KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA

Syllabus for B.Sc. Optional Physics

(Semester Scheme) with effect from

2018-19 and onwards

I and II semester syllabus Approved in BoS (UG) Biotechnology dated 14-05-2018
III and IV semester syllabus Approved in BoS (UG) Biotechnology dated 09-06-2019
V and VI semester syllabus Approved in BoS (UG)Biotechnology dated 30-01-2020

KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA

New syllabus of B.Sc. Physics Optional Subject, I- VI semesters, w.e.f. 2018-19 and onwards

Subject Code	Subject Title	Teaching Scheme Hrs/week		Examination			
				Exam. Duration (Hrs)	Marks		
		Theory	Practical		Theory/ Practical	IA	Total
BSc I Semester (w.e.f. 2018-19 and onwards)							
BSPHY 01	Mechanics and Properties of matter	4	--	3	60	10	070
	PRACTICALS (based on BSPHY 01)	--	6	3	20	10	030
BSc II Semester (w.e.f. 2018-19 and onwards)							
BSPHY 02	Heat, Thermodynamics and Waves And Oscillation	4	--	3	60	10	070
	PRACTICALS (based on BSPHY 02)	--	6	3	20	10	030
BSc III Semester (w.e.f. 2019-20 and onwards)							
BSPHY 03	Optical instruments, Laser and Electrodynamics	4	--	3	60	10	070
	PRACTICALS (based on BSPHY 03)	--	6	3	20	10	030
BSc IV Semester (w.e.f. 2019-20 and onwards)							
BSPHY 04	Physical optic and Electricity	4	--	3	60	10	070
	PRACTICALS (based on BSPHY 04)	--	6	3	20	10	030
BSc V Semester (w.e.f. 2020-21 and onwards)							
BSPHY 051	Atomic Molecular Physics & Special Theory Of Relativity	4	--	3	80	20	100
BSPHY 052	Quantum Mechanics, Nuclear Physics and Energy Physics	4	--	3	80	20	100
BSPHY 053	PRACTICALS (based on BSPHY 051 and BSPHY 052)	--	6	4	80	20	100
BSc VI Semester (w.e.f. 2020-21 and onwards)							
BSPHY 061	Statistical Physics and solid state physics	4	--	3	80	20	100
BSPHY 062	Optoelectronics Electronics and Nano materials	4	--	3	80	20	100
BSPHY 063	PRACTICALS (Based on BSPHY 061 and BSPHY 062)	--	6	4	80	20	100

BSc I SEMESTER

BSPHY 01	MECHANICS AND PROPERTIES OF MATTER
Teaching: 4Hrs/week Total Teaching Hours : 56	Exam. Marks: 60 IA Marks : 10

Unit I **8 Hrs**

Frames References: Inertial Frame, Galilean Principle of relativity, Galilean transformation equation: Transformation of position, distance, velocity and acceleration, invariance of laws of conservation of momentum and energy. Non inertial frames, fictitious force, rotating frame of reference, concept of Coriolis force and effect of Coriolis force, (Derivation), Centre of mass, motion of centre of mass, centre of mass as a frame reference.

Unit II **8 Hrs**

Conservation Laws: (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).

Unit III **8 Hrs**

(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 IV **8 Hrs**

Angular Motions: Motion along a curved path: Expression for radial and transverse components of velocity and acceleration.

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

Unit V **8 Hrs**

Rigid Bodies: Moment of Inertia, Theorems on moment of inertia: Examples of MI: circular disc, annular ring, rectangular bar, 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 VI **8 Hrs**

Elasticity: Introductory, Stress, Strain, Hooke's Law Moduli 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.

Unit VII **8 Hrs**

Surface Tension: Cohesive and adhesive forces, surface tension explanation on the basis of molecular theory, surface energy, angle of contact, pressure within a curved surface (with derivation) interfacial tension, Drop weight method with necessary theory. Factor affecting Surface tension.

Viscosity: Streamline and Turbulent motion: Derivation of Poiseulle's Equation, Stoke's law, effect of temperature on viscosity.

References:

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 Subramanayam.

BSPHY 01	**PHYSICS PRACTICAL**
Practical: 6 Hrs/week	Exam. Marks: 20 IA Marks : 10
Total No. of Practicals: 23	

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 graphs.
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 Stoke'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)

References:

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

BSc II Semester

BSPHY 02	HEAT, THERMODYNAMICS AND WAVES AND OSCILLATION
Teaching: 4Hrs/week Total Teaching Hours : 56	Exam. Marks: 60 IA Marks : 10

Unit I **8 Hrs**

Kinetic Theory: Postulates of Kinetic theory of Gasses, derivation of expression for pressure exerted by gas. Maxwell's law for distribution of molecular velocity (no derivation), Calculation average velocity, RMS velocity and most probable velocity. Mean free path, expression for mean free path. Degrees of freedom, principle of equipartition of energy, application to the specific heart of gases.

Unit II **8 Hrs**

Thermodynamics: First law of thermodynamics. 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. Carnot's theorem.

Unit III **8 Hrs**

Entropy: change of entropy in reversible cycle, principle of increase of entropy of 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 IV **8 Hrs**

Low temperature physics: 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).

Unit V **8 Hrs**

Radiation And Thermal conductivity: **Rigid Bodies:** 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.

Thermal conductivity: Thermal conductivity expression. Determination of thermal conductivity of bad conductor by Lee's Charlton's method

Unit VI **8 Hrs**

Waves and oscillations: 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. Laplace's correction. Expression for stationary longitudinal vibration in a rod. Expression for harmonics in fixed at both ends and free at both ends of the rod.

Unit VII **8 Hrs**

Vibration of a stretched string and Applied acoustics: Harmonics. Super position of SHM's lissajou's figure, composition of two SHM of equal periods at right angle (Analytical 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. Sound transducer's and their characteristics Microphone (Carbon) and speaker (Moving Coil), reverberation time. Sabine's formula (with derivation). Requisites of good auditorium.

Reference:

1. Sound by khanna and Bedi.
2. Wave and oscillations by A.P. Fech.
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

BSPHY 02	**PHYSICS PRACTICAL**
Practical: 6 Hrs/week	Exam. Marks: 20 IA Marks : 10
Total No. of Practicals: 18	

1. Specific heat by cooling-graphical method.
2. Emissive of surface.
3. Thermal conductivity of good conductor by Searle's method.
4. Thermal conductivity of bad conductor by lee's and Charlton's method.
5. Determination of Stefan's constant for Black body radiation.
6. Verification of Stefan's-Boltzmann's Law.
7. Thermal conductivity of rubber tube.
8. J-by Electrical method (applying radiation correction by graphical method),
9. Measurement of temperature using thermo couple.
10. Helmholtz resonator.
11. Velocity of sound through a wire using Sonometer.
12. Determination of frequency of an electrically maintained tuning fork.
13. Determination of Latent heat of a Vaporization of a liquid.
14. To verify the laws of transverse vibration using Sonometer.
15. To verify the laws of transverse vibration using Melde's apparatus.

16. To compare the mass per unit length of two strings using Melde's apparatus.
17. Frequency of AC by using method.
18. Velocity of sound using Kund's tube.

Reference:

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

BSc III Semester

BSPHY 03	OPTICAL INSTRUMENTS, LASER AND ELECTRODYNAMICS
Teaching: 4Hrs/week Total Teaching Hours : 56	Exam. Marks: 60 IA Marks : 10

Unit I **8 Hrs**

Optical Instruments: Aberration, Spherical aberration in the lens, Reducing Spherical aberration (Using stops, crossed lens, Plano convex lenses,2 Plano convex lenses separated by distance).Chromatic Aberration in a lens (Derivation: f_r-f_b= ωf) circle of least confusion (Derivation : d = ½ Dω) Minimising chromatic aberration in lens; condition for a achromatism of two lenses placed in contact(Method of calculus) condition for Achromatism of 2 thin lenses separated by a finite distance problems.

Unit II **8 Hrs**

Cardinal points: Cardinal points (Focal points, principal points, Nodal points) Expression for equivalent focal length of 2 thin lenses separated by a finite distance and principal points, power of a lens, expression for Newton's formula.Eye piece- Huygens &Ramsdens, problems.

Unit III **8 Hrs**

Lasers: General principles of laser, properties of lasers spontaneous and stimulated emission of radiation, population inversion, optical pumping. He-Ne laser (Principle and working) semiconductor laser, laser application, Holography.

Unit IV **8 Hrs**

Vector Analysis: Scalar and vector fields, gradient, divergence and curl (qualitative) and their physical significance,

Vectors identities-

1. ST $\nabla(\emptyset + \varphi) = \nabla\emptyset + \nabla\varphi$
2. ST $\nabla.(\emptyset A) = (\nabla\emptyset).A + \emptyset(\nabla.A)$
3. ST $\nabla.(A + B) = \nabla \times A + \nabla \times B$
4. ST $\nabla.(\nabla\emptyset) = \nabla^2\emptyset$
5. ST $\nabla \times (\nabla\emptyset) = 0$
6. ST $\nabla.(\nabla \times A) = 0$
7. Prove $\nabla \times (\nabla \times A) = \nabla(\nabla.A) - \nabla^2 A$
8. If r is the position vector of a point, prove that curl r = 0

Statement and proof of Gauss divergence theorem and Stokes theorem.

Unit V **8 Hrs**

Electrostatics and Magnetostatics: Electrostatics: static electric charges, 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.

Magneto statics : Steady current, Biot- Savart law, Magnetic field at a point due to straight current carrying conductor, magnetic field at any point on the axis of a circular coil carrying current, field at the centre of the coil, and magnetic field on the axis of solenoid(at the centre and at one end).

Unit VI **8 Hrs**

Electromagnetism-I: Non-Steady current and charges, Faraday's laws of electromagnetic induction, concept of dipole, Ampere's circuital law, current loop as a dipole, torque on a dipole, displacement current.

Unit VII **8 Hrs**

Electromagnetism-II: Maxwell's field equations (derivation) Equation of continuity, Equation for plane electromagnetic waves: 1) Electromagnetic waves in free space 2) Electromagnetic waves in isotropic non-conducting medium,(dielectric)Pointing theorem, Production of EM waves- Hertz experiment.

Referencs:

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 Schaum 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.
8. Electrostatic and magneto statics by B.B.Laud.
9. Text book of optics by Brijilal&Subramnyam.
10. Text book of optics by khanan&Gulati

BSPHY 03	PHYSICS PRACTICAL
Practical: 6 Hrs/week	Exam. Marks: 20 IA Marks : 10
Total No. of Practicals:	

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 Helmholtz 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. Searlesgoniomerer.
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 μ_o and μ_e using Laser/Monochromatic source.

References:

6. Experimental Physics – M.A Hippargi
7. Experimental Physics – Gadad&Hiregoudar
8. Practical Physics – C.L Arora
9. Advanced Practical physics – Wornsop and Flint.
10. Practical Physics – Gupta & Kumar Vol I, Vol II.

BSc IV Semester

BSPHY 04	PHYSICAL OPTIC AND ELECTRICITY
Teaching: 4Hrs/week Total Teaching Hours : 56	Exam. Marks: 60 IA Marks : 10

Unit I **8 Hrs**

Theories of light: Corpuscular theory, Wave theory: Huygen's principle, Wave front, Reflection and Refraction of Plane wave front at plane surface. Group velocity & wave velocity - relation between them.Quantum nature, concept of Photon.

Interference (Division of Wave front): Coherent sources interference by division of wave front, Young's double slit-theory and experiment, Freshel's Bi – prism –theory and experiment (determination of λ) Lloyd's mirror.

Unit II **8 Hrs**

Interference (Division of Wave front): Interference at 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 λ and $d\lambda$ only).

Unit III **8 Hrs**

Fresnel's Diffraction: Fraunhoffer DiffractionConcepts of Fresnel and Franuhofferdiffiraction. Rectilinear propagation of light, theory of Zone plate, comparison between zone plate and converging lens.Fresnel's diffraction at straight edge and wire.

Unit IV **8 Hrs**

Fraunhoffer Diffraction: 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.RP of telescope, Rayleigh's criterion.

Unit V **8 Hrs**

Polarization: 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, - Laurent's half shade polarimeter.

Unit VI **8 Hrs**

Alternating Current: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. Maxwell's bridge determination of L.

Unit VII **8 Hrs**

Filters and Rectifiers: 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.

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

References:

8. A text of optics byBrijila and Subramanyam.
9. Optics by AjoyGhatak.
10. Optics by Zenken's and White.
11. A text of optics by D.S. Mathur
12. Modran physics by D.V.N. Rao
13. Modern physics by Murugeshan.

BSPHY 04	**PHYSICS PRACTICAL**
Practical: 6 Hrs/week	Exam. Marks: 20 IA Marks : 10
Total No. of Practicals:	

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. Specific rotation of sugar solution.
6. Bi-prism – Determination of λ.
7. Thickness of a thin film of Bi-prism
8. Brewster's law – polarization
9. Dispersive power of plane diffraction grating.
10. Diffraction a straight edge.
11. Charging and discharging of RC circuit.
12. Study of electromagnetic induction by oscillation of bar magnet.
13. Mutual induction by direct method.
14. LCR series resonant Circuit for atleast two values of resistance
15. LCR Parallel resonant circuit for at least two values of resistance.
16. Maxwell's bridge to determine L.
17. Anderson's bridge to determine L.
18. High pass (RC or RL or LC)
19. low pass filter (RC or RL or LC)

References:

6. Experimental physics – M.A. Hippargi.
7. Experimental physics – Gadad&Hiregoudar.
8. Practical physics – C.L. Aora.
9. Advanced practical physics – Worsnop and Flint.
10. Practical physics – Gupta &kumar Vol I, Vol II

BSc V SEMESTER

BSPHY 051	Atomic Molecular Physics & Special Theory Of Relativity
Teaching: 4Hrs/week Total Teaching Hours : 60	Exam. Marks: 80 IA Marks : 20

Unit I **08 Hrs**

Properties of atom: 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

Unit II **10 Hrs**

Atom model: Thomson's and Rutherford's atom model (Qualitative account) Bohr's theory Hydrogen atom (Dicussion on postulates, expression energy of an electron in nth orbit, spectral series and energy level diagram) Sommerfield's relativistic atom model Excitation and ionization energy and potentials. Frank – Hertz experiment

Unit III **10 Hrs**

Vector atom model: 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).

Unit IV **04 Hrs**

X-ray Spectra: Production and properties of X-rays using Coolidge tube. Soft and Hard X-rays. Continuous and characteristic X – rays. Dune- Hunt law: Mosely's law and its application.

Unit V **06 Hrs**

Molecular spectra: Introduction to molecular spectra – classification of molecular spectra – pure rotation and vibration spectra rotation vibration spectra of diatomic molecules Band structure – Fluoresence and phosphorescence.

Unit VI **07 Hrs**

Scattering of Light: 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.

Unit VII **13 Hrs**

Special Theory of Relativity: 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.

References:

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

BSPHY 052	Quantum Mechanics, Nuclear Physics and Energy Physics	
Teaching: 4Hrs/week	Total Teaching Hours : 60	Exam. Marks: 80 IA Marks : 20

Unit I **20 Hrs**

Elements of Quantum Mechanics: 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 II **10 Hrs**

Properties of nucleus: 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.

Unit III **10 Hrs**

Radioactivity: 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 α 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 – origin of gamma rays.

Applications of nuclear radiations

Unit IV **05 Hrs**

Nuclear Instruments: Particle accelerators: Linear accelerators ,Cyclotron, Betatron Detectors: GM counter: Construction, working, dead time, operating voltage, paralysis time, internal quenching. Scintillation counter.

Unit V **03 Hrs**

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

Unit VI **04 Hrs**

Alternate energy source: 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.

Unit VII **08 Hrs**

Nuclear Energy: 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.

References

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)

BSPR 053	Practicals based on BSPH 051 and BSPH 052
Practical: 6 Hrs/week	Exam. Marks: 80 IA Marks : 20
Total No. of Practicals: 25	

Section A:

Note:

- Each experiment is of 3 Hrs duration.
- Two practical sessions per week

Minimum of 6 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 / LDR.
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

Section B:

Note:

- Each experiment is of 3 hours duration.
- Two practical sessions per week
- Minimum of 6 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

BSc VI SEMESTER

BSPHY 061	Statistical Physics and solid state physics
Teaching: 4Hrs/week Total Teaching Hours : 60	Exam. Marks: 80 IA Marks : 20

Unit I **10 Hrs**

Statistical Physics: Micro and Macro system. Most probable distribution, Statistical ideas in physics Statistical ideas in physics – phase space, Statistical equilibrium, priori probability and thermodynamical probability. Maxwell – Boltzman, Bose-Einstein and Fermi-Dirac Distribution function and their comparison. Ensemble – Canonical , Mircro canonical, grand canocical.

Unit II **10 Hrs**

Astrophysics: 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. Study of atomosphere: Variation of temperature with the distance above the earth, Red giant and White dwarf.

Unit III **10 Hrs**

Crystal structure: 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. Crystal binding: Ionic, Covalent, Metalic, Molecular and Hydrogen bonding.

Unit IV **10 Hrs**

Band theory of Solids: 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. Hall effect : Expression for Hall co-efficient, Experimental determination of Hall Co-efficient Importance of Hall effect.

Unit V **06 Hrs**

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

Unit VI **03 Hrs**

Specific heat of solid: Dulong and Petit's law, Einstein's theory and Debye's theory.(derivation).

Unit VII **06 Hrs**

Magnetic properties of materials: Dia, Para and Ferro magnetism - qualitative explanations . Classical (Langvein's theory)and Quantum theory of Paramagnetism (Currie law Currie-Weiss law).

Unit VIII **05 Hrs**

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

BSPHY 062	Optoelectronics Electronics and Nano materials
Teaching: 4Hrs/week Total Teaching Hours : 60	Exam. Marks: 80 IA Marks : 20

Unit I **07 Hrs**

Optoelectronics: Optical fibres, structure, pulse dispersion and modes of propagation of light through optical fibres, critical angle of propagation, angle of acceptance, expression for numerical aperture and fractional refractive index change, application of optical fibers and advantages. Display devices: Photo diode LED, construction and use of LED in display. Liquid crystal, types of liquid crystals. Basic principle of LCD and its construction, Comparison between LED and LCD.

Unit II **06 Hrs**

Network theorems: Kirchoff's laws, Superposition theorem (proof), Thevenin's and Norton's theorem(only thevinising and nortonising without proof), Maximum power transfer theorem (proof) and its applications.

Unit III **07 Hrs**

Transistors: 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. Integrated circuits monolithic IC-description of discrete IC.

Unit III **10 Hrs**

Amplifier: 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 IV **04 Hrs**

Oscillators: 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.

Unit V **06 Hrs**

Digital electronics : 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.

Unit VI **11 Hrs**

Nano-materials: Introduction to nano-particles (zero, one , two and three dimentional). Synthesis of material Bottom-up approach(Sol-Gel method) Top-down approach (Ballmilling) Properties and applications of Nanomaterials. CNTs Synthesis (CVD), properties and applications. SEM and TEM-Principle & operation.

Unit VIII **09 Hrs**

Computational Physics: Basic concept of computer, MS power point. Basics of C- language: program structure in C, Constants & Variables, Input and output statements, Arithmetic and conditional operations, conditional structure, Looping structures, one dimensional Arrays, programs to solve linear and quadratic equations.

Referencs:

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 Malvino
5. Electronics by Gupta.
6. Basic electronic by Grob.
7. Electronics made simple by V.K. Mehta.
8. Liquid crystal by S. Chandrashekar
9. Net work analysis by B.L. Theraja.
10. Nano materials by K.P.Bandopadhyay
11. Nanocrystals, C.N.Rao, P.John Thomas
12. Engineering Physics Wiley publication.
13. Nanotechnology Principles and Practices by Sulabha K Kulkarni Capital pub co.
14. Principles of Nanoscience and Nanotechnology by M.A.Shah and Tokeer Ahmad
15. Computational physics, An Introduction by RC Verma, Ahulwalia, Sharma
16. A first Course in computational physics by paul L De Vries, Javier E Hasbun.
17. Basics of Atmoshpheric Science by A Chandrashekar, PHI Publications (2010)
18. Weather, Climate and atmoshphere by Siddartha.
19. C-programming Language, Balaguruswamy Tata Mc Graw Hill.
20. Computer Programming in C by V Rajaraman, PHI Learning PVT.Ltd.

BSPR 063	**Practicals based on BSPH 061 and BSPH 062**
Practical: 6 Hrs/week	Exam. Marks: 80 IA Marks : 20
Total No. of Practicals: 30	

Section A:

Note:

- Each experiment is of 3 Hrs duration.
- Two practical sessions per week
- Minimum of 6 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.)

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

Section B:

Note:

- Each experiment is of 3 Hrs duration.
- Two practical sessions per week
- Minimum of 6 experiments are to be carried out.

Lab Experiments:

1. Characteristics of transistor in CE configuration.
2. Characteristics of LED
3. Characteristics of FET
4. CE amplifier – study of frequency response and measurement of gain.
5. Phase shift oscillator
6. Wein bridge oscillator
7. Study of Logic gates using diodes and transistor/IC
8. Inverting Op_Amp.
9. Non-inverting Op_Amp.
10. RI of optical fiber
11. Verification of Thevenin's theorem.
12. Verification of Norton's theorem.
13. Maximum power transfer theorem.
14. Execution of computer programs using C for the following problems.
    a)Verification of ohm's law.
    b)Determination of orbital velocity.

References:

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