness (both reflected and transmitted ) and wedge shaped film, Newton's ring – theory and experiment. Experimental determination of refractive index of liquid. Michelson Interferometer (determination of wave length $\lambda$ and $d\lambda$ only).

## Unit - 2

**3. Diffraction:** (11 Hrs)

Concepts of Fresnel and Franuhoffer diffiraction. Rectilinear propagation of light, theory of Zone plate, comparison between zone plate and converging lens. Fresnel's diffraction at straight edge and wire. Fraunhoffer diffraction at a single slit, derivation of intensity expression double slit with theory. Transmission grating theory and experiment (determination of wave length of light) dispersion and resolution of grating.

**4. Polarization:** (9 Hrs)

Double refraction in uni-axial crystals. Huygen's theory, positive & negative crystals. Principle refractive indices Huygen's construction of 'O' & 'E' wave in uni-axial crystal for plane wave front (all cases) Quarter wave & half wave plate.

Production and detection of plane, circularly and elliptically polarized light, Babinet compensator, optical activity, Fresnel's theory. Laurent's half shade polarimeter.

## Unit - 3

**5. Alternating Current:** (15 Hrs)

RMS value, response of LR, CR and LCR circuits to sinusoidal voltages (using j symbols) series and parallel resonance, half power frequency, band width, Q-factor, power in electrical circuits, power factor. Maxvell's bridge determination of L and C. Anderson's bridge, determination of L. Filters: High pass and Low pass filters with LR and CR combinations, cutoff frequency, Band pass filter and band stop filter.

Rectifiers: Half wave, Full wave – derivation of expression for $I_{dc}$, $V_{dc}$, $I_{rms}$, $V_{rms}$ & hence ripple factor and efficiency.

**6. CRO** (5 Hrs)

Study of CRO ( construction and working) Measurement of voltage, and frequency.

Reference Books:

1. A text of optics by Brijila and Subramanyam.
2. Optics by Ajoy Ghatak.
3. Optics by Zenken's and White.
4. A text of optics by D.S. Mathur
5. Modran physics by D.V.N. Rao
6. Modern physics by Murugeshan.

## Paper 4.2 : Physics Practical

Note:

- Each experiment is of 3 Hrs duration.
- Two practical sessions per week
- Minimum of 12 experiments are to be carried out.

Lab Experiments:

1. Interference at a wedge measurement of thickness.
2. Newton's Rings – radius of curvature.
3. Diffraction grating Normal incidence.
4. Diffraction grating minimum deviation.
5. Diffraction at a wire.
6. Specific rotation of sugar solution.
7. Bi-prism – Determination of $\lambda$.
8. Thickness of a thin film of Bi-prism
9. Brewster's law – polarization
10. Double refraction ($\mu_e$ and $\mu_o$)
11. Y – by Corlus method.
12. Dispersive power of plane diffraction grating.
13. Diffraction a straight edge.
14. Disauty's bridge AC using head phone.
15. Charging and discharging of RC ckt.
16. Study of electro magnetic induction by oscillation of bar magnet.
17. Mutual induction by direct method.
18. LCR series resonant Circuit for atleast two values of resistance
19. LCR Parallel resonant circuit for atleast two values of resistance.
20. Maxwell's bridge to determine L.
21. Anderson's bridge to determine L.
22. High pass and low pass filter (RC or RL or LC)

Reference Books:

1. Experimental physics - M.A. Hippargi.
2. Experimental physics – Gadad & Hiregoudar.
3. Practical physics - C. L. Arora.
4. Advanced practical physics – Worsnop and Flint.
5. Practical physics – Gupta & Kumar Vol I, Vol II

**B.Sc.** V – Semester

Paper 5.1 – Atomic Molecular Physics & Special theory of Relativity

**Unit - 1**

**1. Properties of atom:** (8 Hrs)

Properties of Cathode rays, Effect of electric and magnetic field on electrons, Determination of charge of an electron by Millikon's oil drop method, e/m by J.J.Thomson and Dunnington's method. Determination of atomic mass by Dempster's method.

**2. Models of atom:** (11 Hrs)

Review or Rutherford's model, Rutherford's alpha scattering experiment (qualitative), Bohr's theory Hydrogen atom and its inadequacies, effect of nuclear mass, Sommerfield model (qualitative study), Excitation and ionization energy and potentials. Frank – Hertz experiment.

**Unit - 2**

**3. Vector atom model:** (11 Hrs)

Space quantization, electron spin, quantum numbers and Paul's exclusion principle. Fine structure of spectral lines. Stern-Gerlach experiment: degeneracy associated with magnetic quantum number, selection rules. Coupling schemes, L.S. and J.J.Coupling for two electrons system, Zeeman effect: Normal and anomalous (quantum mechanical explanation). Stark effect (qualitative).

**4. X-ray Spectra:** (4 Hrs)

Continues and characteristics spectra, Mosley's law, Duane-Hunt limit.

**5. Molecular spectra:** (7 Hrs)

Introduction to molecular spectra – classification of molecular spectra – Electronic –pure rotation and vibration spectra of diatomic molecules (Eigen value equation) Band structure – Fluoresence and phosphorescence.

**Unit -3**

**6. Scattering of Light:** (6 Hrs)

Brief discussion on Tyndall, Reyleigh, Brillouin and Raman scatterings. Raman effect – Experiment study of Raman effect – Quantum theory of Raman effect. Intensity of Raman lines – polarization of Raman line (Qualitative study). Determination of molecular structure by using Raman effect.

**7. Special Theory of Relativity:** (9 Hrs)

Inertial and non inertial frame of references, Michelson Morely experiment. Postulates of special theory of relativity – Larentz transformation equation – Length contraction and time dilation – Relativity of simultaneity concept of proper frame, proper length, proper time – relativistic velocity transformation equations – Variation of mass with velocity. Einstein's mass energy relation – (with derivation) Energy momentum relationship – concept of four vectors – Minkowisky space.

Reference Books:

1. Modern Physics by R. Murgeshan
2. Lasers by Adikeshalu
3. Modern Physics by Brijialal and Subramanyam
4. Atomic Physics by Ghatak
5. Modern Physics b Ghatak
6. Introduction to Molecular Physics by Banwell
7. Atomic Physics by H.E. White
8. Laser Experiments by Shirohi
9. An introduction to Lasers by M.N. Avadhanulu

## Paper 5.3 Physics Practical

Note:

- Each experiment is of 3 Hrs duration.
- Two practical sessions per week
- Minimum of 7 experiments are to be carried out.

Lab Experiments:

1. Temperature of flame by line reversal method.
2. Rydberg Constatn.
3. Charge of an electron by dispersion method.
4. e/m – by Thomoson method.
5. h –by photocell.
6. Thermionic emission – Child's law.
7. Calibration of thermister – determination of temperature co-efficient resistance and unknown temperature.
8. Spectral response of photo conductor (LDR).
9. Charge of an electron by Millikan's oil drop method.
10. Excitation and ionization potentials.
11. e/k using tansistor
12. Energy gap of a diode by reveres saturation method.
13. Capacitance of a reverse bias diode.
14. Determination of h using LED or Photo diode.

Reference Books:

1. Experimental physics - M.A. Hippargi.
2. Experimental physics – Gadad & Hiregoudar.
3. Practical physics - C. L. Arora.
4. Advanced practical physics – Worsnop and Flint.
5. Practical physics – Gupta & Kumar Vol I, Vol II

**B.Sc.** V – Semester

Paper 5.2 – Quantum Mechanics, Nuclear Physics and Energy Physics

## Unit - 1

**1. Elements of Quantum Mechanics:** (20 Hrs)

Failure of classical mechanics – origin of quantum theory – particle nature of waves – Compton scattering (theory) – wave nature of particle – experiment of Davisson and Germer, Concept of matter waves – Uncertainty principle – Illustrations by gamma ray microscope and Diffraction at a single slit. Schrodinger's wave equation (time dependent and independent), Interpretation of wave function. Application of Schrodinger's equation – particle in a box – solution for one dimension – extension to three dimensions – degeneracy – Harmonic Oscillator (Qualitative) – zero point energy

## Unit - 2

**2. Properties of nucleus:** (10 hrs)

Constituents of Nucleus – Proton electron and proton - neutron hypotheses of nucleus – properties (Qualitative) – distribution of mass, charge, size, density, spin and magnetic moment. Binding energy of nucleus (Specific B E). Nuclear forces – characteristics of nuclear forces YUKAWA theory (qualitative). Nuclear models – liquid drop model, shell model, (qualitative) – nuclear energy levels and magic numbers.

**3. Radioactivity:** (10 Hrs)

Radioactivity decay law – half life and mean life (derivation) – successive radioactive disintegration. Radioactive equilibria – transient and secular equilibrium.

**Alpha Rays:**

Range and energy – determination of range of an $\alpha$ particle by Braggs method. Theory of Alpha decay (Qualitative). Geiger Nuttel law.

**Beta Rays:**

Beta ray spectrum continuous and line spectrum. Pauli's Neutrino hypotheses

**Gamma Rays:**

Gamma ray spectra – attenuation of gamma rays –

Applications of nuclear radiations : industrial, medical, agriculture

## Unit - 3

**4. Nuclear Instruments:** (6 Hrs)

Particle accelerators: Linear accelerators ,Cyclotron, Betatron,.

Detectors: GM counter: Construction, working, dead time, operating voltage, paralysis time, internal quenching. Scintillation counter

**5. Elementary Particles:** (3 Hrs)

Classification of elementary particles, particles and anti particles, four basic interaction in nature. Quark model of elementary particles.

**6. Alternate energy source:** (6 Hrs)

Energy source: Energy crisis, resources of energy. conventional and non-conventional energy sources Brief description and utilization of other sources of energy : solar energy, Wind energy, Tidal energy and Bio energy.

**7. Nuclear Energy:** (8hrs )

Concept of nuclear fission – Q value of nuclear reaction(derivation) Controlled and uncontrolled chain reactions. Types of nuclear reactors Power reactor (Construction and

working) , concept of nuclear fusion, thermo nuclear reaction, C-N cycle and P-P cycle, Magnetic confinement of Plasma.

Reference Books:

1. Modern Physics by R. Murgeshan
2. Nuclear Physics by D.C. Tayal
3. Non – Conventional energy sources by G. D. Rai
4. Energy technology by S.Rao and B.B. Barulekar.
5. Nuclear reactor engineering by S. Glass ton and A. Sesonke.
6. Introduction to nuclear Physics by Kenneth crane (John – Wiley)

## Paper 5.4 : Physics Practical

Note:

- Each experiment is of 3 Hrs duration.
- Two practical sessions per week
- Minimum of 7 experiments are to be carried out.

Lab Experiments:

1. Analysis of random error, Poission distribution static's of nuclear counting (data may be provided)
2. Characteristics of GM tube.
3. Verification of Inverse square law using GM tube.
4. Determination of half life using GM tube.
5. Absorption co-efficient of aluminum of beta rays.
6. Attenuation of co-efficient of gamma rays.
7. Earth inductor.
8. Power supply using bridge rectifier.
9. Construction of simple millimeter.
10. V – I characteristics of solar cells.
11. Temperature co-efficient of metals

Reference Books:

1. Experimental physics - M.A. Hippargi.
2. Experimental physics – Gadad & Hiregoudar.
3. Practical physics - C. L. Arora.
4. Advanced practical physics – Worsnop and Flint.
5. Practical physics – Gupta & Kumar Vol I, Vol II

**B.Sc** VI – Semester

Paper – 6.1 Statistical Physics and solid state physics

**Unit - 1**

**1. Statistical Physics:** (10 Hrs)

Statistical ideas in physics – phase space, Ensemble – Canonical , Mircro canonical, grand canocical. Maxwell – Boltzman, Bose-Einstein and Fermi-Dirac Distribution function and their comparison.

**2. Astrophysics** (8 hours)

Scope of Astronomy and Astrophysics. Definition of Light year. Luminosity of stars, apparent and absolute magnitudes.. Colour and surface temperature of stars. Stellar spectra, spectrum classification of stars, the HR diagram, Milky way galaxy.

**Unit - 2**

**3. Crystal structure:** (6 Hrs)

Concept of lattice, periodic crystal, unit cell, Bravais lattice, Crystal planes and Miller indices. Interplanar spacing interms of miller indices. X-ray diffraction, Bragg's law, Bragg spectrometer (construction and working), powder method. Structure of NaCl and KCL.

**4.Crystal binding** (Qualitative) Ionic, Covalent, Metalic, Molecular and Hydrogen bonding. (3 hours)

**5. Specific heat of solid** (3 hrs)

Dulong and Petit's law, Einstein's theory and Debye's theory.(derivation)

**6. Band theory of Solids:** (8 Hrs)

Classification of solids into Conductors, Semi conductors and Insulators Intrinsic and extrinsic semi conductors. Derivation of expression for Electron density, hole density and Electrical conductivity in intrinsic semi conductor Experation for Fermi level in intrinsic sand extrinsic semiconductors. PN juncition diode and Zener diode. Hall effect : Expression for Hall co-efficient, Expeimental determination of Hall Co-efficient Importance of Hall effect.

**Unit - 3**

**4. Electrical and thermal properties:** (7 Hrs)

Free electron theory of metals, expression for electrical and thermal conductivities, Ohm's law, calculation of electron density of states, Concept of Fermi energy, expression for Fermi energy as a function of temperature.(at absolute zero)

**6. Magnetic properties of materials:** (7 Hrs)

Dia, Para and Ferro magnetism - qualitative explanations . Classical and Quantum theory of Paramagnetism (Currie law Currie-Weiss law)

**7. Super conductivity:** (6 Hrs)

Elementary ideas of super conductivity and experimental facts, Meissner effect, Critical magnetic field, persistant current, London's equations. Type I and Type II super conductors. Applications of super conductors.

Reference Books:

1. Statistical Mechanics by ESR Gopal.
2. Statistical Mechanics by K Huang.
3. Modern Physics by Murugeshan
4. Introduction to Solid state physics by C. Kittel
5. Solid state Physics by A. J. Dekkar
6. Introduction to solid state Physics by J.S. Black More.
7. Elementary solid state Physics M. Ali Omer.
8. Solid state Physics by S. O. Pillai.

## Paper 6.3 : Physics Practical

Note:

- Each experiment is of 3 Hrs duration.
- Two practical sessions per week
- Minimum of 7 experiments are to be carried out.

Lab Experiments:

1. B-H Curve using Magnetometer.
2. Energy gap of a semiconductor.
3. Determination of Debeys temperature (Example Tin)
4. Determination of dielectric constant of liquid.
5. Determination of dielectric constant of solid.
6. Spectral response of photo diode.
7. Resistance measurement of a semiconductor by Vandes Pau's method
8. Measurement of resistance of thin film by four probe method
9. Measurement of Hall co-efficient.
10. Inter planer spacing. Using XRD -pattern
11. Determination of curie temperature of ferromagnetic material.
12. Temperature co-efficient of resistance of semiconductor.
13. Measurement of thickness of thin film by Gravimeter/optical/electrical method.
14. Energy gap of thermistor.
15. Characteristics of PN junction.
16. Study of CRO (Measurement of voltage frequency & comparision of frequencies using Lissajour figures.)
17. Characteristics of Zener diode
18. Zener diode as voltage regulator

Reference Books:

1. Experimental physics - M.A. Hippargi.
2. Experimental physics – Gadad & Hiregoudar.
3. Practical physics - C. L. Arora.
4. Advanced practical physics – Worsnop and Flint.
5. Practical physics – Gupta & Kumar Vol I, Vol II

**B.Sc** VI – Semester

Paper – 6.2 Network theorems, Optoelectronics and Electronics

## Unit - 1

**1. Network theorems:** (6 Hrs)

Kirchoff's laws -Proof (Mesh analysis), Super position theorem(proof), Thevenin's and Norton's theorem(only thevinising and nortonising without proof), Maximum power transfer theorem (proof) and its applications.

**2. Optoelectronics:** (5 Hrs)

Optical fibers, structure, pulse dispersion and modes of propagation of light through optical fibers, critical angle of propagation, angle of acceptance, expression for numerical aperture and fractional refractive index change, application of optical fibers and advantages..

**3. Digital electronics :** (9 Hrs)

Conversion to Binary to decimal and decimal to binary Logic system, Types. Logic gates: AND, OR,(analysis using diodes) NOT, NOR, NAND, (analysis using diodes or transistors) XOR gate Conversion of universal to basic gates Half and full adder, flip-flop, RS, JK and master slave flip-flop,

## Unit - 2

**3. Bipolar junction Transistor:** (10 Hrs)

Introduction, ( types and action) Characteristics and parameters of common emitter configuration, D C load line, operating point. Need for transistor biasing Self biasing of a transistor, JFET Construction, working & characteristics Inter relationship between the parameters and MOSFET (E & D).Construction

**4. Amplifier:** (10 Hrs)

CE amplifier (Quantitative), CE amplifier its equivalent circuit using h-parameters, expression for voltage gain, current gain, power gain, input resistance and output resistances in terms of h parameters. Operational-amplifier Characteristics inverting and non inverting amplifier (Quantitative)

## Unit - 3

**5. Oscillators:** (4 Hrs)

Concept of feed back, positive and negative feedback. Expression for loop gain Barkhausen's criteria, phase shift oscillator and Wein's bridge oscillator Merits and demerits. Types of Negative feed back.(Qualitative) Advantages of negative feed back.

**7. Radio communication:** (13 Hrs)

Modulation modes of Radio wave propagation(Qualitative), need for modulation, amplitude modulation, modulation factor, side bands, band width, AM spectrum, power in AM wave. frequency modulation, FM spectrum, Demodulation, essentials of demodulation, diode detector circuit. Superhytrodyne receivers, block diagram of AM & FM receivers. Advantages of FM over AM. Applications

**8. Display devices:** (3 Hrs)

LED, construction and use of LED in display. Liquid crystal, types of liquid crystals. Basic principal of LCD and its construction, Comparison between LED and LCD.

Reference Books:

1. Solid state and Electronics by B L Theraja
2. Principles of Electronics by V K Mehta.
3. Digital principles and applications by Malvino and Leach
4. Electronics principle by Malvio
5. Electronics by Gupta.
6. Basic electronic by Grob.
7. Electronics made simple by V.K. Mehta.
8. Physics of Liquid Cryatal by P.G.Degenner
9. Liquid crystal by S. Chandrashekar
10. Net work analysis by B.L. Theraja.

## Paper 6.4 : Physics Practical

Note:

- Each experiment is of 3 Hrs duration.
- Two practical sessions per week
- Minimum of 7 experiments are to be carried out.

Lab Experimens:

1. Characteristics of transistor in CE configuration.
2. Characteristics of LED
3. Characteristics of FET
4. Characteristics of MOSFET
5. CE amplifier – study of frequency response and measurement of gain.
6. Phase shift oscillator
7. Wein bridge oscillator
8. Study of Logic gates using diodes and transistor/IC
9. Inverting Op_Amp.
10. Non-inverting Op_Amp.
11. RI of optical fiber
12. Verification of Thevenin's theorem.
13. Verification of Norton's theorem.
14. Maximum power transfer theorem.
15. CE amplifier

Reference Books:

1. Experimental physics - M.A. Hippargi.
2. Experimental physics – Gadad & Hiregoudar.
3. Practical physics - C. L. Arora.
4. Advanced practical physics – Worsnop and Flint.
5. Practical physics – Gupta & Kumar Vol I, Vol II

## SCHEME OF TEACHING & EXAMINATION

## B.SC PHYSICS SEMESTER SCHEME

| Sem | Paper no. | Course title | Teaching hours as per week | Internal assets | Semester end examination | | Total max marks for course. |
|---|---|---|---|---|---|---|---|
| | | | | | Duration hours | Maximum marks | |
| I | 1.1 | Mechanics & Properties of matter | 04 | 20 | 03 | 80 | 100 |
| | 1.2 | Physics practical | 3+3 | 10 | 03 | 40 | 50 |
| II | 2.1 | Heat,Thermodynamics, Waves & Oscillations | 04 | 20 | 03 | 80 | 100 |
| | 2.2 | Physics practical | 3+3 | 10 | 03 | 40 | 50 |
| III | 3.1 | Optical Instruments, Lasers & Optics | 04 | 20 | 03 | 80 | 100 |
| | 3.2 | Physics practical | 3+3 | 10 | 03 | 40 | 50 |
| IV | 4.1 | Physical Optics & Electricity | 04 | 20 | 03 | 80 | 100 |
| | 4.2 | Physics practical | 3+3 | 10 | 03 | 40 | 50 |
| V | 5.1 | Atomic & Molecular Physics and Special theory of relativity. | 04 | 20 | 03 | 80 | 100 |
| | 5.2 | Quantum mechanics, Nuclear Physics & Energy Physics | 04 | 20 | 03 | 80 | 100 |
| | 5.3 | Physics practical | 3+3 | 10 | 03 | 40 | 50 |
| | 5.4 | Physics practical | 3+3 | 10 | 03 | 40 | 50 |
| VI | 6.1 | Statistical Physics, Solid state Physics and Astrophysics | 04 | 20 | 03 | 80 | 100 |
| | 6.2 | Network theorems, Optoelectronics and Electronics | 04 | 20 | 03 | 80 | 100 |
| | 6.3 | Physics practical | 3+3 | 10 | 03 | 40 | 50 |
| | 6.4 | Physics practical | 3+3 | 10 | 03 | 40 | 50 |

**KARNATAKA STATE WOMEN'S UNIVERSITY, BIJAPUR**
**B.Sc. (Semester Scheme)**
**Syllabus for optional subject – Physics**

Blue print for Question paper

Maximum marks for each paper = 80

| Q. No. | Question Type | No. of Units in Syllabus | To be set | | To be attempted | | |
|---|---|---|---|---|---|---|---|
| | | | Questions Per Unit | Total No. Of Questions | No. of Questions | Marks/ Question | Total Marks |
| 1 | Objective | 3 | 5 | 15 | 12 | 1 | 12 |
| 2-7 | Short answers | 3 | 2 | 6 | 4 | 4 | 16 |
| 8 –13 | a) Long answer | 3 | 2 | 6 | 4 | 9 | 36 |
| | b) Problems | 3 | 2 | 6 | 4 | 4 | 16 |