MANGALORE UNIVERSITY

B. Sc. CHOICE BASED CREDIT SYSTEM

COURSE PATTERN AND SCHEME OF EXAMINATION

CORE SUBJECT: PHYSICS

Core/Elective	Course Code	Title	Instruction hrs/week	Duration of the Exam (hrs)	Max. Marks			Credits
					IA	Exam	Total	
I Semester								
Group I Core Subject	BSCPHC131	General Physics I	4	3	20	80	100	2
	BSCPHP 132	Physics Practicals I	3	3	10	40	50	1
Group II Elective	BSCPHCE 133	Basics of Radiation and Environment	2	2	10	40	50	1*
Total number of Credits for Core Subject in I Semester: 04								
II Semester								
Group I Core Subject	BSCPHC 181	General Physics Paper II	4	3	20	80	100	2
	BSCPHP 182	Physics Practicals II	3	3	10	40	50	1
Group II Elective	BSCPHCE 183	Physics of Nano Science and Smart materials	2	2	10	40	50	1*
Total number of Credits for Core Subject in II Semester: 04								
III Semester								
Group I Core Subject	BSCPHC 231	Optics	4	3	20	80	100	2
	BSCPHP 232	Physics Practicals III	3	3	10	40	50	1
Group II Elective	BSCPHCE 233	Electrical Appliances	2	2	10	40	50	1*
Total number of Credits for Core Subject in III Semester: 04								
IV Semester								
Group I Core Subject	BSCPHC 281	Electricity &X-ray Crystallography	4	3	20	80	100	2
	BSCPHP 282	Physics Practicals IV	3	3	10	40	50	1
Group II Elective	BSCPHOE 283	Basics of Communication and Astronomy	2	2	10	40	50	1*
Total number of Credits for Core Subject in IV Semester: 04								
V Semester								
Group I Core Subject	BSCPHC 331	Modern Physics	3	3	20	80	100	2
	BSCPHP 333	Physics Practicals V	4	3	20	80	100	2
Group I Core Subject	BSCPHC 332	Condensed Matter Physics	3	3	20	80	100	2
Total number of Credits for Core Subject in V Semester: 06								
VI Semester								
Group I Core	BSCPHC 381	Nuclear Physics	3	3	20	80	100	2

Subject	BSCPHP 383	Physics Practicals VI	4	3	20	80	100	2
Group I Core Subject	BSCPHC 382	Electronics	3	3	20	80	100	2
Total number of Credits for Core Subject in VI Semester: 06								
Total number of Credits for Core Subject in I-VI Semesters: 28								

* Credits for Elective Papers will be considered for the entire B.Sc. Programme.

Note: The theory IA will be based on the average of two internal tests. The practical IA will be based on regular performance and one model test.

MANGALORE UNIVERSITY

CHOICE BASED CREDIT SYSTEMSYLLABUS

CORE SUBJECT: PHYSICS

I Semester

BSCPHC131: General Physics Paper-I

(4 hrs/week; Total 48 hrs)

Unit-I: Mechanics-I

Derivative of a vector. Instantaneous velocity and acceleration. Derivative of a planar vector of constant magnitude but changing direction. Arbitrary planar motion, radial and transverse component of velocity and acceleration. Deduction of the results of uniform circular motion

Geometrical symmetries - Translation in space, rotation in space, translation in time. Symmetry aspects of conservation laws.

Conservation of linear momentum, motion of a rocket, multistage rockets- rocket fuel, rocket shape, elements of satellite motion. Orbital velocity, time period of the satellite, geostationary satellites, shapes of the orbits, perturbation of orbits, injection conditions, entry problems, uses of artificial satellites. Indian Space Programme.

Central force**,** Law of conservation of angular momentum – under the action of central forces. Mention of Kepler's laws, Deduction of Kepler's second law of planetary motion.

(12 Hrs)

Unit-II: Mechanics-II

Rotational dynamics of a rigid body – Angular momentum, kinetic energy. Moment of inertia and radius of gyration. Theorem of moment of inertia – parallel and perpendicular axes theorems with proof. Calculation of MI of regular shaped bodies - rectangular lamina, thin rod, circular disc (about different axes). Problems.

Theory of compound pendulum: expression for time period. Reversibility of centre of oscillation and centre of suspension. Bar pendulum. Determination of g and K. Problems.

Conservation of energy conservative and non conservative forces and deduction of Conservation of energy in conservative force field.

Simple Harmonic Motion, Vertical oscillations of the light loaded spring, expression for force constant. (12 Hrs)

Unit-III: Thermal Physics

Types of thermal processes, Derivation of PV^{γ} in an adiabatic process, Expression for work done during Isothermal and adiabatic processes.

Carnot's engine: Carnot's cycle. Efficiency of Carnot's engine. Reversibility of Carnot's engine. Refrigerator (principle only), coefficient of performance. Derivation of Claussius-Clepeyron first latent heat equation and applications. Second law of thermodynamics. Kelvin's and Claussius Statements. Problems.

Entropy: Change in entropy during isothermal, adiabatic, reversible and irreversible processes, T-S diagram of Carnot's cycle, relation between entropy and thermodynamic probability, order and disorder of a system. Problems. (12 Hrs)

Unit-IV: Physics of Low Temperature & Thermo emf

Distinction between real and perfect gases, Andrews experiment and discussion of results, Concept of critical Temperature, Boyle temperature, Joule – Thomson effect, Porous Plug experiment – Expression for inversion temperature, principle of regenerative cooling, adiabatic demagnetization for extremely low temperature. Cryogenics (mention).

Thermo emf., Seebeck effect, Thermoelectric series, neutral temperature inversion temperature Measurement of temperature Thermo couple. Problems. (12 Hrs)

Reference Books:

1. Fundamentals of Physics by Halliday and Resnick, Wiley Publication (10^{th} edn 2013)
2. Mechanics by D.S. Mathur, S Chand Publication (2014)
3. Physics for degree students by C.L. Arora & Dr. P.S. Hemne, S Chand Publication (2014)
4. Properties of Matter by D.S. Mathur, S Chand Publication (2010)
5. Mechanics - J C Upadhyaya, Himalaya Publishing House Pvt. Ltd.; First Edition (2016)
6. Heat and thermodynamics –Brijlal & Subramanyam S Chand Publication (2001)
7. Heat and thermodynamics - D S Mathur, Sultan Chand & Sons (2008)
8. Heat and thermodynamics - M W Zemansky, Sears & Dittman, McGraw Hill Education; 8 edition (2017)
9. Thermal Physics - C Kittel & H Kroemer, W. H. Freeman; Second edition (1980)

10. Numerical Problems in Physics, Subramanyam & BrijLal S Chand (G/L) & Company Ltd (2011)

	Physics Practicals I; I Sem B.Sc. BSCPHP 132
Sl.No.	**Name**
1	Torsion Pendulum –rigidity modulus& M>I> Irregular body
2	Specific heat by cooling
3	Thermocouple
4	Fly Wheel
5	Searle's double bar
6	Static Torsion
7	Viscosity by Poiseuille's method
8	Oswald Viscometer
9	Surface tension by drop weight method
10	Bar pendulum – 2 hole method
11	Linear density & Material density by sonometer
12	Melds Experiment
13	LDR
14	Fermi Energy of a metal

II Semester

BSCPHC-181: General Physics Paper II
(4 hrs/week; Total 48 hrs)

Unit-I: Properties of Matter

Elasticity: Hooke's law, moduli of elasticity and Poisson's ratio, derivation of relation connecting elastic constants, limiting values of Poisson's ratio, work done (energy stored) in stretching a wire, twisting couple on a wire – work done in twisting.

Beams, bending of beams uniform & non uniform, expression for bending moment, light cantilever bending with theory, I-section girders. Problems.

Fluid dynamics: Surface Tension: surface tension Excess pressure inside liquid drop Surface tension by drop weight method, Interfacial tension. Problems

Viscosity – Poiseuille's equation, Stokes law, Viscosity by Stokes method.

Lubrication: Basics of lubricants. Problems. (12 Hrs)

Unit-II: Relativity

Inertial frames with uniform linear velocity. Galilean transformation equation, Galilean principle of relativity. Classical velocity addition theorem. Galilean invariance of space and time. Non–inertial frames with uniform linear acceleration. Fictitious forces.

Search for absolute frame of reference – ether hypothesis. Velocity of light and Galilean transformation. Significance of the null result of Michelson Morley experiment. Constancy of speed of light. Postulates of special theory of relativity. Lorentz transformation (no derivation). Length contraction. Relativity of simultaneity. Time dilation, velocity addition theorem. Einstein's mass energy equivalence- (derivation based on photon gun experiment). Relativistic expression for kinetic energy. Relation between energy and momentum. Rest mass of the photon.

Minkowski's four dimensional space time continuum. Elementary ideas of General theory of relativity. Problems. (12 Hrs)

Unit-III: Astrophysics

Stellar parallax and units of stellar distances. Definition of arcsec, parsec (pc), astronomical unit (AU), light year (ly) and their relations. Hubble's law. Spectra of stars and their classification. Radius of a star. Mass – Luminosity relationship and expression for lifetime

of a star. H-R diagram, Main sequence stars and their general characteristics. Star formation and main sequence evolution, White dwarfs, Pulsars, Neutron stars and Black holes. Variable stars, Supernova explosion, Chandrasekhar limit, Virial Theorem. Doppler effect of light. Universe, concept of evolution, Planck's length and time. Experimental evidence of Big-Bang, Penzias and Wilson experiment. Problems. Dark Matter and Dark Energy (Mention)

(12 Hrs)

Unit-IV: Waves & Oscillations

Free and forced oscillations: Equation for a harmonic oscillator. Free oscillations, damped oscillations. Setting up of equation for forced oscillations and its solution, condition for resonance.

Progressive waves: Equation for a progressive wave in one dimension. Differential equation of wave motion. Expression for velocity of longitudinal waves in a fluid. Newton`s formula for velocity of sound in air – Laplace correction. Longitudinal vibrations in a rod. Velocity of transverse vibrations in a string. Expression for frequency of fundamental and overtones.

Fourier's theorem: Statement and explanation– expression for Fourier coefficients (complex form). Limitations of Fourier theorem. Mathematical analysis of a square wave. Problems.

(12 Hrs)

Reference Books:

1) Selected topics in Physics (COSIP)
2) Fundamentals of Physics by Halliday, Resnick and Walker, Wiley Publication (10^{th} edition 2013)
3) Mechanics by D S Mathur, Chand Publication (2014)
4) Properties of matter By Brijalal & Subrahmanyam, S Chand (2002)
5) Physics for degree students By C L Arora & P S Hemne, S Chand Publication (2014)
6) College Physics N Sunderajan, United Publisher
7) Mechanics by J C Upadhyaya, Himalaya Publishing House Pvt. Ltd.; First Edition edition (2016)
8) Modern Physics by R. Murugeshan and Kiruthiga Sivaprasath, S Chand (2010)
9) Modern Physics by G. Aruldhas and P. Rajagopal, PHI Learning 0(2005)
10) Chandrashekar and his limits by B. Venkaraman, Universities Press (1992)
11) Theoretical Astrophysics, T. Padmanabhan, (Three Volumes) Cambridge University Press, 2000
12) Special theory of relativity by Resmick, Wiley; 1 edition (2007)
13) Astrophysics for Physicists by Arnab Rao Chaudhury, Cambridge University Press (2010)
14) Waves and Oscillations by A. P. French, CRC Press (1971)
15) The Structure of the Universe, Jayant Narlikar, Oxford University Press (1993)
16) Violent Phenomena in the Universe, Jayant Narlikar, Oxford University Press (1984).
17) Astronomy – The Evolution of the Universe, Michel Zeilik, John Wiley & Sons (1994)
18) Theoretical Astrophysics, T. Padmanabhan, (Three Volumes) Cambridge University Press (2000)

	Physics Practicals II; II Sem B. Sc. BSCPHP 182
Si No.	Name
1	Theorem of M I –parallel & perpendicular axes
2	q by cantilever
3	Law of conservation of liner momentum
4	η Stokes method
5	Spiral spring
6	Damped oscillations
7	Interfacial tension
8	Maxwell's distribution of velocities
9	Platinum resistance thermometer
10	BAR Pendulum-h-T graph
11	Monte Carlo expt.
12	Joules heating effect
13	Energy gap of p-n diode
14	q by Koenig's Method

Question paper pattern for I and II Semester

Internal Assessment: 20 marks

Semester Examination: 80 marks

Questions carrying 1 mark 8 out of 10 **1 x 8 = 8 marks**

Questions carrying 2 marks 6 out of 8 **2 x 6 = 12 marks**

UNIT I, II, III & IV Internal choice for each unit

Questions carrying 1 x 4 = 4

1 x 7 = 7

Problem 1 x 4 = 4

Total 15 x 4 = 60

III Semester

BSCPHC 231: Optics
(4 hrs/week; Total 48 hrs)

Unit-I: Interference

Interference: Coherent sources, Production of coherent sources, Biprism – construction, working and experiment to find wavelength, fringes with white light. Coherent sources by Amplitude division, Colors of thin films in reflected light – theory,theory and experiment of air wedge, Newton's Rings, Michelson's interferometer and applications.

(12 Hrs)

Unit-II: Polarization and diffraction

Polarization: Plane polarized light and method of production by double refraction, doubly refracting crystals, Huygens' explanation of double refraction. Circularly and elliptically polarized light, retarding plates. Theory of quarter wave plate (QWP) and half wave plate (HWP) & uses. Optical activity. Problems.

Fraunhofer diffraction – Single slit, double slit theory, many slits, diffraction grating, theory of normal & oblique incidence, dispersive power, resolution, Rayleigh's criterion – expression for resolving power of grating and telescope. Problems. (12 Hrs)

Unit-III: Electromagnetism

Scalar and vector fields with examples, operator grad, gradient of a scalar function. Relation between field and potential. Integration theorems - line integral, surface integral, volume integral. Divergence and curl of a vector, physical significance. Gauss and Stokes' theorems. Equation of continuity - setting up of Maxwell's field equations - concept of displacement current, setting up of wave equations for E & B – velocity of e.m. wave in a dielectric medium –light as e.m. wave - transverse nature of e.m. wave (proof). Mention of normal & anomalous dispersion, Poynting theorem – Poynting vector – energy density of e.m. waves. Problems. (12 Hrs)

Unit-IV: Radiation & Lasers

Radiation: Energy distribution in a black body spectrum. Wien's displacement law. Kirchoff's law, Stefan–Boltzman law, Wien's distribution law and Rayleigh – Jeans law. Derivation of Planck's law. Deduction of Wien's distribution law, Rayleigh – Jeans law from

Planck's law. Definition of Radiation pressure, solar constant and its determination. Estimation of surface temperature of the sun.

Lasers: General Principles – spontaneous and induced emissions – optical pumping, resonance cavity – active medium – population inversion – condition for laser action. Mention of Einstein's coefficients A & B. He-Ne & solid state lasers – pulsed and tunable lasers. Applications of Lasers (mention only) Elementary ideas of holography. Problems.

(12 Hrs)

Books for reference:

1. Fundamentals of Optics – Jenkins and White, Tata McGraw-Hill Education, 1937
2. Optics – Khanna and Gulati, R. Chand, 1984
3. A Text Book of Optics – B K Mathur, Gopal Printing, 1967
4. A Text Book of Electro Magnetism – Khan Academy, Faculty Press (1993)
5. Laser Fundamentals – Silfvast WT, Cambridge University Press; 2 edition (2008)
6. Optics by Subramnya & Brijlal, S Chand; 23rd Rev. Edn. 2006
7. Physics for degree students By C L Arora & P S Hemne, S Chand Publication (2014
8. Modern Physics by R. Murugeshan and Kiruthiga Sivaprasath, S Chand (2010)

	Physics Practicals III; III Sem B.Sc. BSCPHP 232
Si No.	Name
1	Air wedge
2	Network theorems
3	Diffraction at straight wire
4	Grating minimum deviation
5	Stefan Boltzmann law
6	Helmholtz's Resonator
7	Carey-foster bridge
8	Uniform bending
9	Charging and discharging C R circuit
10	Laser diffraction
11	Tangent galvanometer
12	Dispersive power of prism
13	Diode Characteristics
14	Clipping circuits

IV Semester

BSCPHC 281: Electricity & X-ray Crystallography
(4 hrs/week; Total 48 hrs)

Unit-I: Transients & DC Networks

Transient Currents: Theory of CR circuit (charging and discharging) –LR circuit (growth and decay), LCR circuit (discharging).

Network theorems: Superposition theorem, Thevenin's & Norton's theorems. Maximum power transfer theorem (derivation), some applications. Problems. (12 Hrs)

Unit-II: Alternating Currents & Filters

Alternating currents: Expression for the RMS value of voltage and currents, j operator principles of superposition and phasor analysis. Response of LR, CR and LCR circuit to sinusoidal voltages using j operators. Series and parallel resonance circuits – expression for the 'Q' factor, bandwidth – expression for the power.

Filters: High and low pass filters using CR and LR circuits, frequency response curves, cutoff frequency, qualitative study of band pass filters. Problems. (12 Hrs)

Unit-III: Electrical & Magnetic Measurements

Force acting on a moving charge in electric and magnetic fields - Lorentz force. Force on a current carrying conductor in a magnetic field. Torque on a current loop in a magnetic field.

Magnetic dipole moment – Torque on a magnetic dipole. Equivalence of a current loop and a magnetic dipole.

Ballistic galvanometer – charge sensitivity – effect of damping. Applications of B.G. Determination of capacitance by absolute - determination of high resistance by leakage. Theory of Andersons bridge & De-Sauty's bridge. Problems. (12 Hrs)

Unit-IV: X-ray Crystallography & Superconductivity

X- ray crystallography: production of X-rays. Coolidge tube. Continuous and characteristic X-ray spectra. Moseley's law. Definition of a lattice, unit cell, seven crystal systems. Miller indices, Bragg's law. Bragg's spectrometer, structure of NaCl and KCl.

Superconductivity: Elementary ideas – experimental facts, transition temperature, critical field, critical current, Meissner effect. High temperature superconductivity. Applications of superconductivity – production of high magnetic field. Problems. (12 Hrs)

Books for reference:

1. Electricity and magnetism – E M Purcell, Cambridge University Press, 2013
2. Elements of Electromagnetism – Mathew and N O Sadiku, Oxford University Press, 2018
3. Introductory to Circuit Analysis – Robert Boylested, Pearson Education India, 2007
4. Electricity and magnetism – D C Tayal, Himalaya Publishing House, 1989
5. Elements and magnetism – Tareja, Springer New York, 2014
6. Elements of X- ray diffraction – Cullity & Stock, Addison-Wesley Publishing Co. 1978
7. Solid state Physics – H C Guptha, Vikas Publishing House Pvt Limited, 2001
8. Elementary Solid state Physics – Ali Omer, Pearson Education India, 1975
9. Modern Physics by R. Murugeshan and Kiruthiga Sivaprasath, S Chand, 2010

	Physics Practicals IV; IV Sem B.Sc. BSCPHP 282
Si No.	Name
1	De-Sauty's Bridge
2	Charge sensitivity BG
3	Newton's rings
4	Double coil T G
5	Field along the axis of a coil
6	Grating normal incidence
7	Polarimeter
8	Max. Power transfer theorem
9	E C E of copper
10	Low resistance by potentiometer
11	Phasor diagram
12	Low & high pass filter
13	High resistance by leakage
14	R. I. Prism By Brwester's law.

Question paper pattern for III & IV semester

Internal Assessment: 20 marks

Semester Examination 80 marks

Questions carrying 1 mark 8 out of 10 1 x 8 = 8 marks

Questions carrying 2 mark 6 out of 8 2 x 6 = 12 marks

UNIT I,II, III &IV Internal choice for each unit

Questions carrying 1 x 4 = 4

1 x 7 = 7

Problem 1 x 4 mark

Total 15 x 4 = 60

V Semester

BSCPHC 331: Modern Physics
(4 hrs/week; Total 48 hrs)

Unit-I: Dual Nature of Matter & Quantum Mechanics

Evidences of Quantum nature of light: Photoelectric effect (Einstein's equation only), Compton effect – expression for Compton shift using relativistic expressions for momentum and energy.

Wave nature of particles: De-Broglie waves, Phase and group velocity of waves, Davisson and Germer experiment. Principle of an electron microscope, difference between optical and electron microscope, Uncertainty principle, three sets of uncertainty relations, γ ray microscope. Application of uncertainty relation – estimation of width of spectral lines, impossibility of the existence of electrons inside the nucleus. Problems.

Wave function, need to represent wave function in a complex form, properties of wave function. Setting up of time dependent Schrodinger wave equation and to arrive at the time independent wave equation. (16 Hrs)

Unit-II: Quantum Mechanics& Atomic spectra: Expectation values. Eigen values and Eigen functions. Normalization of wave functions. Solution of Schrodinger equation (i) for a free particle (ii) a particle in a one dimensional box. Graphs of ψ and $|\psi|^2$. Extension to three dimensional box. Degeneracy. Problems.

One dimensional harmonic oscillator (qualitative), zero point energy of harmonic oscillator-using uncertainty principle.

Atomic models, Concept of Spatial & spin quantization of electrons. Different quantum numbers associated with vector atom model, spectral terms and their notations, selection rules, coupling schemes, L-S and J-J coupling. Pauli's exclusion expression for maximum number of electrons in an orbit. Fine structure of Sodium D-line, Larmour precession, Bohr magneton, Stern-Gerlach experiment. Zeeman effect, experimental study of Zeeman effect, theory of normal Zeeman effect (16 Hrs)

Unit-III: Molecular Spectra & Scattering

Different regions of molecular spectra, pure rotational spectra of diatomic molecules, vibrational rotational spectra of diatomic molecules, electronic spectra. Theory of origin of pure rotational spectra – rigid rotator Theory of origin of pure vibration spectra Application of molecular spectra. Electronic spectra of molecules, Fluorescence & phosphorescence.

Coherent & incoherent scattering Rayleigh scattering blue colour of the sky Raman effect. Experimental arrangement, Quantum theory of Raman effect, characteristic properties of Raman lines. Intensity, depolarization ratio of Raman lines Problems. comparison of Raman shift with IR spectra, rule of mutual exclusion, applications Raman effect diatomic & triatomic molecules. . Raman scanner. Laser- Raman spectroscopy, Problems. (16 Hrs)

Reference Books

1. Concepts of Modern Physics 6th Edn. – Arthur Beiser, Tata McGraw-Hill Education, 2003
2. Introduction to Atomic and Nuclear Physics 5th Edn – Semat & Albright, Springer Science & Business Media, 2012
3. Modern Physics – Kenneth S Krane, Wiley, 2012
4. Fundamentals of Molecular spectroscopy, 4th Edn – Banwell, Tata McGraw-Hill Education, 1994
5. Quantum Physics – A P French, Routledge, 2018
6. Quantum Physics, Vol IV – E Wichman, Berkeley Physics Course, Tata McGraw-Hill Education
7. Quantum Physics – Gasorovicz, Wiley, 1995
8. Modern Physics – Murugeshan, Chand, 1997
9. Quantum Physics - G Aruldhas, PHI Learning Pvt. Ltd., 2008

V Semester

BSCPHC 332: Condensed Matter Physics
(4 hrs/week; Total 48 hrs)

Unit-I: Statistical Physics, Specific Heat & Free electron theory

Statistical ideas in Physics, Maxwell – Boltzmann, Bose – Einstein and Fermi – Dirac statistics, MB statistics as the classical limit of BE and FD statistics.

Specific heat of solids: Molar specific heat, Dulong – Petit law, its limitations. Einstein's theory of specific heat at low and high temperatures and its limitations. Debye's theory of specific heat at low and high temperatures assuming the modes of vibration in the frequency interval ν and $\nu + d\nu$, its limitations, comparison of Einstein's and Debye's theories. Problems.

Quantum free electron theory, expression for Fermi energy and average energy of electrons at absolute zero – mention of expressions above absolute zero. Statement for F(E) and $\langle E \rangle$ at T > 0, Boltzmann tail. Problems. (16 Hrs)

Unit-II: Hall Effect & Band Theory of Solids

Hall effect- expression for Hall co-efficient and its significance. Measurement of Hall co-efficient. Problems.

Band formation in solids, explanation of electrical conductivity of metals, insulators and semiconductors. Intrinsic semiconductors – expression for conductivity of intrinsic semiconductors, variation of resistance with temperature. Extrinsic semiconductors,Fermi level, donor and acceptor levels, electrical conductivity of extrinsic semiconductors, p – n junction, expression for diode current (no derivation). LED, solar cell. Problems.

(16 Hrs)

Unit-III: BJT& FET

BJT:Transistors - construction, types, action, characteristics in CE mode, mention of CB and CC mode, Definition of α and β (dc and ac) - relation. Biasing, voltage divider bias only, voltage divider bias as a current source. CE amplifier with voltage divider bias. DC and AC load line analysis. DC and AC equivalent circuits. Hybrid parameters – general definitions. Hybrid model of transistor in CE configuration. Calculation of amplifier characteristics – expressions for voltage gain, current gain, input resistance and output resistance – frequency response. Comparison of CE, CB and CC amplifiers (qualitative).

FET: Types, construction and characteristics of n - channel FET. MOSFET – enhancement and depletion type and working. Comparison of BJT and FET. Problems. (16 Hrs)

Reference Books

1. Solid state physics 6th Edn by S.O. Pillai, New Age International, 2006
2. Elementary solid state physics by M Ali Omar, Pearson Education India, 1975
3. Modem physics by J Bernstein, P.M. Fizhbane, S. Gasiorowicz, Prentice Hill, 2000
4. Modem physics by S.R. Shankara Narayana, New Age Internationals; First edition, 1992
5. Basic electronics solid state by B.L. Theraja, S Chand 2006
6. Foundations of electronics 2nd Edn by D. Chattopaddhyay, P.C. Rakshit, B. Saha, N.N. Purkait, New Age International Private Limited, 2014
7. Modern Physics by R. Murugeshan, S Chand, 2010
8. Refresher course in physics Volume III by C. L. Arora, S Chand & Company, 1999

	Physics Practicals V; V Sem B.Sc. BSCPHP 333
Sl. No.	Name
1	Biprism
2	Series resonance
3	Andersons bridge
4	Thermistor
5	Resolving power of grating
6	Cauchy's constant
7	Transistor characteristics
8	Intensity of a spectral line
9	Specific charge of an electron
10	Earth inductor
11	Hysteresis
12	OR, AND, NOT, NOR & NOT gates using discrete components)
13	Planks constant using LED
14	Zenervoltage regulator

VI Semester

BSCPHC 381: Nuclear Physics
(4 hrs/week; Total 48 hrs)

Unit-I: Nuclear Decay and Spectra of Nuclear Radiation&Artificial Transmutation of Elements

Successive disintegration (A → B → C), expression for number of daughter nuclei, radioactive equilibrium - transient and secular, radioactive series, radioactive dating - radio uranium and radio carbon dating.

Alpha decay, alpha particle disintegration energy, alpha ray spectra, range, velocity and energy relations. Geiger-Nuttal Law. Beta ray spectra and paradoxes, Pauli's neutrino hypothesis, modes of beta decay. Gamma ray emission, interaction of gamma rays with matter - photo electric effect (mention), Compton effect (mention) and pair production. Absorption of gamma rays by matter and absorption coefficient.

Nuclear radiations-units: Curie, Becquerel, Absorbed dose rate - Gray and dose equivalent - Sievert - definitions. Problems.

Artificial Transmutation of Elements: Rutherford experiment, Q values of nuclear reactions, threshold energy for endoergic nuclear reaction, Types of nuclear reactions, Artificial radioactivity, Application of radioisotopes, Discovery, classification and properties of neutron. Neutron sources (mention), interaction of neutrons with bulk matter Problems.

(16 Hrs)

Unit-II: Nuclear Structure and Models & Nuclear Energy

Rutherford alpha scattering formula assuming impact parameter - nuclear cross section - differential and total. Mass spectrographs - Dempster's mass spectrograph. Characteristics of nuclear forces, Yukawa's theory, estimation of mass of mesons using uncertainty principle.

Nuclear models: liquid drop model and explanation of nuclear fission, semi empirical mass formula, Shell model and magic numbers. Salient features of liquid drop model and shell model.Nuclear fission: critical Mass , Critical size Nuclear Power Reactor Four factor formula. Application Nuclear Fusion, Plasma Confinement , Magnetic bottle C-N cycle & p-p Cycle Stellar Energy Problems. (16 Hrs)

Unit-III: Particle Accelerators & Detectors, Cosmic Rays & Fundamental Particles

Accelerators: Linear accelerators, Cyclotron and Betatron, Microtron (principle only).

Detectors: Gas filled counters - G M counter - construction and working, principle of scintillation and semiconductor detectors.

Cosmic rays: latitude and altitude effect, east west effect, primary and secondary cosmic rays and composition, origin of cosmic rays, cosmic ray showers, Van Allen Radiation belts, Aurorae.

Fundamental particles: General properties - Dirac concept of anti particles - classification based on interactions. Leptons and Hadrons.Quarks model and mediators of basic interactions. Problems. (16 Hrs)

Reference Books:

1. Concepts of Modern Physics, 6th Edn, Beiser, McGraw-Hill Education, 2003
2. Modern Physics – Berstein, Fishbane, Gasirowiez, Prentice Hill, 2000
3. Modern Physics – K.S. Krane, Wiley, 2012
4. Introductory Nuclear Physics – K.S. KraneWiley, 2008
5. Introduction to Atomic and Nuclear Physics, 5th Edn, Semat & Albright, Springer Science & Business Media, 2012
6. Quantum Physics of Atoms, Molecules, Solids, Nuclei & Particles, 2nd Edn, Eisberg & Resnick, Wiley, 1985
7. Nuclear Physics – Irving Kaplan, Addison-Wesley, 1953
8. Modern Physics – Murugesan, S Chand, 2010

VI Semester

BSCPHC 382: Electronics
(4 hrs/week; Total 48 hrs)

Unit-I: OP-AMP, Regulated Power Supply &Oscillators

Operational amplifiers (OP-AMP): Differential amplifier – dual input and balanced output. Concept of an ideal OP-AMP. OP-AMP Characteristics for IC 741, inverting and non inverting amplifiers with feed back. Derivation of expression for voltage gain, Frequency response.

Regulated power supply: Block diagram, bridge rectifier- derivation of expressions for efficiency, ripple factor. Capacitor filter. Voltage regulator using Zener diode.

Oscillators: Block diagrams for feedback network – positive and negative feedback – Barkhausen criterion for oscillations in electronic circuits, phase shift oscillator using BJT and Wein bridge oscillator using OP-AMP, expression for frequency of oscillation. Problems. (16 Hrs)

Unit-II: Digital Electronics

Boolean Algebra. Logic gates – OR, AND and NOT using discrete components (diodes and transistor). Universal gates - Truth table. Boolean theorems, de-Morgan's theorems, simplification of Boolean expressions. SOP method of solving digital problems. Realization of basic gates and XOR gate using NAND gates only. Half adder and Full adder.

Sequential logic circuits (timing diagram for counters only).

Introduction to flip-flops – RS, D and JK-FF (using NOR gates only). Serial shift register using D-FFs. Asynchronous binary counters using JK-FF. Working of a decade counter. Displaying the counter output using BCD to seven segment decoder (block diagram) and seven segment display. Problems. (16 Hrs)

Unit-III: Communication Electronics

Communication electronics: Need for modulation, AM - expression for AM wave, power relations, SSB transmission in AM - advantages and disadvantages. Qualitative discussion of FM, AM, Transmitters and Receivers with Block diagram, comparison of AM and FM. Demodulation-diode detector, Super heterodyne receiver.

Ionosphere: Types of radio wave propagation, skip distance, maximum usable frequency, satellite communication & Remote sensing. Mobile communication. Optical fiber Communication CRO-CRT working, time base signals, scanning principle, uses of CRO. Block diagrams TV Transmitting & Receiving systems. LCD and LED monitors (qualitative). Problems. (16 Hrs)

Reference Books

1. Electric Devices & circuits, 8th Edn – Boylested & Nashelsky, Pearson Education India, 2009
2. Electronic Devices, 6th Edn – Floyd, Prentice Hall, 12-Sep-2012
3. OP-AMPS and Linear Integrated Circuits, 3rd Edn – RA Gayakwad, Regents/Prentice Hall, 1993
4. Operational Amplifiers & Linear Integrated Circuits, 6th Edn. – RF Coughlin & FF Driscoll, Prentice Hall, 2001
5. Operational Amplifiers & Linear ICs, 2nd Edn – David A Bell, Oxford University Press; 2 edition, 2007
6. Digital Fundamentals, 8th Edn – Floyd, Pearson Education India, 2011
7. Digital Design, 3rd Edn.-Morris Mano, EBSCO Publishing, Inc., 2002
8. Digital Systems, 8th Edn – R Tocci, Pearson Education, 2016
9. Electronic Communication, 4th Edn.- Kennedy & Davis, Tata McGraw-Hill Education, 1999
10. Electronic Communication, 6th Edn – Miller & Beasley, Pearson/Prentice Hall, 2005
11. Electronic Principles by A P Malvino, Tata McGraw-Hill Education, 2007
12. Digital Electronics B LTheraja, S. Chand Limited, 2006

	Physics Practicals VI; VI Sem B.Sc. BSCPHP 383
Si No.	Name
1	Parallel resonance
2	Capacity of C using B G
3	Bridge rectifier
4	Mutual inductance –BG
5	Rydberg Constant
6	CE amplifier
7	OP-amp
8	Analysis of Square wave
9	Wein bridge oscillator
10	M & C by Carey –foster bridge
11	Stefan's law
12	Basics Logic gates Using NAND gates
13	G M counter
14	Half adder & full adder

Question paper pattern for V & VI semester

Internal Assessment: 20 marks

Semester Examination 80 marks

Questions carrying 1 mark 8 out of 9 1 x 8 = 8 marks

Questions carrying 2 marks 6 out of 9 2 x 6 = 12 marks

UNIT I,II, III Internal choice for each unit

Questions carrying 1 x 3 = 3

1 x 5= 5

1 x 8 =8

Problem 1 x 4 mark

Total 20 x 3 = 60

Mangalore University

B.Sc. Physics Practical

Choice based credit System-2019-20 onwards

Instructions:

i) Minimum 8 experiments should be done. (otherwise student is not allowed to sit for semester examination)

ii) Internal marks must be allotted based on the test & regular performance of practical's, submission of record & observations ,

iii) Knowledge of the experiment:-

- Student knowledge is judged based on the performance of the handling equipments&recognising suitable devices used in the experiment. Questions must be asked to test basic knowledge of concerned the experiment only.

Marks allotment for practical's

Allotment of marks	I, II, III & IV semesters	V & VI semesters
Formula	3	5
Circuit & diagram	3	5
Setting	4	10
Observation & trails	10	20
Calculation & graph	3	15
Result & accuracy	3	5
Viva-Knowledge of the experiment	4	10
Record marks	10	10
Total marks	40	80
Internal examination & Continuous evaluation	10	20

MANGALORE UNIVERSITY
CHOICE BASED CREDIT SYSTEM

I SEMESTER B.Sc.

ELECTIVE PAPER

BSCPHCE 133 -PHYSICS OF RADIATION & ENVIRONMENT
(2 hrs/week; Total 24 hrs)

Unit I

BIOPHYSICS: Accommodation of the eye, Color Vision, Speech and hearing, biological effects of radiation, Medical Use of Radiation, Radioactive isotopes as tracers, Thermodynamics of Life.

GEOPHYSICS: The Deeper, The hotter, Earthquakes, Why is the earth hot inside, Upside Down Mountains, Floating Continents, The raise of Mountains, Terrestrial Magnetism, Physics of the atmosphere.Introduction to Seismology: The Earth's interior and crust as revealed by the earth quakes – Rayleigh waves. Tsunami causes and impacts. (12 hrs)

Unit II

MEDICAL PHYSICS: Introduction to Medical Physics. X-rays: Electromagnetic spectrum, production of x-rays, X-ray diagnostics and imaging. Physics of NMR, NMR imaging, MRI radiological imaging, Ultrasound imaging, Physics of Doppler with applications.

ENVIRONMENTAL STUDIES: Ecosystems: Structure and functions (abiotic and biotic), environmental problems: global warming and climate change, ozone layer depletion, deforestation, acid rain. Renewable and non-renewable energy sources. Environmental pollution: air, water, soil and noise pollution. Radiation in environment: Nuclear hazards and human health risks. (12 hrs)

Reference Books:

1. Physics- Foundation and Frontiers- George Gamow, John M. Cleveland, Prentice-Hall, 1960
2. Garland, Introduction to Geophysics 11th edition, WB Saunder Company, London 1979
3. William Lowrie, Fundamentals of Geophysics 11th edition, Cambridge press, UK.
4. Physics of Radiation Therapy, F M khan- Williams and Wilkins, 3rd Edition, 2003.
5. The essential Physics of Medical imaging, Bushberg, Seibert, Leidholdt and Boone Lippincot Williams and Wilkins, 2nd edition 2002.
6. Handbook of Physics in Diagnostic Imaging, R.S Livingstone, B.I. Publications pvt.Ltd.
7. Environmental Studies – Challenges and Solutions A quick compendium by NG Dhawan and KiranBisht, I K International Publishing House Pvt. Ltd, 2013
8. Nuclear Science – A guide to the nuclear science Wall chart, 2018 (CPEP)

II SEMESTER B.Sc.

ELECTIVE PAPER

BSCPHCE 183: PHYSICS OF NANO SCIENCE AND SMART MATERIALS

(2 hrs/week; Total 24 hrs)

Unit I

NanoScience:Introduction to Nanoscience, The development of nanoscale science, Nanotechnology. Making of nanostructures: Overview of top down nanofabrication processes. Mechanical grinding (ball milling), photolithography, electron beam lithography. Overview of bottom up nanofabrication processes. Vapor – phase synthesis: Gas-Vapor deposition , Plasma – based synthesis, Molecular beam epitaxy, Electrodeposition, Sol-gel technique: Introduction. Sol-gel process sol-gel coating processes, Sol-gel applications.

Visualization and manipulation tools used in NanoScience:Optical, electron (SEM, TEM), SPM (STM, AFM) and Optical Tweezers.

Application of Nano Technology. (12 hrs)

Unit II

Smart materials:Overview of smart materials, Piezoelectric Ceramics, Piezo-polymers, Magnetostrictive Materials, Electroactive Polymers, Shape Memory Alloys polymers, Photovoltaic cells, Electro and Magneto Rheological Fluids, pH sensitive polymers, Thermoelectric materials, Magneto caloric materials, Photo mechanical materials, ceramic materials, Shape Intelligent devices based on smart materials, Applications of Smart Actuators: Active and Hybrid Vibration Control. (12 hrs)

ReferenceBooks:

1. Nano World - Introduction to Nano Science and Technology, CNR Rao, Nava Karnataka Publication Limited, Bangalore (2011)
2. Fundamentals of Nano Science, Kakani, New Age International Publishers(2017)
3. Modern Physics, G Aruldas, P Rajgopal PHI learning Limited, New Delhi (2009)
4. Modern Physics, SL KakaniSubhraKakani Viva Books (2011)
5. Solid State Physics, SO Pillai, New Age International (2018)
6. Concepts of Modern Physics, Arthur Beiser, TMH Publication (1997).

III SEMESTER B.Sc.

ELECTIVE PAPER

BSCPHCE 233: Electrical Appliances

(2 hrs/week; Total 24 hrs)

Unit I

Basics of Current Electricity: Electric current, Ohms law, emf, resistances in series & parallel. Electric Power, KWh, Battery connected in in series & parallel (brief discussion). Alternating current, frequency, period, rms value, generator, reactance, impedance, capacitor, inductor, choke &transformer, Principle of generator.

Current and voltage measuring instruments: AC & DC Ammeter, AC & DC Voltmeter, watt hour meter, Potentiometer, Multi meter, Oscilloscope. (12 hrs)

Unit II

Working Principle of Appliances: Working of switches (1-way 2-way), Principle and working of regulator, principle and working of starter and chokes, Application of Fuses, ELCB (Earth Leakage Circuit Breaker) Principle and working of lightning conductor, Principle and working of Iron box, Principle and working of filament bulb, tube light, fluorescent bulb and LED bulbs, Working of ceiling & table fan, working of Mixer and Grinder, Working of Fridge. (12 hrs)

Reference books:

1. Electrical Engineering, MV Rao, Subhas Stores Books Corner, 2013
2. Electrical Wiring, SL Uppal, GC Gang, Khanna, 1986
3. Electrical Engineering, NL Anwani, DhanpatRai& Sons, 1978

IV SEMESTER B.Sc.

ELECTIVE PAPER

BSCPHOE 283: BASICS OF COMMUNICATION & ASTRONOMY
(2 hrs/week; Total 24 hrs)

Unit I

Electronic communication

Definition, Revolution in electronic communication- Telegraphy, telephony, radio, TV, optical fiber, satellite communication, audio signal, video signal (AF, RF, UHF, VHF) signals. Transducers- microphones, loudspeakers, Advantages of optical fiber communication, satellite communication, Antenna-Receiving antenna, transmitting antenna, Types of communication - short distance communication (AM, FM), Applications: Applications of optical fibre communication and satellite communication. (12 hrs)

Unit II

Basic Astronomy

Brief History of Astronomy**:**Geocentric Model of the Universe, Heliocentric model of Copernicus, Kepler's Laws, Newton's law of gravitation, Galileo and new astronomy. Spectra of light, Reflection and refraction of light, Basic principle of telescope, Types of telescopes – Optical, IR, Gamma ray, X- ray and Radio telescopes.

Solar system: Birth and evolution of solar system. Sun and its structure (mass, radius, size, density, temperature), photosphere, chromosphere, corona, sun spots and sun spot cycle.

Evolution of the earth, Structure of the earth (interior of the earth, mass, size and density, atmosphere, seasonal variation, magnetic field) Moon – structure of the moon (distance from the earth, mass, size, density, atmosphere, phases of the moon). Exploration of the moon. Eclipses – solar and lunar.

Stars : Birth, life and death of stars – life cycle of stars – Protostar to blackhole.

Universe: Origin and evolution of the universe. Expanding universe. Concept of Dark matter and dark energy. (12 hrs)

References Books:

1. Introduction to Astrophysics, BaidyanathBasu, Prentis Hall Publication (1997)
2. Astronomy – The Evolution of Universe, Michel Zeilik, John Weiley& Sons (1988)

Question Paper Pattern for all electives:

Total Marks : 50

Internal : 10

Semester Examination :40

Questions carrying 1 mark (4 out of 6) 1 x 4 =4

Questions carrying 2 marks (4 out of 6) 2 x 4 =8

UNIT I,IIInternal choice for each unit

Questions carrying 4 marks 4 x 4 =16

Questions carrying 6 marks 2 x 6 =12