FACULTY OF SCIENCES

SYLLABUS

of

Physics

For

B.Sc. Non-Medical &Computer Science

(Semester I to IV)

(Under Continuous Evaluation System)

(12+3 System of Education)

Session: 2020-21

The Heritage Institution
KANYA MAHA VIDYALAYA
JALANDHAR

Scheme of Studies and Examination B.Sc.

Physics Semester I

Course Name	Program Name	Course Code		Course Type	Marks					Examination time (in Hours)
					Total	Paper	Ext.		CA	
							L	P		
Physics	B.Sc. (Non-Medical) B.Sc. (Computer Sci.)	BSNM-1395 BCSM-1395	I	E	100	Mechanics	30	-	20	3
			II			Electricity And Magnetism	30	-		3
			P			Physics Practical	-	20		3

Physics Semester II

Course Name	Program Name	Course Code		Course Type	Marks					Examination time (in Hours)
					Total	Paper	Ext.		CA	
							L	P		
Physics	B.Sc. (Non Medical) B.Sc. (Computer Sci.)	BSNM-2395 BCSM-2395	I	E	100	Relativity And Electromagnetism	30	-	20	3
			II			Vibration And Waves	30	-		3
			P			Physics Practical	-	20		3

Physics Semester III										
Course Name	**Program Name**	**Course Code**		**Course Type**	**Marks**					**Examination time (in Hours)**
					Total	**Paper**	**Ext. L**	**Ext. P**	**CA**	
Physics	B.Sc. (Non-Medical) B.Sc. (Computer Sci.)	BSNM-3395 BCSM-3395	I	C	100	Statistical Physics and Thermodynamics	30	-	20	3
			II			Optics	30	-		3
			P			Physics Practical	-	20		3

Physics Semester IV										
Course Name	**Program Name**	**Course Code**		**Course Type**	**Marks**					**Examination time (in Hours)**
					Total	**Paper**	**Ext. L**	**Ext. P**	**CA**	
Physics	B.Sc. (Non Medical) B.Sc. (Computer Sci.)	BSNM-4395 BCSM-4395	I	C	100	Quantum Mechanics	30	-	20	3
			II			Atomic Spectra & Lasers	30	-		3
			P			Physics Practical	-	20		3

SEMESTER–I
PHYSICS
MECHANICS
(THEORY)

Course code: BSNM-1395 (I) for B.Sc. (Non Medical)
BCSM-1395 (I) for B.Sc. (Computer Science)

Course Outcomes: Mechanics -Paper (A)

After passing this course, students will be able to:

CO1: Understand the various coordinate systems and its applications. Students will be able to know the conservations laws and the symmetries of space & time.

CO2: Know the fundamental forces of nature, concept of centre mass, central forces and the motion of particle under central force and to determine the turning points of orbit.

CO3: Understand the frames of reference, coriolis force forces and its applications and effect of rotation of earth on g.

CO4: understand the elastic collision in different systems, cross section of elastic scattering as well as Rutherford scattering and know the motion of rigid body.

B.Sc. (Semester System) (12+3 System of Education) *(Semester–I) (Session 2020-21)*
(Faculty of Sciences)
SEMESTER–I

PHYSICS
MECHANICS
(THEORY)
Course code:BSNM-1395 (I) for B.Sc. (Non Medical)
BCSM-1395 (I) for B.Sc. (Computer Science)

Time: 3 Hours **Marks: 30**

Pass Marks: 11

Instructions for the Paper Setters:
Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I
Cartesian and spherical polar co–ordinate systems, area, volume, velocity and acceleration in these systems, Solid angle, Relationship of conservation laws and symmetries of space and time.

UNIT–II
Various forces in Nature (Brief introduction) centre of mass, equivalent one body problem, central forces, equation of motion under central force, equation of orbit and turning points. Kepler Laws. Concept of Ether and Michelson–Morley experiment.

UNIT–III
Inertial frame of reference. Galilean transformation and Invariance. Non Inertial frames, Coriolis force and its applications. Variation of acceleration due to gravity with latitude. Foucault pendulum.

UNIT–IV
Elastic collision in Lab and C.M. system, velocities, angles and energies, cross section of elastic scattering, Rutherford scattering. Rigid Body motion; Rotational motion, principal moments and Axes. Euler's equations, precession and elementary gyroscope.

Books Suggested:

1. Mechanics-Berkeley Physics Course, by C. Kittel, W. D. Knight, M. A.Ruderman, C. A. Helmholtz and R. J. Moyer-Tata Mc Graw Hill Publishing Company Ltd.,New Delhi. Vol-I (second edition)
2. Fundamentals of Physics by D. Halliday, R. Resnick and J. Walker (sixth edition)-Wiley India Pvt. Ltd., New Delhi, 2004.
3. Analytical Mechanics by S. K. Gupta, Modern Publishers.

SEMESTER–I
PHYSICS
ELECTRICITY AND MAGNETISM
(THEORY)
Course code: BSNM-1395 (II) for B.Sc. (Non Medical)
BCSM-1395 (II) for B.Sc. (Computer Science)

Course Outcomes: Electricity and magnetism

After passing this course the students will be able to:

CO1: understand the vector calculus and vector algebra and its applications in electricity and magnetism. The students will be able to solve the electrostatic problems with the help of Gauss law and Coulomb's law.

CO2: understand the applications of scalar potential for the calculation of electric field and electric potential due to an arbitrary charge distribution.

CO3: solve the problems with the help of method of images and understand the conduction of electric current and fundamental laws of electricity.

CO4: relate the electric and magnetic fields in two inertial frames of reference.

SEMESTER–I
PHYSICS
ELECTRICITY AND MAGNETISM
(THEORY)
Course code: BSNM-1395 (II) for B.Sc. (Non Medical)
BCSM-1395 (II) for B.Sc. (Computer Science)

Time: 3 Hours **Marks: 30**

Pass Marks: 11

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I

Basic ideas of Vector Calculus Gradient, Divergence, curl and their physical significance. Laplacian in rectangular, cylindrical and spherical coordinates. Coulomb's Law for point charges
And continuous distribution of charges. Electric field due to dipole, line charge and sheet of charge. Electric flux, Gauss's Law and its applications. Gauss's divergence theorem and differential form of Gauss's Law. Green's theorem.

UNIT–II

Work and potential difference. Potential difference as line integral of field. Electric potential due
to a point charge a group of point charges, dipole and quadruple moments, long uniformly charged wire, charged disc. Stoke's theorem and its applications in Electrostatic field, curl E=0.Electric fields as gradient of scalar potential. Calculation of E due to a point charge and dipole from potential. Potential due to arbitrary charge distribution and multipole moments.

UNIT–III

Poisson and Laplace's equation and their solutions in Cartesian and spherical coordinates. Concept of electrical images. Calculation of electric potential and field due to a point charge placed near an infinitely conducting sheet. Current and current density, equation of continuity. Microscopic form of Ohm's Law ($J=\sigma E$) and conductivity, Failure of Ohm's Law. Invariance of charge.

UNIT–IV

E in different frames of reference. Field of a point charge moving with constant velocity. Interaction between moving charges and force between parallel currents. Behaviour of various substances in magnetic field. Definition of M and H and their relation to free and bound currents.
Permeability and susceptibility and their interrelationship. Orbital motion of electrons and Diamagnetism.

Books Suggested:

1. Fundamentals of Electricity and Magnetism by Arthur F. Kipp.
2. Electricity and Magnetism, Berkeley Physics Course, by E.M. Purcell. Vol. II
3. Introduction to Classical Electrodynamics by David Griffith.
4. EM Waves and Radiating System by Edward C. Jordan and K.G. Balmain.
5. Fields and Waves Electromagnetic by David K. Cheng.

SEMESTER–I
PHYSICS
PHYSICS PRACTICAL
Course code:BSNM-1395 (P) for B.Sc. (Non Medical)
BCSM-1395 (P) for B.Sc. (Computer Science)

Course Outcomes : Physics Lab Sem I
CO1: Students will be able to find the value of acceleration due to gravity using pendulums.
CO2 : It will give understanding of collisions In 1-Dimension.
CO3: It helps to study the moment of inertia of a body & on what factors its depends.

SEMESTER–I
PHYSICS PRACTICAL
Course code: BSNM-1395 (P) for B.Sc. (Non Medical)
BCSM-1395 (P) for B.Sc. (Computer Science)

Instructions to Practical Examiner
Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar

General Guidelines for Practical Examination
I. The distribution of marks is as follows: **Marks: 20**
i) One experiment **7 Marks**
ii) Brief Theory **3 Marks**
iii) Viva–Voce **5 Marks**
iv) Record (Practical file) **5 Marks**
II. There will be one sessions of 3 hours duration. The paper will have one session.
Paper will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.
III. Number of candidates in a group for practical examination should not exceed 12.
IV. In a single group no experiment is to be allotted to more than three examinees in any group.

LIST OF EXPERIMENTS
1. To study the dependence of moment of inertia on distribution of mass (by noting time periods of oscillations using objects of various geometrical shapes but of same mass).
2. To establish relationship between torque and angular acceleration using fly wheel.
3. To find the moment of inertia of a flywheel.
4. Study of bending of beams and determination of Young's modulus.
5. Determination of Poisson's ratio for rubber.
6. To determine energy transfer, coefficient of restitution and verify laws of conservation of linear momentum and kinetic energy in elastic collisions using one dimensional collisions of hanging spheres.
7. To verify the laws of vibrating string by Melde's experiment.
8. Measure time period as a function of distance of centre of suspension (oscillation) from centre of mass, plot relevant graphs, determine radius of gyration and acceleration due to gravity.
9. Find the value of 'g' by Kater's pendulum.
10. Measure time period of oscillation of a Maxwell needle and determine modulus of rigidity of the material of a given wire.
11. To measure logarithmic decrement, coefficient of damping, relaxation time, and quality factor of a damped simple pendulum.

SEMESTER II

SEMESTER–II
PHYSICS
RELATIVITY AND ELECTROMAGNETISM
(THEORY)
Course code: BSNM-2395 (I) for B.Sc. (Non Medical)
BCSM-2395 (I) for B.Sc. (Computer Science)

Course Outcomes: Relativity & Electromagnetism -Paper (A)

After passing this course, students will be able to:

CO1: understand special theory of relativity and related basic concepts and applications.

CO2: derive Maxwell equations and their applications in propagation of e.m. waves in conductors and insulators.

CO3: apply the Biot Savart's Law and Ampere's circuital law in different situations and frames.

CO4: understand the Faraday's Law of electromagnetic induction and LCR circuits.

SEMESTER–II
PHYSICS
RELATIVITY AND ELECTROMAGNETISM
(THEORY)

Course code: BSNM-2395 (I) for B.Sc. (Non Medical)
BCSM-2395 (I) for B.Sc. (Computer Science)

Time: 3 Hours Marks: 30 **Pass Marks: 11**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I

Postulates of special theory of relatively. Lorentz transformations, observer and viewer in relativity. Relativity of simultaneity, Length, Time, velocities. Relativistic Dopper effect. Variation of mass with velocity, mass–energy equivalence, rest mass in an inelastic collision, relativistic momentum & energy, their transformation, concepts of Murkowski space, four vector
formulation.

UNIT–II

Lorentz's force, Definition of B. Biot Savart's Law and its application to long straight wire, circular current loop and solenoid. Ampere's Circuital law and its application. Divergence and curl of B. Hall effect, expression and co–efficient. Vector potential, Definition and derivation, current–density–definition, its use in calculation of charge in magnetic field at a current sheet. Transformation equation of E and B from one frame to another.

UNIT–III

Faraday's Law of EM induction, Displacement current, Mutual inductance and reciprocity theorem. Self inductance, L for solenoid, Coupling of Electrical circuits. Analysis of LCR series and parallel resonant, circuits Q–factor, Power consumed, power factor.

UNIT–IV

Maxwell's equations their derivation and characterizations, E.M. waves and wave equation in a medium having finite permeability and permittivity but with conductivity $\sigma= 0$). Poynting vector, impedance of a dielectric to EM waves. EM waves in a conducting medium and Skin depth. EM wave velocity in a conductor and anomalous dispersion. Response of a conducting medium to EM waves. Reflection and transmission of EM waves at a boundary of two dielectric media for normal and oblique incidence.

Recommended Books:

1. Introduction to Electrodynamics by D.J. Griffiths-Pearson Education Ltd., New Delhi, 1991
2. Physics of Vibrations and Waves by H.J. Pain.
3. EM Waves and Radiating Systems by Edward C. Jordan and K.G. Balmain.
4. Fields and Waves Electromagnetic by David K. Cheng.

SEMESTER–II
PHYSICS
VIBRATION AND WAVES
(THEORY)
Course code: BSNM-2395 (II) for B.Sc. (Non Medical)
BCSM-2395 (II) for B.Sc. (Computer Science)

After passing this course the student will be able to:

CO1: demonstrate Lissajous figures by mechanical and analytical method with different cases.

CO2: understand Free, damped and resonance oscillations, both mechanical and electric using differential equations.

CO3: solve differential equation of forced oscillations & to obtain related quantities.

CO4: understand concept of coupled oscillators and wave motion. Student will also be able to apply the concept of waves and oscillations to any type of waves like e. m. waves, mechanical waves.

SEMESTER–II
PHYSICS
VIBRATION AND WAVES
(THEORY)
Course code: BSNM-2395 (II) for B.Sc. (Non Medical)
BCSM-2395 (II) for B.Sc. (Computer Science)

Time: 3 Hours **Marks: 30**

Pass Marks: 11

Instructions for the Paper Setters:
Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I
Simply harmonic motion, energy of a SHO. Compound pendulum. Torsional pendulum Electrical Oscillations Transverse Vibrations of a mass on string, composition of two Perpendicular SHM of same period and of period in ratio 1:2.

UNIT–II
Decay of free Vibrations due to damping. Differential equation of motion, types of motion, types of damping. Determination of damping co–efficient– Logarithmic decrement, relaxation time and Q–Factor. Electromagnetic damping (Electrical oscillator).

UNIT–III
Differential equation for forced mechanical and electrical oscillators. Transient and steady state behaviour. Displacement and velocity variation with driving force frequency, variation of phase with frequency, resonance. Power supplied to an oscillator and its variation with frequency. Q–value and band width. Q–value as an amplification factor. Stiffness coupled oscillators, Normal co–ordinates and normal modes of vibration. Inductance coupling of electrical oscillators.

UNIT–IV
Types of waves, wave equation (transverse) and its solution characteristic impedance of a string. Impedance matching. Reflection and Transmission of waves at boundary. Reflection and transmission of energy. Reflected and transmitted energy coefficients. Standing waves on a string of fixed length. Energy of vibration string. Wave and group velocity.

Recommended Books:
1. Fundamentals of Vibrations and Waves by S.P. Puri.
2. Physics of Vibrations and Waves by H.J. Pain.

SEMESTER–II
PHYSICS PRACTICAL

Course code: BSNM-2395 (P) for B.Sc. (Non Medical)
BCSM-2395 (P) for B.Sc. (Computer Science)

COURSE OUTCOMES

CO1: Students will be able to study resonance in series & parallel LCR circuit.

CO2: At the end of this course, students will be able to find the value of capacitor, coefficient of self inductance, permeability & permittivity of air.

CO3: Students will be able to study the variation of magnetic field on the axis of coil & can find the value of horizontal component of magnetic field.

SEMESTER–II
PHYSICS PRACTICAL

Course code: BSNM-2395 (P) for B.Sc. (Non Medical)
BCSM-2395 (P) for B.Sc. (Computer Science)

Instructions to Practical Examiner

Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar

General Guidelines for Practical Examination: (4.5h/week)

I. The distribution of marks is as follows: **Marks: 20**
i) One experiment **7 Marks**
ii) Brief Theory **3 Marks**
iii) Viva–Voce **5 Marks**
iv) Record (Practical file) **5 Marks**
II. There will be one sessions of 3 hours duration. The paper will have one session.
Paper will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.
III. Number of candidates in a group for practical examination should not exceed 12.
IV. In a single group no experiment is to be allotted to more than three examinees in any group.

LIST OF EXPERIMENTS

1. To determine low resistance with Carey-Foster's Bridge.
2. To study the magnetic field produced by a current carrying solenoid using a search coil and calculate permeability of air.
3. To study the induced e.m.f. as a function of the velocity of the magnet.
4. Study of phase relationships using impedance triangle for LCR circuit and calculate impedance.
5. Resonance in a series and parallel LCR circuits for different R–value and calculate Q–value.
6. Capacitance by flashing and quenching of a neon lamp.
7. Measurement of capacitance, determination of permittivity of a medium air and relative permittivity by de–Sauty's bridge.
8. To determined L using Anderson Bridge.
9. To find the value of BH the horizontal component of earth's magnetic field in the lab using a deflection & vibration magnetometer.
10. To study the variation of magnetic field with distance along the axis of coil carrying current by plotting a graph.

Course Outcomes: PHY-Statistical Physics and Thermodynamics

Course code: BCSM-3395 (I)

After passing this programme the students will be able to:

CO1: Understand the basic ideas and scope of probability as well as distribution of n particles in different compartments.

CO2: Concept of different types of Statistics and the need for Quantum Statistics.

CO3: Understand the concept of entropy, Laws of Thermodynamics and applications to thermoelectric effect.

CO4: Understand the Maxwell Thermodynamics relations, Change of state and Claypron equation.

SEMESTER-III PHYSICS
Course code: BCSM-3395 (I)
PAPER-A
STATISTICAL PHYSICS & THERMODYNAMICS
(THEORY)

Time: 3 Hours **Marks: 30**
Pass Marks: 11

Instructions for the Paper Setters:
Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.
Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I

Basic ideas of Statistical Physics, Scope of Statistical Physics, Basic ideas about probability, Distribution of four distinguishable particles into compartments of equal size. Concept of macro states, microstates, Thermodynamic Probability, Effects of constraints on the system. Distribution of n particles in two compartments, Deviation from the state of maximum probability. Equilibrium state of dynamic system, Distribution of distinguishable n particles in k compartments of unequal sizes.

UNIT–II

Phase space and division into elementary cells. Three kinds of statistics. The basic approach in three statistics. Maxwell Boltzmann (MB) statistics applied to an ideal gas in equilibrium. Experimental verification of law of distribution of molecular speeds. Need for Quantum Statistics – B.E. Statement of Planck's law of Radiation Wien's Displacement and Stefan's law. Fermi Dirac (FD) statistics. Comparison of M.B, B.E and F.D statistics.

UNIT–III

Statistical definition of entropy, Change of entropy of system, additive nature of entropy, Law of increase of entropy, Reversible and irreversible processes, and their examples, work done in reversible process, examples of increase in entropy in natural processes, entropy and disorder, Brief review of Terms, Laws of Thermodynamics, Carnot Cycle, Entropy changes in Carnot cycle, Absolute thermodynamics or Kelvin Scale of Temperature, Applications of thermodynamics to thermoelectric effect, Peltier Effect, Thomson Effect, change of entropy along reversible path in P-V diagram. Heat death of universe.

UNIT–IV

Derivation of Maxwell Thermodynamics relations, Cooling produced by adiabatic stretching, A diabetic Compression, change of internal energy with volume, Specific heat and constant pressure and constant volume. Expression for C_P-C_V, Change of state and Claypron equation, Joule-Thomson effect.

Text Reference Books:

1. Statistical Physics and Thermodynamics by V.S. Bhatia (Sohan Lal Nagin Chand), Jalandhar.
2. A Treatise on Heat by M.N. Saha & B.N. Srivastava (The Indian Press Pvt. Ltd., Allahabad), 1965.
3. Statistical Mechanics: An Introductory Text by Bhattacharjee, J.K. (Allied Pub., Delhi), 2000.
4. Statistical Physics by Bhattacharjee, J.K. (Allied Pub., Delhi) 2000.
5. Statistical Mechanics by B.B. Laud, (Macmillan India Ltd.) 1981.

Course Outcomes: PHY-OPTICS

Course code: BCSM-3395 (II)

After passing this programme the students will be able to:

CO1: understand the concept of interference of waves by division of wave front and its different methods and concept of coherence.

CO2: understand the interference of waves by division of Amplitude and its methods and will have knowledge of interferometers

CO3: understand the Huygen's Fresnel theory and diffraction, Fraunhoffer diffraction due to single slit, double slit and n slits, the concept of resolving power.

CO4: understand the concept the polarization of light and types of polarisers.

SEMESTER–III

PHYSICS
Course Code: BCSM-3395 (II)
PAPER–B: OPTICS
(THEORY)

Time: 3 Hours **Marks: 30**
Pass Marks: 11

Instructions for the Paper Setters:
Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I

Interference of Light:
Superposition of light waves and interference, Young's double slit experiment, Distribution of intensity in Young's double slit experiment, Conditions for sustained interference pattern,
Coherent sources of light, Temporal and spatial coherence, Mathematical analysis of temporal coherence, Interference pattern by division of wave front, Fresnel Biprism, Fresnel double mirror, Llyod's single mirror, Achromatic fringes. Displacement of fringes,

UNIT–II

Interference by Division of Amplitude:
Change of phase on reflection, Interference in thin films due to reflected and transmitted light, Interference in parallel and wedge shaped films, Colour of thin films. Need for extended source for interference by division of amplitude, non-reflecting films, Newton's Rings. Michelson Interferometer, Fabry Perot interferometer and etalon. Distribution of intensity in Fabry Perot fringes.

UNIT–III

Diffraction:
Huygens's fresnel theory, half-period zones, Zone plate, Distinction between Fresnel and Fraunhoffer diffraction. Fraunhoffer diffraction due to single slit, rectangular and circular aperture, double slits and plane transmission grating, Effect of diffraction in optical imaging, its use as a spectroscopic element and its resolving power, Resolving power of telescope, of diffraction grating, of microscope and of Fabry-Perot interferometer.

UNIT–IV

Polarization:
Plane Polarized light, Elliptically polarized light, wire grid polarizer, Sheet polarizer, Maul's Law, Brewster Law, Polarization by reflection and scattering, Double refraction, Nicol prism, Retardation plates, Production and Analysis of plane, circularly and elliptically polarized light, Quarter and half wave plates, Optical activity

Text Reference Books:

1. Fundamentals of Optics by F.A. Jenkins and Harvey E White, (Mcgraw Hill) 4th Edition, 2001.
2. Optics, Ajoy Ghatak by (McMillan Indian) 2nd Edition, 7th Reprint, 1997.
3. Optics by Born and Wolf, (Pergamon Press) 3rd Edition, 1965.
4. Physical Optics by B. K. Mathur and T. P. Pandya.
5. A textbook of Optic by N. Subrahmanyam, Brijlal and M. N. Avadhanulu.
6. Geometrical and Physical Optics by Longhurst.
7. Introduction to Modern Optics by G. R. Fowels.
8. Optics by P. K. Srivastav.

Course Outcomes: SEMESTER–III PHYSICS (PRACTICAL)

Course code: BCSM-3395 (P)

After passing this programme the students will be able to:

CO1: use spectrometer to determine the refractive index of different transparent materials wills dispersive power and resolving power of different transparent prisms and liquids using spectrometer.

CO2: use diffraction grating and apply it to determine dispersive power, resolving power, the wavelengths of Hg source and the Cauchy’s constants.

CO3: to measure an accessible (Horizontal and vertical) and inaccessible heights using sextant.

CO4: set up of Newton’s rings to determine wavelength of sodium light.

CO5: demonstrate the verification of laws of probability distribution.

SEMESTER–III
PHYSICS
Course Code: BCSM-3395 (P)
(PRACTICAL)

Instructions to Practical Examiner

Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar

General Guidelines for Practical Examination

I. The distribution of marks is as follows: **Marks: 20**
i) One experiment **7 Marks**
ii) Brief Theory **3 Marks**
iii) Viva–Voce **5 Marks**
iv) Record (Practical file) **5 Marks**
II. There will be one sessions of 3 hours duration. The paper will have one session.
Paper will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.
III. Number of candidates in a group for practical examination should not exceed 12.
IV. In a single group no experiment is to be allotted to more than three examinees in any group.

List of Experiments

1. To determine refractive index of glass and liquid using spectrometer.
2. To determine the Cauchy's constants.
3. To study the refractive index of a doubly refracting prism.
4. To set up Newton's rings to determine wavelength of sodium light.
5. To determine the wavelength by using plane diffraction grating (Use Hg source)
6. To determine dispersive power of plane diffraction grating.
7. To determine resolving power of a telescope.
8. To measure an accessible (Horizontal and vertical) height using sextant.
9. To measure inaccessible height by using sextant.
10. Verify laws of probability distribution by throwing of similar coins.
11. To determine the wavelength of given laser source using Young's double slit experiment

Course Outcomes: Quantum Mechanics (Paper A)

Course code: BCSM-4395 (I)

After completing this course

CO1: Students will be familiar with the main aspects of the historical development of quantum mechanics

CO2: Students will understand the central concepts and principles in quantum mechanics

CO3: Students will be able to find the solution of Schrödinger wave equation for simple systems in one dimension and for Hydrogen atom.

CO4: Students will understand concept of X rays spectra and molecular spectra.

SEMESTER–IV
PHYSICS
Course code: BCSM-4395 (I)
PAPER–A
QUANTUM MECHANICS
(THEORY)

Time: 3 Hours **Marks: 30**
Pass Marks: 11

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I

Formalism of Wave Mechanics:

Brief introduction to need and development of quantum mechanics, photoelectric effect,
Compton effect, Wave particle duality, De Broglie hypothesis, Wave packet, Group velocity, Uncertainty principle and its applications. Fundamental postulates of wave mechanics, Time dependent and time independent Schrodinger wave equation for a free particle and equation of a particle subject to forces. Stationary states, Superposition principle.

UNIT–II

Normalization and probability interpretation of wave function, Gaussian wave packet. Admissibility conditions of wave function, Eigen function and Eigen value, Expectation value, Operator and commutator formalism, Hermitian operator, orthogonal system, Probability current and conservation of probability, Ehrenfest theorem,.

UNIT–III

Problem in One and Three Dimensions:

Application of Schrodinger Equation for solving one dimensional Particle in a box, one dimensional potential step, Potential Barrier and Linear harmonic oscillator. Schrodinger equation for spherically symmetric potential for hydrogen atom. Spherical harmonics and their solution. Physical significance of quantum number, Degeneracy.

UNIT–IV

Production of X Rays and its properties, X-ray spectra, Moseley law, Absorption of X Rays, Auger effect, Molecular bonding of hydrogen molecule ion and hydrogen molecule, Molecular spectra, selection rules, Raman Effect.

Text Reference Books:

1. A Text book of Quantum Mechanics by P.M. Mathews and K. Venkatesan, (Tata McGraw Hill Pub., Co., Delhi) 2002.
2. Quantum Mechanics by J.L. Powell and B. Craseman (Narosa Pub. House, New Delhi) 1997.
3. Concepts of Modern Physics by Arthur Beiser (McGraw Hill Pub. Co., New Delhi, 9th Ed.)
4. 1995.
5. Elements of Modern Physics by S.H. Patil (McGraw Hill), 1998.
6. Quantum Mechanics by E. Merzbacher (John Wiley, 2nd Edition)
7. Fundamentals of Molecular Spectroscopy by C.N. Banwell (Tata McGraw Hill Pub. Co.,
8. Delhi), 2001.
9. Atomic Spectra by H.G. Kuhn (Longmans), 2nd Ed., 1969.
10. Introduction to Quantum Mechanic by L. Pauling and E.B. Wilson (Tata McGraw Hill Pub. Co., Delhi), 2002.
11. Quantum Mechanics by W. Greiner (Springer Verlag), 1994.
12. Fundamentals of Molecular Spectroscopy by C.B. Banwell-Tata McGraw Hill, 1986.
13. Molecular Spectroscopy: Jeanne L McHale.

Course Outcomes: PHY- ATOMIC SPECTRA & LASERS
Course Code: BCSM-4395 (II)

After passing this programme the students will be able to:

CO1: understand fine and hyperfine spectrum of hydrogen atom and the concept of spin of an electron

CO2: demonstrate understanding of exchange symmetry of wave function, different coupling schemes and spectra of atoms with more than one electron.

CO3: understand the fundamentals of lasers and its processes

CO4: have the knowledge of different components and types of lasers and its applications

SEMESTER–IV
PHYSICS
Course code: BCSM-4395 (II)
PAPER–B
ATOMIC SPECTRA & LASERS
(THEORY)

Time: 3 Hours **Marks: 30**
Pass Marks: 11

Instructions for the Paper Setters:
Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I

One Electron Atomic Spectra:
Brief review of Bohr and Rutherford model of atom. Idea of vector model of atom and quantum numbers, Spectrum of Hydrogen atom, Line structure, electron spin, Stern Gerlach
experiment, spin orbit coupling, electron magnetic moment, total angular momentum, fine and Hyperfine structure of hydrogen atom, Lande g factor, Normal Zeeman effect, anomalous Zeeman effect.

UNIT–II

Many Electron System Spectra:
Exchange symmetry of wave function, Pauli's Exclusion principle, Electronic configuration and atomic states, shells, sub shells in atoms, Two valence electron atoms: LS and JJ coupling schemes and resulting spectral terms, optical spectra for one and many electron system(Helium), spectra of alkaline earth atoms.

UNIT–III

Laser Fundamentals:
Derivation of Einstein relations, Concept of stimulated emission and population inversion, Fauchber Ledenberg formula, Threshold and Schawlow Tonnes condition, Components of laser devices and its types, three level and four level laser schemes, elementary theory of optical cavity.

UNIT–IV

Laser Systems:
Construction, mode of creating population inversion and output characteristics of Ruby laser, He-Ne laser, CO_2laser and Nd: YAG laser, applications of lasers–a general outline, Q-switching, Basics of holography.

Text Reference Books:

1. Introduction to Atomic Spectr by: H.E. White-Auckland McGraw Hill, 1934.
2. Spectroscopy Vol. I, II & III by Walker & Straughen
3. Introduction to Molecular Spectroscopy by G.M. Barrow-Tokyo McGraw Hill, 1962.
4. Spectra of Diatomic Molecules by Herzberg-New York, 1944
5. Introduction to Atomic Spectra by H.E. White (Mcgraw Hill, Book Co., Inc., New York)
6. Laser Fundamentals by W.T. Silfvast (Foundation Books), New Delhi, 1996
7. Laser and Non-Liner Optics by B.B. Laud (New Age Pub.) 2002
8. Laser, Svelto by (Plenum Pres) 3rd edition, New York

Course Outcomes: PHY Lab Sem IV

Course code: BCSM-4395 (P)

CO1: The exercises included in this laboratory course are aimed at training the students to handle different type of equipment for verification of some of the laws and concepts studied in theory like concepts of thermodynamics, photoelectric effect and for carrying out precise measurements so that they develop confidence to use later the sophisticated instruments in their respective fields.

CO2: After the completion of this course students will be able to use spectrometer and hence will be able to study absorption spectra of iodine.

CO3: At the end of this course students will be able to prepare cane sugar solution and hence will be able to find its specific rotation by using polarimeter.

SEMESTER–IV
PHYSICS
(PRACTICAL)
Course code: BCSM-4395 (P)

Instructions to Practical Examiner

Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar

General Guidelines for Practical Examination

I. The distribution of marks is as follows: **Marks: 20**

i) One experiment **7 Marks**

ii) Brief Theory **3 Marks**

iii) Viva–Voce **5 Marks**

iv) Record (Practical file) **5 Marks**

II. There will be one sessions of 3 hours duration. The paper will have one session.

Paper will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment is to be allotted to more than three examinees in any group.

List of Experiments

1. To study adiabatic expansion of gas and hence to calculate value of V.
2. To find the coefficient of Thermal Conductivity of a bad conductor by Lee's method.
3. To plot a calibration curve of a given thermocouple (copper constantan).
4. To study the photoelectric effect and determine the value of Planck's constant.
5. To determine the ionization potential of mercury.
6. Study of variation of light intensity with distance using photovoltaic cell
(Inverse Square Law)
7. To determine the heating efficiency of an electric kettle with varying voltage.
8. To study the absorption spectra of iodine vapours.
9. To study the rotation of plane of polarization by using polarimeter.
10. To determine the specific rotation of sugar using Laurent's half shade polarimeter
11. To study the characterizations of Photovoltaic cell.

ANNEXURE C

FACULTY OF SCIENCES

PHYSICS
SYLLABUS
for
Bachelor of Science

(Non-Medical &Computer Science)

(12+3 SYSTEM OF EDUCATION)

(Semester V&VI)

(Under Continuous Evaluation System)

Session: 2020-21

The Heritage Institution

KANYA MAHA VIDYALAYA JALANDHAR (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME

Bachelor of Science

(Non-Medical &Computer Science)

Session-2020-21

<table>
<tr><th colspan="12">B.Sc. Non-Medical &Computer Science Semester V</th></tr>
<tr><th rowspan="3">Course Name</th><th rowspan="3">Program Name</th><th rowspan="3" colspan="2">Course Code</th><th rowspan="3">Course Type</th><th colspan="5">Marks</th><th rowspan="3">Examination time (in Hours)</th></tr>
<tr><th rowspan="2">Total</th><th rowspan="2">Paper</th><th colspan="2">Ext.</th><th rowspan="2">CA</th></tr>
<tr><th>L</th><th>P</th></tr>
<tr><td rowspan="3">Physics</td><td rowspan="3">B.Sc. (Non Medical)
B.Sc. (Computer Sci.)</td><td rowspan="3">BSNM-5395
BCSM-5395</td><td>I</td><td rowspan="3">C</td><td rowspan="3">100</td><td>CONDENSED MATTER PHYSICS</td><td>30</td><td>-</td><td rowspan="3">20</td><td>3</td></tr>
<tr><td>II</td><td>NUCLEAR PHYSICS</td><td>30</td><td>-</td><td>3</td></tr>
<tr><td>P</td><td>Physics Practical</td><td>-</td><td>20</td><td>3</td></tr>
</table>

<table>
<tr><th colspan="12">B.Sc. Non-Medical &Computer Science Semester VI</th></tr>
<tr><th rowspan="3">Course Name</th><th rowspan="3">Program Name</th><th rowspan="3" colspan="2">Course Code</th><th rowspan="3">Course Type</th><th colspan="5">Marks</th><th rowspan="3">Examination time
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<tr><th>L</th><th>P</th></tr>
<tr><td rowspan="3">Physics</td><td rowspan="3">B.Sc. (Non Medical)
B.Sc. (Computer sci.)</td><td rowspan="3">BSNM-6395
BCSM-6395</td><td>I</td><td rowspan="3">C</td><td rowspan="3">100</td><td>RADIATION AND PARTICLE PHYSICS</td><td>30</td><td>-</td><td rowspan="3">20</td><td>3</td></tr>
<tr><td>II</td><td>ELECTRONICS</td><td>30</td><td>-</td><td>3</td></tr>
<tr><td>P</td><td>Physics Practical</td><td>-</td><td>20</td><td>3</td></tr>
</table>

Bachelor of Science (Semester System) (12+3 System of Education)
(Semester–V) (Session 2020-21)
PHYSICS (CONDENSED MATTER PHYSICS)
(THEORY)
Course code: BSNM-5395 (I) for B.Sc. (Non Medical)
BCSM-5395 (I) for B.Sc. (Computer Science)

Course Outcomes

After passing this course, students will be able to:

CO 1. Understand basics about crystal structures in solids, various types of crystal structure, unit cells and symmetry operations.

CO 2. Understand the experimental methods to determine crystal structures, reciprocal lattice, Brillioun zones and form factor.

CO 3. Understand the concept of lattice vibrations and role of phonons in determining specific heat of solids at low temperatures and models of specific heat.

CO 4. Build concept from free electron model to Kronig Penny model and its application to band theory to differentiate insulators, semiconductors and conductors.

Bachelor of Science (Semester System) (12+3 System of Education)
(Semester–V) (Session 2020-21)
PHYSICS (CONDENSED MATTER PHYSICS)
(THEORY)

Course code: BSNM-5395 (I) for B.Sc. (Non Medical)
BCSM-5395 (I) for B.Sc. (Computer Science)

Time: 3 Hours **Max. Marks: 30** **Pass Marks: 11**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 6 marks.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I

Crystal structure, Symmetry operations for a two and three dimensional crystal, Two dimensional Bravais lattices, Three dimensional Bravais lattices, Basic primitive cells, Crystal planes and Miller indices, Diamond and NaCl structure.

UNIT–II

Crystal Diffraction: Bragg's law, Experimental methods for crystal structure studies, Laue equations, Reciprocal lattices of SC, BCC and FCC, Brag's law in reciprocal lattice, Brillioun zones and its construction in two and three dimensions, Structure factor and atomic form factor.

UNIT–III

Lattice vibrations, Concepts of phonons, Scattering of photons by phonons, Vibration and monoatomic, linear chains, Density of modes, Einstein and Debye models of specific heat. Free electron model of metals, Free electron, Fermi gas and Fermi energy.

UNIT–IV

Band Theory: Kronig Penney model, Metals and insulators, Conductivity and its variation with temperature in semiconductors, Fermi levels in intrinsic and extrinsic semiconductors, band gap in semiconductors.

Books Suggested:

1. Introduction to Solid State Physics by C. Kittel (Wiley Eastern)
2. Elements of Modern Physics by S.H. Patil (TMGH, 1985).
3. Solid State Physics by Puri and Babbar.
4. Condensed Matter Physics by T.S. Bhatia (Vishal Publishing Co.)

Bachelor of Science (Semester System) (12+3 System of Education)
(Semester–V) (Session 2020-21)
PHYSICS (NUCLEAR PHYSICS)
(THEORY)
Course code: BSNM-5395 (II) for B.Sc. (Non Medical)
BCSM-5395 (II) for B.Sc. (Computer Science)

Course Outcomes

After passing this course, students will be able to:

CO 1. Understand basic properties of nucleus and nuclear forces.

CO 2. Understand about radioactivity, theories of alpha, beta and gamma decay, neutrino hypothesis.

CO 3. Understand concepts and types about nuclear reactions, reactions cross section and compound nucleus.

CO 4. Understand nuclear models (Liquid drop and Shell model) and their failures and successes.

Bachelor of Science (Semester System) (12+3 System of Education)
(Semester–V) (Session 2020-21)
PHYSICS (NUCLEAR PHYSICS)
(THEORY)

Course code: BSNM-5395 (II) for B.Sc. (Non Medical)
BCSM-5395 (II) for B.Sc. (Computer Science)

Time: 3 Hours **Marks: 30** **Pass Marks: 11**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 6 marks.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I

Nuclear Properties: Constituents of nucleus, non-existence of electrons in nucleus, Nuclear mass and binding energy, features of binding energy versus mass number curve, nucleus radius, angular momentum and parity, nuclear moments: magnetic dipole moment and electric quadruple moment, properties of nuclear forces, Yukawa theory.

UNIT–II

Radioactive Decays: Modes of decay of radioactive nuclides and decay Laws, radioactive series and displacement law, radioactive dating, Alpha decay: Gamow's theory of alpha decay, barrier penetration as applied to alpha decay, Geiger Nuttal law, Beta decays: β^-, β^+ and electron capture decays, Neutrino hypothesis and its detection, parity violation in β decay, Gamma transitions, internal conversion.

UNIT–III

Nuclear Reactions: Types of nuclear reactions, reactions cross section, conservation laws, Kinematics of nuclear reaction, examples of nuclear reactions: proton, deuteron, alpha particle, neutron and photon induced reactions. Q-value and its physical significance, Compound nucleus

UNIT–IV

Nuclear Models: Liquid drop model, semi-empirical mass formula, condition of stability, evidence for nuclear magic numbers, Shell Model, energy level scheme, angular momenta of nuclear ground states, parity and magnetic moment of nuclear ground states.

Reference Books:

1. Basic Ideas and Concepts in Nuclear Physics by K. Hyde
2. Introduction to Nuclear Physics by H.A. Enge
3. Nuclear Physics by I. Kaplan (Addison Wesley)
4. Nuclei and Particles by E. Segre

Bachelor of Science (Semester System) (12+3 System of Education)
(Semester–V) (Session 2020-21)
PHYSICS PRACTICAL
Course code: BSNM-5395 (P) for B.Sc. (Non Medical)
BCSM-5395 (P) for B.Sc. (Computer Science)

Course Outcomes : Physics Lab Sem V

CO 1. Students will be able to characterize p-n junction, zener diode, LED and LDR.
CO 2. Student will be able to use CRO for AC, DC, voltages and frequencies.
CO 3. Student will be able to understand the use of GM counter.

Bachelor of Science (Semester System) (12+3 System of Education)
(Semester–V) (Session 2020-21)
PHYSICS PRACTICAL
Course code: BSNM-5395 (P) for B.Sc. (Non Medical)
BCSM-5395 (P) for B.Sc. (Computer Science)

Instructions to Practical Examiner

Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, Kanya MahaVidyalaya, Jalandhar

General Guidelines for Practical Examination

I. The distribution of marks is as follows: **Marks: 20**

i) One experiment **7 Marks**

ii) Brief Theory **3 Marks**

iii) Viva–Voce **5 Marks**

iv) Record (Practical file) **5 Marks**

II. There will be one sessions of 3 hours duration. The paper will have one session.

Paper will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment is to be allotted to more than three examinees in any group.

LIST OF EXPERIMENTS-

1. Measurement of reverse saturation current in p-n-junction diode at various temperatures and to find the approximate value of energy gap.
2. To draw forward and reverse bias characteristics of a p-n junction diode and draw a load line.
3. To trace the B-H curves for different materials using CRO and find the magnetic parameters from these.
4. To study the characteristics of a thermistor and find its parameters.
5. To study the response of RC circuit to various input voltage (square, sine and triangular)
6. Study the working of CRO and measure voltage and frequency of AC and DC supply.
7. Study the characteristics of a LED.
8. To study characteristics of a LDR.
9. To obtain the wave form of a given oscillator using a cathode ray oscilloscope.
10. To draw the characteristics of a Zener diode.

Bachelor of Science (Semester System) (12+3 System of Education)
(Semester–VI) (Session 2020-21)
PHYSICS (RADIATION AND PARTICLE PHYSICS)
Course code: BSNM-6395 (I) for B.Sc. (Non Medical)
BCSM-6395 (I) for B.Sc. (Computer Science)

Course Outcome:

After successfully completing this course a student will be able to:

CO1: understand interaction of radiation and charged particles with matter.

CO2: understand theory and working of various types of nuclear detectors like gas filled, semiconductor, solid state track detectors and nucleus emulsions.

CO3: understand theory and working of various particle accelerators, linear and cyclic and phase stability conditions.

CO4: understand about elementary particles, different types of interactions and quark mode.

Bachelor of Science (Semester System) (12+3 System of Education)

(Semester–VI) (Session 2020-21)
PHYSICS (RADIATION AND PARTICLE PHYSICS)
Course code: BSNM-6395 (I) for B.Sc. (Non Medical)
BCSM-6395 (I) for B.Sc. (Computer Science)

(THEORY)

Time: 3 Hours **Marks: 30** **Pass Marks: 11**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. **Each question carries 6 marks.**

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I

Interaction of Radiation and Charged Particles with Matter: Derivation of Bethe-Bloch formula, Stopping power and range of heavy charged particles, Energy loss of electrons and positrons, Positrons annihilation, interaction of gamma rays with matter.

UNIT–II

Nuclear Radiation Detection: Gas-filled detectors, Proportional and Geiger-Mueller counters, Scintillation detectors, Semiconductor detectors, Cherenkov effect, Solid state nuclear track detectors. Bubble chamber.

UNIT–III

Accelerators: Linear accelerators, Cyclic accelerators: Cyclotron, Synchrocyclotron, Betatron, Electron and proton synchrotron, Colliding beam machines: introduction to Large Hadron Collider

UNIT–IV

Elementary Particles: Historical introduction, high energy physics units, fermions and bosons, particles and antiparticles, Classification of particles, types of interactions, electromagnetic, weak, strong interactions, gravitational interactions, Quantum numbers and conservation laws: Charge, Baryon number, lepton number, parity, isospin, charge conjugation, strangeness. Introduction to quarks and qualitative discussion of the quark model,

Reference Books:

1. Basic Ideas and Concepts in Nuclear Physics by K. Hyde
2. Introduction to Nuclear Physics by H.A. Enge
3. Nuclear Physics by I. Kaplan (Addison Wesley)
4. Nuclei and Particles by E. Segre
5. Introduction to High Energy Physics by D.H. Perkins
6. Elementary Particles by I.S. Hughes

Bachelor of Science (Semester System) (12+3 System of Education)
(Semester–VI) (Session 2020-21)
PHYSICS (ELECTRONICS)
Course code: BSNM-6395 (II) for B.Sc. (Non Medical)
BCSM-6395 (II) for B.Sc. (Computer Science)

Course Outcomes- After completing this course a student will be able to
CO1: understand, concept of voltage and current sources, working of a p-n junction diode and zener diode in rectification and voltage regulation.
CO2: understand the characteristics, biasing and working of BJT and FETs.
CO3: able to understand h-parameters, amplifiers using BJT & FETs and types of feedbacks and practical example of negative feedback (emitter follower).
CO4: understand LC and RC oscillators and their comparison.

Bachelor of Science (Semester System) (12+3 System of Education)
(Semester–VI) (Session 2020-21)
PHYSICS (ELECTRONICS)
Course code: BSNM-6395 (II) for B.Sc. (Non Medical)
BCSM-6395 (II) for B.Sc. (Computer Science)
(THEORY)

Time: 3 Hours **Marks: 30** **Pass Marks: 11**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. **Each question carries 6 marks.**

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I

Concepts of current and voltage sources, p-n junction, Biasing of diode, V-I characteristics, Rectification: half wave, full wave rectifiers and bridge rectifiers, Efficiency, Ripple factor, Qualitative ideas of filter circuits (Shunt capacitor, L section and π filters), Introduction to Zener diode and voltage regulation, Photonic devices (construction and working of solar cell, photodiode and LED).

UNIT–II

Junction transistor : Structure and working relation between different currents in transistors, Sign conventions, Amplifying action, Different configurations of a transistor and their comparison, CB and CE characteristics, Structure and characteristics of JEFT, Transistor biasing and stabilization of operating point, Voltage divider biasing circuit.

UNIT–III

Working of CE amplifier, Amplifier analysis using h-parameters, Equivalent circuits, Determination of current gain, Power gain, Input impedance, FET amplifier and its voltage gain, Feed back in amplifiers, Different types, Voltage gain, Advantage of negative feed back, Emitter follower as negative feedback circuit.

UNIT–IV

Barkhausen criterion of sustained oscillations, LC oscillator (tuned collector, tuned base Hartley), RC oscillators, Phase shift Oscillator and Wein Bridge Oscillator

Books Suggested:

1. Basic Electronics and Linear Circuits by N.N. Bhargave, D.C. Kulshreshtha and S.C. Gupta.

2. Foundations of Electronics by D. Chatophadhyay, P.C. Rakshit, B. Saha and N.N. Purkit.

3. Basic Electronics by D.C. Tayal (Himalaya Pub.)

Bachelor of Science (Semester System) (12+3 System of Education)
(Semester–VI) (Session 2020-21)
PHYSICS PRACTICAL
Course code: BSNM-6395 (P) for B.Sc. (Non Medical)
BCSM-6395 (P) for B.Sc. (Computer Science)

Course Outcome: After successfully completing this course a student will be able to:

CO1: understand application of p-n junction diode and zener diode as rectifiers and voltage regulators respectively.
CO2: plot characteristics of BJT and FET and be able to understand h-parameters and application of BJT as amplifier and oscillator.
CO3: use of GM counter to concepts of end point energy and absorption coefficient.

Bachelor of Science (Semester System) (12+3 System of Education)
(Semester–VI) (Session 2020-21)
PHYSICS PRACTICAL
Course code: BSNM-6395 (P) for B.Sc. (Non Medical)
BCSM-6395 (P) for B.Sc. (Computer Science)

Instructions to Practical Examiner
Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar
General Guidelines for Practical Examination
I. The distribution of marks is as follows: **Marks: 20**
i) One experiment **7 Marks**
ii) Brief Theory **3 Marks**
iii) Viva–Voce **5 Marks**
iv) Record (Practical file) **5 Marks**
II. There will be one sessions of 3 hours duration. The paper will have one session.
Paper will consist of 8 experiments out of which an examinee will mark 6 experiments andone of these is to be allotted by the external examiner.
III. Number of candidates in a group for practical examination should not exceed 12.
IV. In a single group no experiment is to be allotted to more than three examinees in any group.

LIST OF EXPERIMENTS-
1. To study the stabilization of output voltage of a power supply with Zener diode as function of input voltage and variable load resistance.
2. Study of a diode as a clipping element.
3. To measure the efficiency and ripple factors for (a) halfwave (b) full wave and (c) bridge rectifier circuits.
4. To study the reduction in the ripple in the rectified output with RC, LC and л filters.
5. To study characteristics of Common Base transistor (pnp/npn) and find h-parameters of a given transistor.
6. To study characteristics of Common Emitter transistor (pnp/npn) and determine h-parameters of a given transistor.
7. To draw output and mutual characteristics of an FET and determine its parameters.
8. To set up an Hartley oscillator and to study its output on CRO for different C values.
9. To study the gain of an amplifier at different frequencies and to find Band width.
10. To draw the plateau of a GM counter and find its dead time.
11. To study the absorption of beta particles in aluminium using GM counter and determine the absorption coefficient of beta particles from it.

ANNEXURE D

Faculty of Sciences

Syllabus for

Bachelor of Science (Honours) Physics

(Under Continuous Evaluation System)

(SEMESTER: I– II)

Session – (2020-21)

Kanya Maha Vidyalaya, Jalandhar
(Autonomous)
The Heritage Institution

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME
Bachelor of Science (Honours) Physics
Session-2020-21

Semester-I

Sr. No.	Course Code	Course Type	Course Title	Max Marks				Examination time in Hours)
				Total	Ext		CA	
					L	P		
1.	BOPL-1421 BOPL-1031 BOPL-1431	C	Punjabi(Compulsory [1]Basic Punjabi [2]Punjab History and Culture	50	40	-	10	3
2.	BOPL-1102	C	Communication skills in English	50	40	-	10	3
3.	BOPL-1393	C	Mechanics-I	75	60	-	15	3
4.	BOPL-1394	C	Electricity &Magnetism-I	75	60	-	15	3
5.	BOPL-1335	C	Mathematics-I	50	40	-	10	3
6.	BOPL-1086	C	Chemistry-I	50	40	-	10	3
7.	BOPP-1397	C	Physics Lab-I	50	-	40	10	3
8.	BOPP-1088	C	Chemistry Lab-I	50	-	40	10	3
9.	AECD-1161	AC	*Drug Abuse: Problem Management & Prevention (Compulsory)	50	40	-	10	3
10.	SECF-1492	AC	*Foundation Program	25	20		5	1

***Marks of these papers will not be added in total marks**
1 In Lieu of Punjabi (Compulsory) for students from Punjab
2. In Lieu of Punjabi (Compulsory) for students outside Punjab (Other States)

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME

Bachelor of Science (Honours) Physics

Session-2020-21

Semester II

Sr. No.	Course Code	Course Type	Course Title	Max Marks				Examination time in Hours)
				Total	Ext		CA	
					L	P		
1	BOPL-1421 BOPL-1031 BOPL-1431	C	Punjabi(Compulsory [1]Basic Punjabi [2]Punjab History and Culture	50	40	-	10	3
2	BOPL-2102	C	Communication Skills in English	50	40	-	10	3
3	BOPL-2393	C	Electricity & Magnetism-II	75	60	-	15	3
4	BOPL-2394	C	Vibrations and Waves	75	60	-	15	3
5	BOPL- 2335	C	Mathematics-II	50	40	-	10	3
6	BOPL-2086	C	Chemistry-II	50	40	-	10	3
7	BOPP-2397	C	Physics Lab-II	50	-	40	10	3
8	BOPP-2088	C	Chemistry Lab-II	50	-	40	10	3
9	AECD-2161	AC	*Drug Abuse: Problem, Management and Prevention (Compulsory)	50	40	-	10	3
10	SECM-2502	AC	* Moral Education Programme	25	20		5	1

****Marks of these papers will not be added in total marks**

1 In Lieu of Punjabi (Compulsory) for students from Punjab

2. In Lieu of Punjabi (Compulsory) for students outside Punjab (Other States)

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Students will demonstrate proficiency in mathematics and the mathematical concepts needed for a proper understanding of physics.

2. Students will demonstrate knowledge of classical mechanics, electromagnetism, quantum mechanics, Electronics, Nuclear and thermal physics, and be able to apply this knowledge to analyse a variety of physical phenomena.

3. Students will demonstrate knowledge of organic, Physical and inorganic chemistry and are able to recognize and apply the principles of atomic and molecular structure to predict chemical properties and chemical reactivity.

4. Students will show that they have learned laboratory skills, enabling them to take measurements in a physics and chemistry laboratory and analyse the measurements to draw valid conclusions.

5. Upon completion of this degree, students will be able to understand theoretical concepts of instruments that are commonly used in most physics and chemistry fields as well as interpret and use data generated in instrumental analysers.

6. Students will be capable of oral and written scientific communication, and will prove that they can think critically and work independently.

SEMESTER–I

MECHANICS-I

Course Code: BOPL-1393

Course Outcomes: Mechanics -I

After passing this course, students will be able to:

CO1: Understand the various coordinate systems and its applications. Students will be able to know the conservations laws and the symmetries of space & time.

CO2: Know the fundamental forces of nature, concept of center mass, central forces and the motion of particle under central force and to determine the turning points of orbit.

CO3: Understand the frames of reference, coriolis forces and its applications and effect of rotation of earth on g.

CO4: understand the elastic collision in different systems, cross section of elastic scattering as well as Rutherford scattering and know the motion of rigid body.

BACHELOR OF SCIENCE (HONURS) PHYSICS (SESSION 2020-21)

SEMESTER-I

COURSE CODE: BOPL-1393

MECHANICS-I

Maximum Marks: 75 (External 60 + Internal 15) **Examination Time: 3 Hours**

Pass Marks: 21 **Total Teaching hours: 60**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

Unit- I

Co-ordinate system and Motion of a Particle: Cartesian and Spherical polar co-ordinate systems; area, volume, displacement, velocity and acceleration in these systems. Solid angle, Newton's laws of motion. Relationship of conservation laws and symmetries of space and time.

Unit- II

Conservation of Momentum and Collisions: Internal forces and momentum conservation, Centre of mass, Elastic collisions in laboratory and centre of mass systems; velocities, angles, energies in these systems and their relationships. Conservation of angular momentum and examples-shape of the galaxy, angular momentum of solar system. Torques due to internal forces, angular momentum about center of mass. Cross-section elastic scattering and impact parameter, Rutherford scattering.

Unit- III

Inverse-Square-Law Force: Forces in nature (qualitative). Central forces, Potential energy and force between a point mass and spherical shell, a point mass and solid sphere, gravitational and electrostatic self-energy. Two body problem and concept of reduced mass. Motion of a body under central force, equation of orbit in inverse-square force field. Kepler's laws and their derivation.

Unit- IV

Dynamics of Rigid Bodies: Equation of motion of a rigid body, rotational motion of a rigid body in general and that of plane lamina. Rotation of angular momentum vector about a fixed axis. Angular momentum and kinetic energy of a rigid body about principal axis, Euler's equations. Precession and elementary gyroscope, Spinning top.

Reference Books:

1. Mechanics-Berkeley Physics Course, Vol-I by C. Kittel, W. D. Knight, M. A. Ruderman, C. A. Helmholtz and R. J. Moyer-Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Fundamentals of Physics by D. Halliday, R. Resnick and J. Walker -Wiley India Pvt. Ltd., New Delhi.
3. Introduction to Classical Mechanics by R. G. Takwale & P.S. Puranik. Tata McGraw Hill Publishing Company Ltd., New Delhi
4. An introduction to Mechanics by D. Kleppne r& R. Kolenkow. Tata McGraw Hill Publishing Company Ltd., New Delhi.
5. Mechanics by H.S. Hans & S.P Puri, Tata McGraw Hill Publishing Company Ltd. New Delhi.
6. Analytical Mechanics by S. K. Gupta, Modern Publishers.

ELECTRICITY & MAGNETISM-I

Course No. BOPL-1394

Course Outcomes: Electricity and Magnetism-I

After passing this course the students will be able to:

CO1: understand the vector calculus and vector algebra and its applications in electricity and magnetism. The students will be able to solve the electrostatic problems with the help of Gauss law and Coulomb's law.

CO2: understand the applications of scalar potential for the calculation of electric field and electric potential due to an arbitrary charge distribution.

CO3: solve the problems with the help of method of images and understand the conduction of electric current and fundamental laws of electricity and relate the electric and magnetic fields in two inertial frames of reference.

CO4: able to understand electric field, potential and polarization of different media and related quantities.

BACHELOR OF SCIENCE (HONURS) PHYSICS (SESSION 2020-21)
SEMESTER-I
COURSE CODE: BOPL-1394
ELECTRICITY AND MAGNETISM-I

Maximum Marks: 75 (External 60 + Internal 15) **Examination Time: 3 Hours**
Pass Marks: 21 **Total Teaching hours: 60**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

Unit- I

Calculus of Vectors : Introduction to gradient, divergence & curl; their physical significance. Rules for vector derivatives, useful relations involving gradient, divergence &curl. Fundamental theorem for gradients, Gauss's and Stoke's theorems.

Unit- II

Electrostatics and Electric Current: Electric charge and its properties, Coulomb's law. The electric field due to a point charge and continuous charge distributions, Field due to electric dipole, Field lines, flux, Gauss's law and its applications. Curl of electric field. Relation between potential and electric field. Poisson's and Laplace's equations. Electric potential due to different charge distribution: Wire, Ring, Disc, Spherical Shell, Sphere, dipole etc. The potential energy for a point and continuous charge distribution.

Unit- III

Field of Moving Charges:- Conductors in the electrostatic field, Capacitors, Current and current density, drift velocity, expression for current density vector, equation of continuity. Ohm's Law and expression for electrical conductivity, limitations of Ohm's law. Equipotential surface method of electrical images, Measurement of charge in motion, Transformation of electric and magnetic fields in different frames of references, Electric field due to moving charges, electric force in two inertial frames, Interaction between moving charges.

Unit- IV

Electric Fields in Matter: Moments of charge distribution, Potential and field of a dipole, torque and force on a dipole in an external electric field, polarizability tensor, Electric field caused by polarized matter, Electric field of Polarized Sphere, Dielectric sphere in a uniform electric field, Field of a charge in a dielectric medium, Electric susceptibility and atomic polarizability tensor, Polarization in alternating fields.

Text and Reference Books:

1. Introduction to Electrodynamics by D.J. Griffiths, Perason Prentice Hall of India, New Delhi
2. Electricity & Magnetism by E.M. Purcell, Berkeley Physics Course Vol. 2, McGraw Hill, New York
3. Fundamental of Physics by D. Halliday, R. Resnick and J. Walker (6th edition)-John Wiley India Pvt. Ltd.,.
4. Electricity and Magnetism by A. S. Mahajan & A. A. Rang Wala, Tata –McGraw Hill Publication Pvt. Ltd.

B.Sc. (Hons.) Physics Semester–I

Course Title: Mathematics-I

Course Code: BOPL-1335

Course outcomes

After the completion of this course, students should be able to :

CO 1:Give argument related to limits, continuity and derivative of a function.

CO 2: Understand the concept of maxima and minima of a function of a single variable.

CO 3: Explain the significance of Roll's theorem, Mean Value theorem, and Taylor's and Maclaurin's theorem to find the expansions of functions.

CO 4: Demonstrate the geometrical meaning of integral calculus as an area and their uses in the determination of C.G & moments of inertia.

CO 5: Understand how to solve linear differential equations with constant coefficients and linear homogeneous and inhomogeneous differential equations of second order.

BACHELOR OF SCIENCE (HONURS) PHYSICS (SESSION 2020-21)
SEMESTER-I

COURSE CODE: BOPL-1335

MATHEMATICS-I

Maximum Marks: 50 (External 40 + Internal 10) **Examination Time: 3 Hours**
Pass Marks: 18 **Total Teaching hours: 60**

Instructions for the Paper Setters:
Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT –I

Functions and Derivatives: Limits, continuity and derivative of function. Differentiation of standard functions, Successive differentiation. Geometrical significance of derivative. Maxima and Minima of a function of single variable. Partial differentiation. Chain rule of differentiation. 15 Lectures

UNIT –II

Differential Calculus: Statement of Rolle's theorem and Mean value theorem, Taylor's and Maclaurins theorems and their applications to formal expansion of functions. Tangents and normals. Basic idea about asymptotes.

15 Lectures

UNIT –III

Integral Calculus: Integration as inverse of differentiation. Indefinite integrals of standard forms. Method of substitution. Integration using partial fractions. Integration by parts. Reduction formulae. Definite integrals. Definite integral as limit of a sum and geometrical interpretation as an area.

15 Lectures

UNIT –IV

Differential Equations: Definition & formation of differential equations. Linear differential equation of first order and first degree. Linear homogenous and inhomogeneous differential equation of second order. Linear differential equations with constant coefficients.

15 Lectures

Text and Reference Books:

1. Differential Calculus by Shanti Narayan, New Delhi, ShyamLal
2. Integral Calculus by Shanti Narayan, Delhi, S. Chand
3,. Mathematical Hand Book by M. Vygodsky, Mir, Mascow
4.. Higher Engineering Mathematics by B.S. Grewal, Delhi, Khanna

B.Sc (Hons.) Physics (Semester-I)
COURSE CODE: BOPL-1086
Chemistry-I

(Theory)

Course outcomes:

Students will be able to

CO1: differentiate between chiral and achiral compounds, configuration and conformation.

CO2: understand the concept of isomerism

CO3: understand the resolution of enantiomers and differentiate between dextrorotatory and laevorotatory compounds.

CO4: do conformational analysis of ethane, butane, cyclohexane, monosubstituted and disubstituted cyclohexane.

CO5: explain the various methods of formation and chemical reactions of alkanes, alkenes and alkynes.

CO6: understand functional group transformation by nucleophilic substitution.

CO7: describe the mechanism and stereochemistry of nucleophilic substitution reactions.

CO8: understand the principles of nucleophilic addition to carbonyl groups.

BACHELOR OF SCIENCE (HONURS) PHYSICS (SESSION 2020-21)
SEMESTER-I
COURSE CODE: BOPL-1086
CHEMISTRY-I

Maximum Marks: 50 (External 40 + Internal 10) **Examination Time: 3 Hours**
Pass Marks: 18 **Total Teaching hours: 60**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT I

Stereochemistry: General introduction to stereochemistry and molecular chirality, properties of chiral molecules-optical activity, enantiomerism, introduction to absolute and relative configuration, the Cahn-Ingold Prelog R-S notional system physical properties of enantiomers. Stereochemistry of alkenes, naming stereo isometric alkenes by the E-Z system.
Conformational analysis. Conformational analysis of ethane, butane, cyclohexane, mono substituted and disubstituted cyclohexane

UNIT II

Chemistry of alkanes and alkenes: General chemistry of alkanes and alkenes, preparation of alkanes by decarboxylation. Wurtz reaction and Corey House reaction with mechanisms. Dehydration of alcohols and regioselectivity of these reactions. Acid catalysed dehydration of alcohols with complete mechanistic discussion, Mechanism of dehydrohalogenation of alkyl halides (Elimination mechanism), stereoselective and anti-elimination in elimination reactions.
Mechanism of hydrogenation of alkenes, stereochemistry of hydrogenation of cyclo alkenes, electrophilic addition of hydrogen halides to alkenes its regioselectivity explained on the basis of mechanism, free radical addition of hydrogen bromide to alkenes, acid catalysed hydration of alkene with mechanism, stereochemistry of halogen addition to alkenes and its mechanistic explanation. Hypohalous acid addition to alkenes, epoxidation of alkenes.
Alkynes: General chemistry of alkynes, preparation of alkynes, acidity of acetylene and terminal alkenes, metal ammonia reduction of alkyne, addition of hydrogen halides and water to alkynes, with detailed discussion of mechanism of these reactions.

UNIT-III

Nucleophilic substitution reactions: Functional group transformation by nucleophilic substitution, the biomolecular (S_N2), mechanism of nucleophilic substitution, stereochemistry of S_N2 reactions, steric effect in S_N2 reactions, nucleophiles and nucleophilicity. The unimolecular (S_N1) mechanism of nucleophilic substitution, carbocation stability and the rate of substitution, stereochemistry of S_N1 reactions, carbocation arrangements in S_N1 reactions, solvent effects, substitution and elimination as competing reactions.

UNIT-IV

Chemistry of carbonyl compounds. Principles of nucleophillic addition to carbonyl groups: Hydration, acetal formation, cyanohydrin formation; reactions with primary and secondary amines, Wittig reaction, mechanism of halogenation, acid and base catalysed enolization, haloform reaction, aldol condensation, conjugate nucleophillic addition to unsaturated carbonyl compounds

Text and Reference Books:

1. Advanced Organic Chemistry, Reactions Mechanisms and Structure by J. March.
2. Organic Chemistry by F. A Carey
3. Schaum's Outlines Series Theory and Problems of Organic Chemistry by Herbert Meislick and Jacob Sharefkin
4. Problems and their solution in Organic chemistry by I.L. Finar,
5. Organic Chemistry by D.J. Cram and G.S. Hammond.
6. J.E. Banks, Naming Organic Compounds – Programmed Introduction to Organic Chemistry.
7. E.L. Eliel, Stereochemistry of carbon compounds.

Course Outcomes: Physics Lab-ISem I

Course No. BOPP-1397

CO1: Students will be able to find the value of acceleration due to gravity using pendulums.

CO2: It will give understanding of collisions in 1-Dimension.

CO3: It helps to study the moment of inertia of a body & on what factors it depends.

BACHELOR OF SCIENCE (HONURS) PHYSICS (SESSION 2020-21)
SEMESTER-I
COURSE CODE: BOPL-1397
PHYSICS LAB-I

Maximum Marks: 50 (External 40 + Internal 10) **Examination Time: 3 Hours**
Pass Marks: 18 **Total Teaching hours: 90**
Instructions to Practical Examiner

Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, KanyaMahaVidyalaya, Jalandhar

General Guidelines for Practical Examination

I. The distribution of marks is as follows:
i) One experiment 20 Marks
ii) Brief Theory 6 Marks
iii) Viva–Voce 7 Marks
iv) Record (Practical file) 7Marks

II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 20.

IV. In a single group no experiment be allotted to more than three examinee in any group.

List of experiments-

1. To measure the time periods of oscillation for the objects of various geometrical shapes but of same mass.
2. To study rotational motion using a flywheel and hence show that torque is proportional to angular acceleration.
3. To find the moment of inertia of an irregular body about an axis through its centre of gravity with a torsion pendulum.
4. To determine the moment of inertia of a flywheel.
5. To determine the Young's modulus by bending.
6. Determination of Poisson's ratio for rubber.
7. To verify laws of conservation of (a) linear momentum, (b) kinetic energy in elastic collisions using one dimensional collisions of hanging spheres. (c) Also determine energy transfer and coefficient of restitution.
8. To determine modulus of rigidity of copper wire by Maxwell needle experiment.
9. To determine the coefficient of viscosity of glycerine by Stoke's method.
10. To find the unknown capacitance of a capacitor by flashing and quenching
11. of a neon lamp.
12. Measurement of capacitance, determination of permittivity of a medium air and relative permittivity by de–Sauty's bridge.
13. To study the variation in resistance of filament of a bulb with temperature.

Reference Books:

1. Practical Physics, C.L. Arora, S. Chand & Co.

BACHELOR OF SCIENCE (HONURS) PHYSICS
SEMESTER-I
COURSE CODE: BOPL-1088
CHEMISTRY LAB-I

Course outcomes:

Students will be able to
CO1: develop skills required for the qualitative analysis of organic compounds,
CO2: detect elements (N, S and halogens)

CO3: detect functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and anilide) in simple organic compounds and

CO4: determine the physical constants of organic compounds.

CO5: prepare the derivatives of organic compounds.

BACHELOR OF SCIENCE (HONURS) PHYSICS (SESSION 2020-21)
SEMESTER-I

COURSE CODE: BOPL-1088

CHEMISTRY LAB-I

Maximum Marks: 50 (External 40 + Internal 10) **Examination Time: 3 Hours**
Pass Marks: 18 **Total Teaching hours: 60**

Instruction for practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

General Guidelines for Practical Examination
The preliminary examination of physical and chemical characteristics (physical state, colour, odor and ignition tests), elemental analysis (nitrogen, sulphur, chlorine, bromine, iodine), solubility tests including acid-base reactions, classification tests involving functional reactivity other than acid-base test, preparation of derivatives for given pure organic compounds.
The following categories of compounds should be analysed:

-Phenols
- Carboxylic acids
-Carbonyl compounds (ketones, aldehydes)
-Carbohydrates
-Aromatic amines
-Amides and Nitro compounds

Suggested Book:
1. Practical Organic Chemistry by F.G. Mann and B.C. Saunders
2. Practical Organic Chemistry by Vogel

Semester II

Course Outcome of ELECTRICITY & MAGNETISM-II

Course No. BOPL-2393

After passing this course, students will be able to:

CO1: understand source of magnetic field and application of BiotSavart's Law and Ampere's circuital law in different situations.

CO2: understand different type of magnetic materials and their characteristics.

CO3: understand the Faraday's Law of electromagnetic induction and LCR circuits.

CO4: derive Maxwell equations and their applications in propagation of e.m. waves in conductors and insulators.

BACHELOR OF SCIENCE (HONURS) PHYSICS (SESSION 2020-21)
SEMESTER-I

COURSE CODE: BOPL-2393

ELECTRICITY AND MAGNETISM-II

Maximum Marks: 75 (External 60 + Internal 15) **Examination Time: 3 Hours**
Pass Marks: 21 **Total Teaching hours: 60**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

Unit-I

Magnetostatic : Magnetic fields, magnetic forces, magnetic force on a current carrying wire. Torque on a current loop, Biot-Savart law. Magnetic Field due to infinite wire carrying steady current, field of rings and coils. Magnetic field due to a solenoid, Force on parallel current carrying wires. Ampere's circuital law and its applications to infinite hollow cylinder, solenoid and toroid. The divergence and curl of magnetic induction, Comparison of magneto statics and electrostatics. Magnetic vector potential and its expression. Surface current density and Change in magnetic field at a current sheet. Hall Effect.

Unit-II

Magnetic Fields in Matter: some important terms associated with magnetic materials, Field of a current loop, force on magnetic dipole in a an external field, torque on current loop, potential energy of magnetic dipole, Electric currents in atoms, electron spin and magnetic moment, free and bound currents, magnetization and magnetic susceptibility, Magnetic field caused by magnetized matter,. Basics about diamagnetism paramagnetism and ferromagnetism, hysteresis curve.

Unit-III

Faraday's law and Maxwell's equations: Electromagnetic Induction, Faraday's Induction Experiments, Faraday's Laws of Electromagnetic Induction (Integral And Differential Forms),Lenz's law, Self-Induction, Expression for Self Induction : Neumann's Formula, . Self-Inductance of a Solenoid and a Toroidal, Energy Stored in an Inductor, Mutual Induction, Expression for Coefficient of Mutual Induction and Reciprocity theorem, Mutual Inductance of two Solenoids, Inductive Coupling of Electrical Circuits, Modification of Ampere's Law and the Displacement Current, Maxwell's Equation of Electromagnetism, Series and Parallel LCR Circuits, Average Power Associated with LCR Circuit

Unit-IV

Plane Electromagnetic Waves: Production of em waves, EM wave spectrum, EM wave equation for a medium having finite μ and ε but $\sigma = 0$, Nature of em waves, Wave equation for polarized em waves and their solutions, Relation between electric and magnetic field vectors an em wave, Impedance of a dielectric to em waves, The Poynting vector and flow of energy in an em wave, Equation of continuity, EM waves for a medium having finite values of μ and ε but $\sigma \neq 0$, Solution of wave equation for a conducting medium, Skin depth, EM wave velocity and wave dispersion in a conductor, Behaviour of a medium as a conductor or dielectric, Characteristic impedance of a conducting medium to em waves, magnetic and electric energy densities, Poynting vector and Equation of Continuity for a Conducting medium, Reflection and transmission of em waves at the boundary (Normal and Oblique incidence).

Text and Reference Books:

1. Introduction to Electrodynamics by David J. Griffiths, Pearson Prentice Hall of India

2. Electricity & Magnetism, Berkeley Physics Course Vol. 2 by E.M. Purcell, McGraw Hill, New York

3. Physics of Waves and Vibrations- H. J. Pain, John Wiley and Sons Ltd.

Course Outcomes: Vibrations and Waves

Course No. BOPL-2394

After passing this course the student will be able to:

CO1: demonstrate Lissajous figures by mechanical and analytical method with different cases.

CO2: understand Free, damped and resonance oscillations, both mechanical and electric using differential equations.

CO3: solve differential equation of forced oscillations & to obtain related quantities.

CO4: understand concept of coupled oscillators and wave motion. Student will also be able to apply the concept of waves and oscillations to any type of waves like e. m. waves, mechanical waves.

BACHELOR OF SCIENCE (HONURS) PHYSICS (SESSION 2020-21)
SEMESTER-I
COURSE CODE: BOPL-2394
VIBRATIONS AND WAVES

Maximum Marks: 75 (External 60 + Internal 15) **Examination Time: 3 Hours**
Pass Marks: 21 **Total Teaching hours: 60**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

Unit-I

Simple and Damped Oscillations: Simple Harmonic Motion, energy of SHO, Compound pendulum, Torsional pendulum, Equation of SHM, Superposition of two perpendicular SHM, Lissajous figures– superposition of many SHM's, complex number notation and use of exponential series. Damped motion of mechanical and electrical oscillator, heavy damping, critical damping. Energy dissipation and energy of damped oscillator, amplitude decay, logarithmic decrement, relaxation time, Q value, comparison between Free and Damped oscillations

Unit-II

Forced Oscillations: Differential equation of forced mechanical oscillator**,** Transient and steady state behaviour of a forced oscillator, Variation of displacement and velocity with frequency of driving force, frequency dependence of phase angle between force and (a)displacement, (b) velocity, Power supplied to oscillator by driving force and its variation with driving force frequency, Resonance absorption and Q-value as a measure of power absorption bandwidth, Q-value as amplification factor, Forced electrical oscillator, Variation of current with frequency, Variation of power supplied with frequency of applied voltage, Q factor as amplification factor.

Unit-III

Coupled Oscillations: Stiffness coupled oscillators, In phase and Out phase modes, normal co-ordinates and normal modes of vibration, solutions for differential equations for normal modes and exchange of energy, inductance coupling of electrical oscillators, loose, intermediate and strong coupling, energy exchange between two electrically coupled oscillators.

Unit-IV

Wave Motion: Types of wave motion**,** The wave equation, transverse waves on a string, the string as a forced oscillator, characteristic impedance of a string, reflection and transmission of transverse waves on a string at a boundary, Energy of a progressive wave, impedance matching, standing waves on a string of fixed length, Energy of a vibrating string, normal modes and eigen frequencies. Energy in a normal mode of oscillation, wave groups, group velocity, dispersive and non-dispersive media, longitudinal waves.

Reference Books:

1. The Physics of Vibrations and Waves by H.J. Pain, John Wiley, Chichester

2. Vibrations and Waves in Physics by I.G. Main-Cambridge University, Cambridge

B.Sc. (Hons.) Physics Semester–II

Course Title: Mathematics-II

Course Code: BOPL-2335

Course outcomes

After the completion of this course, students should be able to

CO 1: Manage to solve problems related to series solution of Bessel, Legendre and Hermite functions.

CO 2: Understand the concept of Partial differential equations& its applications to find the solution of Laplace, Wave & Diffusions equations.

CO 3: Apply Laplace transforms on periodic functions and differential equations with constant coefficients.

CO 4: Differentiate between Fourier Sine & Cosine series and Fourier Sine & Cosine transforms.

CO 5: Classify the difference between Laplace transforms and Fourier transforms.

BACHELOR OF SCIENCE (HONURS) PHYSICS (SESSION 2020-21)
SEMESTER-I
COURSE CODE: BOPL-2335
MATHEMATICS-II

Maximum Marks: 50 (External 40 + Internal 10) **Examination Time: 3 Hours**
Pass Marks: 18 **Total Teaching hours: 60**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.
Note: Students can use Non-Scientific calculators or logarithmic tables**.**

UNIT –I

Second order Differential Equations: Linear differential equations with variable coefficients. Series Solution of Bessel, Legendre, Hermite, Laguerre and Hypergeometric differential equations by Frobenius method. Recurrence relations and orthogonality properties.
15 Lectures

UNIT –II

Partial Differential Equations: Definition and formation of first and second order partial differential equations, Laplace, Wave and diffusion equation in one and two dimensions, Solutions of these equations by separation of variables. 15 Lectures

UNIT –III

Laplace Transforms: Definition, elementary Laplace transforms, transforms of derivatives, integration of transforms, Laplace transform of periodic functions, solution of differential equations with constant coefficients using Laplace transforms.

15 Lectures

UNIT –IV

Fourier series and Transforms: Periodic functions, Drichlet's conditions, Fourier coefficients, Sine and Cosine series, half range expansions, exponential series, differentiation and integration of Fourier transform, Fourier Sine and Cosine transforms, Inversion formulae, Fourier transforms of derivatives.
15 Lectures

Reference Books:

1. Mathematics Hand book by M. Vygodsky, Mir, Moscow
2. Higher Engineering Mathematics by B.S. Grewal, Delhi, Khanna
3. Applied Mathematics for Engineers and Physicists by Pipes &Harvill, London, McGraw Hill
4. Mathematics of Physics and Modern Engineering by Sokolnikoff&Recheffer
5. Mathematical Methods for Physicists by George Arfken, New York, Academic Press

B.Sc. (Hons.) Physics (Semester-II)
COURSE CODE: BOPL-2086
Chemistry-II

(Theory)

Course outcomes:

Students will be able to
CO1: understand the key features of coordination compounds viz. variety of structures, oxidation numbers and electronic configurations, coordination numbers and explain the bonding and stability of complexes.
CO2: describe the shapes and structures of coordination complexes with coordination numbers ranging from 4 to 12.
CO3: describe the stability of metal complexes by the use of formation constants.
CO4: understand the splitting of d-orbitals in octahedral, tetrahedral, cubic and square planar fields of ligands.

CO5: calculate C.F.S.E. of high spin and low spin octahedral and high spin tetrahedral complexes.

CO6: explain thermodynamic effects of crystal field splitting and determine microstate and ground state terms.

CO7: draw MOEL diagram for octahedral and tetrahedral complexes.

CO8: explain bonding in polynuclear metal carbonyls and counting of electrons in carbonyl clusters.

CO9: describe the effect of macrocyclic ligands on anion and cation complex structure.

BACHELOR OF SCIENCE (HONURS) PHYSICS (SESSION 2020-21)
SEMESTER-I
COURSE CODE: BOPL-2086
CHEMISTRY-II

Maximum Marks: 50 (External 40 + Internal 10) **Examination Time: 3 Hours**
Pass Marks: 18 **Total Teaching hours: 60**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT- I Co-ordination Chemistry: Introduction, Werner's coordination theory, naming of co-ordinate complexes. Co-ordination numbers 1-12 and their stereo-chemistries. Factors affecting co-ordination numbers and stereo-chemistry
(a) Configurational Isomers (b) Conformational isomerism, VSPER theory, molecular orbital theory applied to homoneuclear diatomic molecules and heteronuclear Diatomic molecules.

Bonding in metal complexes: Valence bond theory for co-ordinate complexes, inner and outer orbital complexes, Electro-neutrality and back bonding, limitations of V.B. theory. **Stability of coordination compounds:** Introduction, Stability constant, stepwise stability constant, overall stability constant. Factors affecting the stability of metal ion complexes with general ligands, HSAB principle.

UNIT-II Crystal field theory: Splitting of d-orbitals in octahedral, tetrahedral, cubic and square planer fields of ligands. Calculation of C.F.S.E. in high spin and low spin octahedral and High spin tetrahedral complexes, factors affecting the 10 Dq Value. Structural effects of crystal field splitting (Jahn-Teller distortion, variation of Ionic radii with increase in atomic number). Thermodynamics effects of C.F. splitting, variation in lattice energies, Hydration energies, Dissociation energies, Formation constants of hexammines. Site selection in spinels, Paramagnetism, diamagnetism, ferro and anti-ferromagnetism. Microstates and spectroscopic terms, a calculation of spectroscopic terms for d1 electronic configurations, L S coupling, Hund"s rule for finding the ground state terms, Electronic spectral properties of Ist transition series, limitations of C.F.T.

UNIT-III Molecular Orbital Theory: Evidence for covalent character in Bonding, MOEL diagram for octahedral and tetrahedral complexes involving bonding, charge transfer transitions.
πAcid Ligands: Definition Carbon monoxide complexes, bonding in linear MCO groups, polynuclear metal carbonyls, carbonyl hydrides and halides. Metal-metal bonding metal-metal multiple bonding , isolable analogies, Structure of high nuclearity carbonyl clusters, counting of electrons in carbonyl clusters.

UNIT-IV Alkali metal and alkaline earth metal chelators: Macrocyclic ligands, macrocyclic effect, crown ethers and podands, coronands, cryptands, structure of 18 crown-6 complex with KNCS, ion cavity complex, effect of anion and cation type on complex structure, simultaneous complexation of metal ion and water or of two metal ions, sandwich formation, cryptands and their cation complexes, podands with aromatic donors and groups.

Text and Reference Books:

1. Inorganic Chemistry, 3rd Ed. By J.E. Huheey
2 Advanced Inorganic Chemistry by . F.A. Cotton and G. Wilkinson
3. Concepts and Models of Inorganic Chemistry by B.E. Douglas and D.H. McDaniel
4. Topics in current chemistry Vol-II by R. Hilgenfeld and W. Saengar

PHYSICS LAB-II

Course No. BOPP-2397

COURSE OUTCOMES

CO1: Students will be able to study resonance in series & parallel LCR circuit.

CO2: At the end of this course, students will be able to find the value of capacitor, coefficient of self-inductance, permeability & permittivity of air.

CO3: Students will be able to study the variation of magnetic field on the axis of coil & can find the value of horizontal component of magnetic field.

CO4: Students will be able to verify various concepts related to oscillations of various pendulums and laws of vibrations of strings.

BACHELOR OF SCIENCE (HONURS) PHYSICS (SESSION 2020-21)
SEMESTER-I
COURSE CODE: BOPL-2397
PHYSICS LAB-II

Maximum Marks: 50 (External 40 + Internal 10) **Examination Time: 3 Hours**
Pass Marks: 18 **Total Teaching hours: 90**

General Guidelines for Practical Examination

I. The distribution of marks is as follows:

i) One experiment 20 Marks **ii) Brief Theory 6 Marks**

iii) Viva–Voce 7 Marks **iv) Record (Practical file) 7 Marks**

II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment be allotted to more than three examinee in any group.

1. To study the magnetic field produced by a current carrying solenoid using a search coil and calculate permeability of air.
2. To study the induced e.m.f. as a function of the velocity of the magnet.
3. To study the phase relationships using impedance triangle for LCR circuit and calculate impedance.
4. Resonance in a series and parallel LCR circuits for different R–value and calculate Q–value.
5. To determine low resistance with Carey-Foster's Bridge.
6. To measure the self-inductance L of a given coil by Anderson Bridge method.
7. To find the value of BH, the horizontal component of ear using a deflection & vibration magnetometer.
8. To study the variation of magnetic field with distance along the axis of coil carrying current by plotting a graph.
9. To plot a graph between the distance of the knife edge from the centre of gravity and the time period of a compound pendulum from graph find (a) acceleration due to gravity, (b) the radius of gyration and moment of inertia about an axis passing through centre of gravity.
10. To determine the acceleration due to gravity by Kater's Pendulum.
11. To verify the laws of vibrating string by using Meldes apparatus and to show that /2 λ is constant.
12. To measure logarithmic decrement, coefficient of damping, relaxation time and quality factor of a damped simple pendulum.

Reference Books:

1. Practical Physics by C.L. Arora, S. Chand & Co.

(Session-2019-20)

B.Sc. (Hons.) Physics (Semester-II)
COURSE CODE: BOPP-2088
Chemistry Lab-II
(Practical)

Course outcomes:

Students will be able to

CO1: separate and identify the various ions present in the mixture.

CO2: detect and remove interfering radicals present in the mixture.

CO3: understand the principle of inorganic qualitative analysis.

BACHELOR OF SCIENCE (HONURS) PHYSICS (SESSION 2020-21)
SEMESTER-I

COURSE CODE: BOPL-2088

CHEMISTRY LAB-II

Maximum Marks: 50 (External 40 + Internal 10) **Examination Time: 3 Hours**
Pass Marks: 18 **Total Teaching hours: 60**

Qualitative Analysis

Identification of cations and anions in a mixture which may contain combinations of acid ions. These must contain interfering acid anions and one, the insoluble.

a) Special Tests for Mixture of anions

I. Carbonate in the presence of sulphate.
II. Nitrate in the presence of nitrite
III. Nitrate in the presence of bromide and iodide.
IV. Chloride in the presence of bromide and iodide.
V. Chloride in the presence of bromide.
VI. Chloride in the presence of iodide.
VII. Bromide and iodide in the presence of each other and of chloride.
VIII. Sulphide, sulphite, thiosulphate and sulphate in the presence of each other.
IX. Borate in the presence of copper and barium salts.

b) Separation and identification of cations in mixtures

i) Separation of cations in groups.
ii) Separation and identification of Group I, Group II ,Group III, Group IV, Group V and Group VI cations.

Reference Books:

1. Vogel's Qualitative Inorganic Analysis (revised) by G. Svehla, and B. Sivasankar, Pearson
2. Vogel's Textbook of Quantitative Inorganic Analysis (revised) by R. C. Bassett, G. H. Denney,and J. Jeffery, Mendham
3. Vogel's book on Inorganic Qualitative Analysis

ANNEXURE E

FACULTY OF SCIENCES

SYLLABUS

of

Electronics

For

B.Sc. Non-Medical

(Semester V & VI)

(Under Continuous Evaluation System)

(12+3 System of Education)

Session: 2020-21

The Heritage Institution

KANYA MAHA VIDYALAYA JALANDHAR (Autonomous)

Programme Specific Outcomes – B. Sc. Non- Medical (Phy. Electronics. Maths.)

Upon successful completion of this course, students will be able to:

PSO1. Demonstrate proficiency in mathematics and the mathematical concepts needed for a proper understanding of physics and electronics.

PSO2: Solve complex mathematical problems by critical understanding, analysis and synthesis. Student will also be able to provide a systematic understanding of the concepts and theories of mathematics and their application in the real world – to an advanced level, and enhance career prospects in a huge array of fields or suitable to succeed at an entry-level position in mathematics post graduate programme.

PSO3: Demonstrate knowledge of mechanics, electromagnetism, quantum mechanics, optics & lasers, waves & vibrations, statistical physics, condensed matter physics, electronics, nuclear & particle physics and be able to apply this knowledge to analyse a variety of physical phenomena.

PSO4: Demonstrate knowledge of Principle of Electronics, Digital Electronics, Microprocessor, Communication and optical communication and apply this knowledge to analyse and fabrication of electronic equipments.

PSO5: Understand theoretical concepts of instruments that are commonly used in most physics and electronics fields as well as interpret and use data generated in instrumental physical and electronic analyses.

PSO6: Show that they have learned laboratory skills, enabling them to take measurements in a physics laboratory and analyse the measurements to draw valid conclusions. They will also be able to employ critical thinking and scientific inquiry in the performance, design, interpretation and documentation of laboratory experiments, at a level suitable to succeed at an entry-level position in industry or a physics/electronics postgraduate program.

PSO7: Capable of oral and written scientific communication i.e. able to communicate effectively by oral, written, computing and graphical means.

Scheme of Studies and Examination (Session 2020-21)
B.Sc. (Non Medical)
Electronics

Semester V

Course Name	Program Name	Course Code		Course Type	Marks					Examination time (in Hours)
					Total	Paper	Ext. L	Ext. P	CA	
Electronics	B.Sc. (Non Medical)	BSNM-5184	I	E	100	Microprocessor Architecture	30	-	20	3
			II			Electronics Communication systems	30	-		3
			P			Communicaton systems Lab	-	20		3

Semester VI

Course Name	Program Name	Course Code		Course Type	Marks					Examination time (in Hours)
					Total	Paper	Ext. L	Ext. P	CA	
Electronics	B.Sc. (Non Medical)	BSNM-6184	I	E	100	Microprocessor Programming	30	-	20	3
			II			Optical Fiber Communication	30	-		3
			P			Microprocessor lab	-	20		3

B.Sc. (Non Medical), Semester–V (Session 2020-21)
Electronics
MICROPROCESSOR ARCHITECTURE

Course Code: BSNM-5184 (I)
(THEORY)

Course Outcomes:

After passing this course, students will be able to:

CO1: Understand the concept of microprocessor architecture and its operations

CO2: Demonstrate Addressing modes, types of 8085 instructions, instruction format

CO3: Understand the instruction set of 8085

CO4: Understand the concept of Memory interfacing

B.Sc. (Non Medical)
Semester–V (Session 2020-2021)
ELECTRONICS
MICROPROCESSOR ARCHITECTURE (501)
Course Code: BSNM-5184 (I)
(THEORY)

Time: 3 Hrs. **Marks: 30**

Instructions for the Paper Setters:
Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT – I
Brief history of Microprocessor, microprocessor architecture and its operations, pin configuration of 8085,difference between microprocessor and microcontroller.

UNIT II
Addressing modes, instruction format, difference between assembler, compiler and interpreter, How to write, assemble and execute a simple program,

UNIT – III
Introduction to 8085 instructions, data transfer operations, 8 an 16 bit arithmetic operations and related to memory, logic operations: compare, rotate , branch operations.

UNIT – IV
Memory interfacing, basic interfacing concepts, interfacing I/O devices, memory mapped I/O, comparison of memory mapped I/O and peripheral mapped I/O programming of the 8085.

Suggested Readings:

1. Microprocessor Architecture and Programming by Gaonkar.
2. Fundamentals of Microprocessor & Microcomputers by B.Ram (Dhanpat Rai & Sons), 1990.
3. Microprosessors and Interfacing by DV Hall (TMH), 2nd Edition, 2006.
4. An Introduction to the INTEL, Family of Processor by JL Antonakos, Pearson Edu. Asia.

B.Sc. (Non Medical)
Semester–V (Session 2020-2021)
ELECTRONICS
COMMUNICATION SYSTEM (502)
Course Code: BSNM-5184 (II)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

CO1- To develop an understanding of Amplitude modulation.

CO2- Develop an understanding of Frequency modulation.

CO3- Develop an understanding of Radio receiver and its types.

C04- Develop and ability to understand IF amplifiers, detection and automatic gain control (AGC)

B.Sc. (Non Medical)
Semester–V (Session 2020-2021)
ELECTRONICS
ELECTRONIC COMMUNICATION SYSTEM (502)
Course Code: BSNM-5184 (II)
(THEORY)

Time: 3 Hrs. **Marks: 30**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I
Amplitude modulation Need for modulation, amplitude modulation, frequency spectrum of the AM wave, representation of AM wave, power relations in AM wave, generation of AM, base modulated class C amplifier, single side band techniques, suppression of carrier, suppression of unwanted sideband using the filter system.

UNIT–II
Frequency modulation, theory of frequency and phase modulation, description of systems, mathematical representation of FM frequency spectrum of the FM wave, phase modulation, intersystem comparisons, generation FM, direct method, indirect method.

UNIT–III
Radio receiver, receiver types, tuned radio frequency receiver, super heterodyne receiver, AM receivers, RF section and characteristics, Frequency changing and tracking, intermediate frequencies.

UNIT -IV
IF amplifiers, detection and automatic gain control (AGC), FM receiver, comparison with AM receivers, amplitude limiting, basic FM demodulator, ratio detector, FM demodulator comparison.

Suggested Readings:

1. Communication System by Kennedy (Tata McGraw Hill Publishing Company), 4th Edition, .
2. Taub's Communication System by Taub Schilling (Tata McGraw Hill), 2nd Edition.
3. Communication System by B.P. Lathi (Wiley Eastern Lim) 8th Edition.

B.Sc. (Non Medical), Semester–V (Session 2020-21)
Electronics
Electronic Communication Systems Lab
Course Code: BSNM-5184 (P)
(PRACTICAL)

Course Outcomes:

CO1: Students will be able to understand amplitude and frequency modulation and demodulation.

CO2. Students will get familiarize with microprocessor 8085 kit.

CO3: Students will be able to understand the concept of a program for add and subtract 8 bit no using 8085 microprocessor.

CO4: Students will able to understand programming of divide and multiply using 8085 microprocessor.

B.Sc. (Non Medical), Semester–V (Session 2020-21)
Electronics
Electronic Communication Systems Lab
Course Code: BSNM-5184 (P)
(PRACTICAL)

Time: 3 Hrs. **Marks: 20**

Instructions for Practical Examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar

General Guidelines for Practical Examination:
I. The distribution of marks is as follows :
i) One experiment 7 Marks
ii) Brief Theory 3 Marks
iii) Viva–Voce 5 Marks
iv) Record (Practical file) 5 Marks
II. There will be one sessions of 3 hours duration. The paper will have one session.
Paper will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.
III. Number of candidates in a group for practical examination should not exceed 12.
IV. In a single group no experiment be allotted to more than three examinee in any group.

EXPERIMENTS

1 To study the amplitude modulation and demodulation experimental boards

2. To study the frequency modulation and demodulation experiment boards.

3. Familrazation with microprocessor 8085 kit and auto step to save and execute the program.
4 Write a program to add and subtract 8 bit number using 8085 microprocessor.
5 Write a program to find 1's and 2's compliment of number using 8085 microprocessor.
6 Write a program to arrange the array of data in ascending order.
7 Write a program to arrange the array of data in descending order.
8 Write a program to find the largest "n" number.

Books Recommended:

1 Basic Electronics and Linear Circuits by N.N. Bhargava, D.C. Kulshreshtha, S.C. Gupta (TMH).
2 Basic Electronics Solid State by B.L. Theraja, (S. Chand & Co.)
3 Digital Design by M. Morris Meno (PHI), (chapters : 4,5,10)
4 Op-Amplifiers & Linear Integrated Circuits by Ramakant & Gayakwars (Prentice Hall India)

B.Sc. (Non Medical), Semester–VI (Session 2020-21)
Electronics
MICROPROCESSOR PROGRAMMING (601)
Course Code: BSNM-6184 (I)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

CO1 - To understand the concept of Programming techniques

CO2- To develop an understanding of advanced subroutine concepts.

CO3- To understand the concept of Interrupts of 8085 and interrupt driven data transfer schemes.

CO4- To develop an understanding of Introduction to 16 bits, 32 bits & 64 bits microprocessor.

B.Sc. (Non Medical), Semester–VI (Session 2020-21)
Electronics
MICROPROCESSOR PROGRAMMING (601)
Course Code: BSNM-6184 (I)
(THEORY)

Time: 3 Hrs. **Marks: 30**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I
Programming techniques: looping, counting and indexing, BCD to binary conversion, binary to BCD conversion, BCD addition

UNIT–II
Stack: push and pop Instruction, subroutine: conditional call and return instructions, advanced subroutine concepts,

UNIT–III
Interrupts of 8085, 8085 vectored interrupts, programmable data transfer, DMA data transfer and interrupt driven data transfer schemes.

UNIT -IV
Block diagram, control word and status word of 8251 USART, 8255 Programmable Peripheral Interface, 8259-PIC Programmable interrupt controller. Comparison of basic features of 16 bits, 32 bits & 64 bits microprocessor .

Suggested Readings:
1. Microprocessor Architecture and Programming by Gaonkar.
2. Fundamentals of Microprocessor & Microcomputers by B.Ram (Dhanpat Rai & Sons).
3. Microprosessors and interfacing by DV Hall (TMH), 2nd Edition.
4. An introduction to the INTEL, Family of Processor by JL Antonakos, Pearson Edu. Asia.

B.Sc. (Non Medical), Semester–VI (Session 2020-21)
Electronics
Optical Fiber Communication
Course Code: BSNM-6184 (II)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

CO1 - To understand the concept of overview of optical fiber communication

CO2- To develop an understanding of transmission characteristics of optical fibers

CO3- To understand the concept of optical sources and detectors

CO4- To develop an understanding of fiber couplers and connectors.

B.Sc. (Non Medical), Semester–VI (Session 2020-21)
Electronics
Optical Fiber Communication
Course Code: BSNM-6184 (II)
(THEORY)

Time: 3 Hrs. **Marks: 30**

Instructions for the Paper Setters:
Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT - 1
OVERVIEW OF OPTICAL FIBER COMMUNICATION:
Introduction, Historical development, general system, advantages, disadvantages, and applications of optical fiber communication, structure of optical fiber, Ray theory, types of optical fiber.

UNIT - 2
TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS:
Introduction, Attenuation, absorption, scattering losses, bending loss, dispersion, Intra modal dispersion, Intermodal dispersion.

UNIT - 3
OPTICAL SOURCES AND DETECTORS:
Introduction, homostructure junction and hetrostructure junction LED's, LASER diodes, Photo detectors, Photo detector noise, Response time, Photodiodes, comparison of photo detectors.

UNIT - 4
OPTICAL FIBER SENSORS
Physical phenomena of optical Fiber sensor, temperature sensor, pressure sensor liquid level sensor.

Suggested Readings:

1. Optical Fiber Communication by Gerd Keiser, Mc Graw -Hill International, 4th Edition., 2010.
2. Optical Fiber Communication by John M. Senior , Second Edition, Pearson Education, 2007.
3. Optical Fiber Communication by Joseph C Palais, 4th Edition, Pearson Education
4. Optical Electronics by Ajoy K. Ghatak , Cambridge University Press,1989

(Session 2020-21)
Electronics
Microprocessor Lab
Course Code: BSNM-6184 (P)
(PRACTICAL)

Course Outcomes:

After passing this course the student will be able to:

CO1: This course gives an overview of microprocessor.

CO2: At the end of this course student will be able to perform programs on microprocessor,

CO3: At the end of this course, the students will be able to understand conversion of programs.

CO4: Students will understand the applications of microprocessor.

B.Sc. (Non Medical), Semester–VI (Session 2020-2021)
Electronics
Microprocessor Lab
Course Code: BSNM-6184 (P)
(PRACTICAL)

Time: 3 Hrs. **Marks: 20**

Instructions for Practical Examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

General Guidelines for Practical Examination:
I. The distribution of marks is as follows :
i) One experiment 7 Marks
ii) Brief Theory 3 Marks
iii) Viva–Voce 5 Marks
iv) Record (Practical file) 5 Marks
II. There will be one sessions of 3 hours duration. The paper will have one session.
Paper will consist of 8 experiments out of which an examinee will mark 6 experiments
and one of these is to be allotted by the external examiner.
III. Number of candidates in a group for practical examination should not exceed 12.
IV. In a single group no experiment be allotted to more than three examinee in any group.

EXPERIMENTS

1 To study the 8085 microprocessor kit.
2 Write the program for multiply two 8 bit number.
3.Write the program for divide two 8 bit number.
4 Write a program to find the largest 'n' number in data array
5 Write a program to find the smallest 'n' number in data array
6 Write a program to convert the given binary no. to equivalent decimal no.
7 Write a program to convert the given decimal no. to equivalent binary no.
8.Write a program to add two sixteen bit number and store the result in 3001H.
9. Write a program to subtract two sixteen bit number and store the result in 3001H.

Books Recommended:
1. Fundamentals of Digital Circuits by A. Anand Kumar (PHI).
2. Modern Digitial Electronics by R.P. Jain (Tata McGrew Hill).
3. Principals of Electronics by S.K. Bhattacharya & Dr. Renu Vij (S.K. Kataria & Sons).
4. Digital Electronics (DCLD) by Neeraj Anand.

ANNEXURE F

FACULTY OF SCIENCES

SYLLABUS
of
Master of Science (Physics)
(Semester: I -IV)

(Under Continuous Evaluation System)

Session: 2020-21

The Heritage Institution

KANYA MAHA VIDYALAYA JALANDHAR (Autonomous)

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF TWO YEAR DEGREE PROGRAMME

M.Sc. (Physics)

Session-2020-21

M.Sc. (Physics) SEMESTER-I							
Course Code	**Course Name**	**Course Type**	**Marks**				**Examination time (in Hours)**
			Total	**Ext.**		**CA**	
				L	**P**		
MPHL-1391	Analog and Digital Electronics	C	100	80	-	20	3
MPHL-1392	Mathematical Physics	C	100	80	-	20	3
MPHL-1393	Classical Mechanics	C	100	80	-	20	3
MPHL-1394	Computational Techniques	C	100	80	-	20	3
MPHP-1395	Electronics Lab	C	100	-	80	20	3
MPHP-1396	Computer Lab	C	100	-	80	20	3
Total			**600**				

SEMESTER-II							
Course Code	**Course Name**	**Course Type**	**Total**	**Ext.**		**CA**	**Examination time (in Hours)**
				L	**P**		
MPHL-2391	Quantum Mechanics-I	C	100	80	-	20	3
MPHL-2392	Electrodynamics-I	C	100	80	-	20	3
MPHL-2393	Condensed Matter Physics-I	C	100	80	-	20	3
MPHL-2394	Atomic & Molecular Spectroscopy	C	100	80	-	20	3
MPHP-2395	Condensed Matter Physics Lab -I	C	100	-	80	20	3
MPHP-2396	Spectroscopy Lab	C	100	-	80	20	3
Total			**600**				

<table>
<tr><th colspan="8">M.Sc. (Physics) Semester-III</th></tr>
<tr><td rowspan="3">Course Code</td><td rowspan="3">Course Name</td><td rowspan="3">Course Type</td><td colspan="4">Marks</td><td rowspan="3">Examination Time (in Hours)</td></tr>
<tr><td rowspan="2">Total</td><td colspan="2">External</td><td rowspan="2">CA</td></tr>
<tr><td>L</td><td>P</td></tr>
<tr><td>MPHL-3391</td><td>Quantum Mechanics-II</td><td>C</td><td>100</td><td>80</td><td>--</td><td>20</td><td>3</td></tr>
<tr><td>MPHL-3392</td><td>Electrodynamics-II</td><td>C</td><td>100</td><td>80</td><td>--</td><td>20</td><td>3</td></tr>
<tr><td>MPHL-3393</td><td>Condensed Matter Physics-I</td><td>C</td><td>100</td><td>80</td><td>--</td><td>20</td><td>3</td></tr>
<tr><td>MPHL-3394</td><td>Nuclear Physics</td><td>C</td><td>100</td><td>80</td><td>--</td><td>20</td><td>3</td></tr>
<tr><td>MPHP-3395</td><td>Condensed Matter Physics Lab-II</td><td>C</td><td>100</td><td>--</td><td>80</td><td>20</td><td>3</td></tr>
<tr><td>MPHP-3396</td><td>Nuclear Physics Lab</td><td>C</td><td>100</td><td>--</td><td>80</td><td>20</td><td>3</td></tr>
<tr><th colspan="8">M.Sc. (Physics) Semester-IV</th></tr>
<tr><td>MPHL-4391</td><td>Particle Physics</td><td>C</td><td>100</td><td>80</td><td>--</td><td>20</td><td>3</td></tr>
<tr><td>MPHL-4392</td><td>Condensed Matter Physics-II</td><td>C</td><td>100</td><td>80</td><td>--</td><td>20</td><td>3</td></tr>
<tr><td>MPHL-4393 (OPT-_)</td><td rowspan="2">Student may choose any two subjects from the following list of options</td><td>C</td><td>100</td><td>80</td><td>--</td><td>20</td><td>3</td></tr>
<tr><td>MPHL-4394(OPT-_)</td><td>C</td><td>100</td><td>80</td><td>--</td><td>20</td><td>3</td></tr>
<tr><td>MPHD-4395</td><td>Assignment/ Project</td><td></td><td>50</td><td>-</td><td>40</td><td>10</td><td></td></tr>
</table>

OPT-I Physics of Materials
OPT-II Radiation Physics
OPT-III Reactor Physics
OPT-IV Plasma Physics
OPT-V Geophysics
OPT-VI Nano Technology
OPT-VII Space Science & Astronomy

Program Specific Outcomes: M.Sc. (Physics)

After the successful completion of the program, the student will be able to do the following

PSO 1. The Master of Science in Physics program provides the detailed functional knowledge of the fundamental theoretical concepts and experimental methods of physics. It will help the candidate to enhance her general competence, and analytical skills on an advanced level, and will prepare her according to the jobs needed in education, research or public administration.

PSO 2. The student will have the knowledge of the topics of the research conducted by researchers at the Department of Physics, and knowledge of a well-defined area of research within physics.

PSO 3. The student will have the understanding of the basic concepts of classical mechanics, quantum mechanics, statistical mechanics and electricity and magnetism to appreciate how diverse phenomena observed in nature follow from a small set of fundamental laws through logical and mathematical reasoning.

PSO 4. The student will learn to carry out experiments in basic as well as certain advanced areas of physics such as nuclear physics, condensed matter physics, spectroscopy, lasers and electronics.

PSO 5. The work course of project and assignment will give the students special expertise within one of the research areas represented at the Department of Physics which will result in some research experience within a specific field of physics, through a supervised project.

PSO 6. The student will be able to critically apply the knowledge gained during the course to scientific models and solve problems in the areas of electrodynamics, quantum mechanics, classical mechanics, statistical mechanics, and advanced mathematical methods.

PSO 7. **General competence**

The candidate will be able to

- Understand the role of physics in society and know the historical development of physics, its possibilities and limitations, and understands the value of lifelong learning.
- Gather, assess, and make use of new information.

M.SC. PHYSICS SEMESTER-I

COURSE CODE: MPHL-1391
ANALOG AND DIGITAL ELECTRONICS

COURSE OUTCOMES

After passing this course the student will be able to:

CO 1. Understand the concept of Electronic devices (MOSFET, UJT, SCR) and their applications.
CO 2. Demonstrate the concept of Electronic circuits: Operational Amplifier and its applications
CO 3. Use concept of Digital Principles for electronic conversions.
CO 4. Demonstrate application of sequential circuits.

SEMESTER-I

COURSE CODE: MPHL-1391

ANALOG AND DIGITAL ELECTRONICS

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**

Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

UNIT-I: Electronic Devices and semiconductor Memories

MOSFETs, construction and working of U.J.T. and SCR and their application in wave generation and power control. Types of Memories, Read/Write Memory, ROM, EPROM, EEPROM, static dynamic memory, memory cell: static RAM Memory cells, NMOS static cells.

Lectures 15

UNIT-II: Electronic Circuits:

Amplifier, Operational amplifier (OP-AMP), OP-AMP as inverting and non-inverting, scalar, summer, integrator, differentiator. Schmitt trigger and logarithmic amplifier, Electronic analog computation circuits

Lectures 15

UNIT-III: Digital Principles:

Binary and Hexadecimal number system, Binary arithmetic, Logic gates, Boolean equation of logic circuits, Karnaugh map simplifications for digital circuit analysis, and design, Encoders & Decoders, Multiplexers and Demultiplexers, Parity generators and checkers, Adder-Subractor circuits.

Lectures 15

UNIT-IV: Sequential Circuits:

Flip Flops, Registers, Up/Down counters, D/A conversion using binary weighted resistor network, Ladder, D/A converter, A/D converter using counter, Successive approximation A/D converter.

Lectures 15

Text and Reference Books

1. Electronic Devices and Circuits by Millman and Halkias-Tata McGraw Hill, 1983.
2. Digital Principles and Applications by A.P.Malvino and D.P.Leach-Tata McGraw Hill, New Delhi, 1986.
3. Digital Computer Electronics by A P Malvino-Tata McGraw Hill, New Delhi, 1986
4. Electronic Devices and Circuit Theory 10e by Robert L. Boylestad; Louis Nashelsky 2009.

SEMESTER-I

COURSE CODE: MPHL-1392

MATHEMATICAL PHYSICS

COURSE OUTCOMES OF MATHEMATICAL PHYSICS

On completion of this course a student will be able to:

CO 1. Understand and use, advanced mathematical methods and theories on various mathematical and physical problems.

CO 2. Identify different special mathematical functions.

CO 3. Understand Cartesian (X, Y, Z), Spherical polar (r, θ, φ) and Cylindrical (ρ, φ, z) co-ordinate systems and their transformation equations.

CO 4. Solve partial differential equations with appropriate initial or boundary conditions with Green function techniques

CO 5. Have confidence in solving mathematical problems arising in physics by a variety of mathematical techniques

SEMESTER-I

COURSE CODE: MPHL-1392

MATHEMATICAL PHYSICS

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**

Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

UNIT-I: Coordinates systems, Fourier and Laplace transform.

Curvillinear coordinates, Differential vector operators in curvilinear coordinates, spherical and cylindrical systems, General coordinate transformation, Tensors: covariant, contra variant and Mixed, Algebraic operations on tensors, Illustrative applications.

Fourier decomposition, Fourier series and convolution theorem, Fourier transforms and its applications to wave theory. Laplace Transform, Laplace transform of derivatives and integrals, Inverse Laplace transform, Application of Laplace Transform.

20Lectures

UNIT-II: Complex analysis.

Function of a complex variables, Analytical functions and Cauchy–Riemann conditions, Cauchy integral theorem, Cauchy integral formula, Taylor and Laurent series, singularities and residues, Cauchy residue theorem, calculations of real integrals.

10Lectures

Unit –III: Differential equations and Special Functions.

Second order differential equations, Frobenions method, wronskian and a second solution, the Strum Liouville theorem, one dimensional Green’s function. Gamma functions. The exponential integral and related functions, Bessel functions of the first and second kind, Legendre polynomials, associated Legendre polynomials and spherical harmonics, Generating functions for Bessel, Legendre and associated Legendre functions, Hermite Functions.

20Lectures

UNIT-IV: Group theory:

Definition of a group, multiplication table, conjugate elements and classes of groups, direct product Isomorphism, homomorphism, permutation group, definition of the three dimensional rotation groups and SU(2)

10Lectures

Text and Reference Books

1. MathematicalMethodsforPhysicist by GeorgeArfken-NewYorkAcademy,1970.
2. MathematicalPhysics by P.K.Chattopadhyay,NewAgeInternational1990.

Semester-1

COURSE CODE: MPHL-1393

CLASSICAL MECHANICS

COURSE OUTCOMES

CO 1. After the students complete this course they will be familiar with aspects of Classical Mechanics such as Lagrangian and Hamiltonian formulation, particle in central potentials, rigid body motion. These will form the essential background for other courses such as Quantum Mechanics, Electrodynamics and High Energy Physics that students would learn in the subsequent semesters.

CO 2. Students will learn the importance of Lagrangian and Hamiltonian mechanics over the Newtonian mechanics and be able to solve the complex problems on the equations of motion by applying these two techniques.

CO 3. Having successfully completed this course, students will be able to demonstrate knowledge and understanding of orbit problems using the conservation of angular momentum and total energy.

CO 4. Students will also be able to demonstrate understanding of rigid body motion using Euler theorem and Euler angles, which will help them to solve advanced problems pertaining to celestial mechanics.

SEMESTER-I

COURSE CODE: MPHL-1393

CLASSICAL MECHANICS

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**

Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the PaperSetters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

UNIT-I: Lagrangian Mechanics

Newton's laws of motion, mechanics of a system of particles, constraints, generalized coordinates D'Alembert's principle and Lagrange equations of motion for conservative systems, simple applications of Lagrangian formulation.**Variational Principles:**Hamiltons principle, some techniques of the Calculus of variations, derivation of Lagrange equations from Hamilton's principle, conservation theorems and symmetry properties.

Lectures 15

UNIT-II: Central Force Problem

Two body central force problem, reduction to equivalent one body problem, the equation of motion and first integrals, the equivalent one dimensional problem, and

classification of orbits, the Virial theorem, the differential equation for the orbit, conditions for closed orbits, the Kepler problem, scattering in a central force field (Rutherford scattering cross section formula).

Lectures 15

UNIT-III: Hamiltonian Mechanics

Legendre transformation and Hamilton equations of motion, cyclic coordinates and conservation theorems, derivation of Hamiltons equations from a variational principle, the principle of least action, simple applications of Hamiltonian formulation.

Canonical Transformations: The equations of canonical transformation, examples of canonical transformations, Poisson brackets, equations of motion, infinitesimal canonical transformations and conservation theorems in the Poisson bracket formulation, Hamilton-Jacoby theory.

Lectures 15

UNIT-IV: Rigid Body Dynamics

The independent coordinates of a rigid body, orthogonal transformation,

the Euler angles, Euler's theorem on the motion of rigid body, finite and infinitesimal rotations, rate of change of a vector, angular momentum and kinetic energy about a point for a rigid body, the inertia tensor and moment of inertia, the eigen values of the inertia tensor and the principal axis transformation. Euler's equations of motion, torque free motion of a rigid body.

Small Oscillations: Eigen value equation, Free vibrations, Normal Coordinates, vibrations of a triatomic molecule.

Lectures 15

Books:

1. Classical Mechanics by Herbert Goldstein-Narosa Pub. House, New Delhi, 1970.
2. Mechanics by L.D. Landau-Pergamon Press, Oxford, 1982.
3. Classical Mechanics by Rana and Joag-Tata McGraw Hill, New Delhi, 1995.

SEMESTER-I

COURSE CODE: MPHL-1394

COMPUTATIONAL TECHNIQUES

COURSE OUTCOMES

On completion of this course a student will be able to:

CO 1. The very first outcome of the course is having knowledge about various programming languages, their need in research and development.

CO 2. The introduction to MATLAB gives a basic knowledge about syntaxes and procedures used in MATLAB to solve various mathematical problems.

CO 3. Understanding of interpolation of data from an experimental data with equal and unequal intervals.

CO 4. The students will be able to solve integration and differentiation numerically by using various methods.

CO 5. Understanding of various numerical methods to solve polynomial and transcendental equations gives an insight of working of these methods.

SEMESTER-I

COURSE CODE: MPHL-1394

COMPUTATIONAL TECHNIQUES

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**
Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

UNIT-I: Introduction of MATLAB

Introduction: Basics of MATLAB, working with arrays, creating and printing plots, Interacting Computations: Matrices and Vectors, Matrices and Array Operations, built in functions, saving and loading data, plotting simple graphs Programming in MATLAB: Scriptfiles, function files, Compiled files, p-code, variables, loops, branches, and control flow, Input/Output, Advanced data objects, structures, cells

Lectures18

UNIT-II: Interpolation

Interpolation, Newton's formula for forward and backward interpolation, Divided differences, Symmetry of divided differences, Newton's general interpolation formula, Lagranges interpolation formula

Lectures12

UNIT-III: Numerical Differentiation and integration

Numerical integration, A general quadrature formula for equidistant ordinates, Simpson, Weddle and Trapezoidal rules, Monte- Carlo Method, Euler's method, Modified Euler's method, Runge Kutta Method. **Lectures15**

UNIT-IV: Roots of Equation

Approximate values of roots, Bisection Method, Regula-Falsi Method, Newton-Raphsonmethod,Bairstowmethod.SimultaneousLinearAlgebraicEquations:SolutionofSimultaneous Linearequations,Gausseliminationmethod,Gauss-Jordonmethod,Matrixinversion, finding eigen values and eigen vectors, matrix factorization, Curve fitting and Interpolation; polynomial curve fitting, least square curve fitting

Lectures15

Text and Reference Books

1. Getting started with MATLAB by RudraPratap-OxfordUniversityPress-2005.
2. A concise introduction to MATLAB by William JPalm III-McGrawHill-2008.
3. Numerical Mathematical Analysis by James Scarborough (Oxford and IBH),1966.
4. Elementary Numerical Analysis by S.D.Conte (McGrawHill),1965.
5. Numerical Methods for Mathematics by John.H.Methews Science and Engineering(Prentice Hall of India).

SEMESTER-I

COURSE CODE: MPHP-1395

ELECTRONICS LAB

COURSE OUTCOMES

After successfully completion of this lab student will be able to

CO1: Characterise and understand the applications of DIAC, TRIAC, UJT and SCR.

CO2: Investigate characteristics of MOSFET and Multivibrators.

CO3: understand experimentally working of Operational Amplifier and its applications

CO4: basics about Digital Logic circuits from logic gates to ALU.

SEMESTER-I

COURSE CODE: MPHP-1395

ELECTRONICS LAB

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**

Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Practical Examiners:

Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, KanyaMahaVidyalaya, Jalandhar

LIST OF EXPERIMENTS

1. To Study the DC characteristics and applications of DIAC.
2. T o study the DC characteristics and applications of SCR.
3. To study the DC characteristics and applicationsofTRIAC.
4. Investigation of the DC characteristics and applicationso of UJT.
5. Investigation of the DC characteristics of MOSFET.
6. Study of bi-stable, mono-stable and astable, multivibrators.
7. Study of Op-Amps and their applications such as an amplifier(inverting, non-inverting), scalar, summer, differentiator and integrator.
8. Study of logic gates using discrete elements and universal gates.
9. Study of encoder, decoder circuit.
10. Study of arithmetic logic unit(ALU)circuit.
11. Study of shift registers.
12. Study of half and full adder circuits.
13. Study of A/D and D/A circuits.

SEMESTER-I

COURSE CODE: MPHP-1396

COMPUTER LAB

After completion of this lab Student will be

CO1: familiar with various MATLAB syntaxes and techniques to carryout simple calculations.

CO2: able to develop MATLAB programs to find roots of equations.

CO3: able to apply MATLAB commands to plot simple graphs in 2D.

CO4: able to write MATLAB programs to solve numerical integration, numerical differentiation and interpolation.

SEMESTER-I

COURSE CODE: MPHP-1396

COMPUTER LAB

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**
Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Practical Examiners:
Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, KanyaMahaVidyalaya, Jalandhar

LIST OF EXPERIMENTS
1.Determination of Roots

a) Bisection Method
b) Newton Raphson Method
c) Secant Method

2.Integration

a) Trapezoidal rule
b) Simpson1/3andSimpson3/8rules
c) Gaussian Quadrature

3.Differential Equations

a) Euler's Method
b) Runge Kutta Method

4.Interpolation

a) Forward interpolation, Backward interpolation.
b) Lagrange's interpolation.

5.Applications

a) Chaotic Dynamics, logistic map
b) One dimensional Schrondinger Equation
c) Time period calculation for a potential
d) Luminous intensity of a perfectly blackbody vs. temperature

SEMESTER-II

COURSE CODE: MPHL-2391

QUANTUM MECHANICS-I

COURSE OUTCOMES OF QUANTUM MECHANICS

This course develops concepts in quantum mechanics such that the behavior of the physical universe could be understood from a fundamental point of view. It provides a basis for further study of quantum mechanics

CO 1. The very first outcome of the course is that the student will learn the mathematical tools needed to solve quantum mechanics problems. This will include complex functions and Hilbert spaces, and the theory of operator algebra and the concept that quantum states could be described in a vector space. Solutions of ordinary and partial differential equations that arise in quantum mechanics will also be studied.

CO 2. The student will be able to build connections between mathematical development and conceptual understanding.

CO 3. The student will be able to apply the concepts of quantum mechanics to solve the one and three dimensional problems of quantum mechanics to understand the basics of atomic structures and the wave mechanics of these atoms.

CO 4. The student will learn the basic concepts of spin and angular momentum and the role of spherical harmonics in determining the shape of electronic clouds around the nucleus. They will also learn about the utilization of simple harmonic oscillator and the role of Hilbert space in developing simple harmonic oscillator.

SEMESTER-II

COURSE CODE: MPHL-2391

QUANTUM MECHANICS-I

Maximum Marks: 100 (External 80 + Internal 20) Examination Time: 3 Hours
Pass Marks: 40 Total Teaching hours: 60

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

NoteforthePaperSetters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

UNIT-I:*Basic Formulation and quantum Kinematics:* Stern Gerlach experiment as a tool to introduce quantum ideas, analogy of two level quantum systems with polarisation states of light. Complex linear vector spaces, ket space, bra space and inner product, operators and properties of operators .Eigen kets of an observable, eigen kets as base kets, matrix representations. Measurement of observable, compatible vs incompatible observable, commutators and uncertainty relations. Change of basis and unitary transformations. Diagonalisation of operators. Position, momentum and translation, momentum as a generator of translations, canonical commutation relations. Wave functions as position representation of ket vectors. Momentum operator in position representation, momentum Space wave function.

Lectures18

UNIT-II: *Quantum Dynamics:*Time evolution operator and Schrödinger equation, special role of the Hamiltonian operator, energy eigen kets, time dependence of expectation values, spin precession. Schrodinger vs. Heisenberg picture, unitary operators, state kets and observable in Schrodinger and Heisenberg pictures, Heisenberg equations of motion, Ehrenfest's theorem. Simple harmonic oscillator Energy eigen values and eigen vectors of SHO, Matrix representation of creation and annihilation operators, Zero-point energy; Coherent states.

Lectures12

UNIT-III: Symmetry Principles: Symmetry and conservation laws, Space time translation and rotations. Conservation of linear momentum, energy and angular momentum. Unitary transformation, Symmetry and Degeneracy, space inversion and parity. Time reversal invariance.

Lectures12

UNIT-IV: Spherical Symmetric Systems and Angular momentum *:*Schrodinger equation for a spherically symmetric potential. Orbital angular momentum commutation relations. Eigen value problem for L^2, spherical harmonics. Three dimensional harmonic oscillator, three dimensional potential well and the hydrogen atom. Angular momentum algebra, commutation relations. Introduction to the concept of representation of the commutation relations in different dimensions. Eigen vectors and eigen functions of J^2 and Jz. Addition of angular momentum and C.G. coefficients.

Lectures18

Text and Reference Books

1. Modern Quantum Mechnics by J.J.Sakurai-PearsonEducatonPvt.Ltd.,New Delhi,2002.
2. A textbook of Quantum Mechanics by P M Mathews, K Venkatesan, MccGraw Hill Education
3. Quantum Mechanics: Concepts and Applications by N. Zettili, John Wiley & Sons.
4. Quantum Mechanics: Merzbacher by JohnWiley&Sons,NewYork,1970.
5. Quantum Mechanics (2^{nd} Ed.) by V.K. Thankappan, New Age International Publications, New Delhi, 1996

SEMESTER-II

COURSE CODE: MPHL-2392

ELECTRODYNAMICS-I

COURSE OUTCOMES

After passing this course the students will be able to:

CO1: understand the basic concepts of electrostatics and magnetism and related quantities and their calculations for different charge distribution as well as the behaviour of electric and magnetic field inside matter. The students will have the ability to solve the electrostatic problems by method of images helps.

CO2: demonstrate knowledge about the time-varying magnetic and electric fields and their effects by

CO3: understand the propagation of electromagnetic waves in conducting and insulating media.

SEMESTER-II

COURSE CODE: MPHL-2392

ELECTRODYNAMICS-I

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**

Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

UNIT-I: Electrostatics: Coulomb's law, Gauss's law and its applications, Scalar potential, Poisson's equation, Laplace equation. method of images, multipole expansion, Solution of boundary value problems: Green's function and its calculation for the image charge problem in the case of a sphere, uniqueness theorem. Electrostatics of dielectric media, Boundary value problems in dielectrics; molecular polarizability, electrostatic energy in dielectric media.

Lectures 18

UNIT-II: Magnetostatics: Biot and Savart's law. The differential equation of Magnetostatics and Ampere's law, magnetic vector potential and magnetic fields of a localized current distribution. Magnetic moment, force and torque on a magnetic dipole in an external field. Dynamics of charged particles in static and uniform electromagnetic fields. Magnetic materials, Magnetization and microscopic equations.

Lectures 12

UNIT-III: Time-varying fields: Electromagnetic induction. Faraday's law of induction, Energy in a magnetic field. Maxwell's displacement current, Maxwell's equations in free space and linear isotropic media; vector and scalar potential, General Expression for the electromagnetic fields energy, Gauge transformations; Lorentz gauge and Coulomb gauge. Poynting theorem, conservation laws for a system of charged particles and electromagnetic field, Equation of continuity

Lectures 15

UNIT-IV: Electromagnetic Waves: Plane wave like solutions of the Maxwell equations. Polarization, linear and circular polarization. Superposition of waves in one dimension. Group velocity. Illustration of propagation of a pulse in dispersive medium. Reflection and refraction of electromagnetic waves at a plane surface between dielectrics. Polarization by reflection and total internal reflection. Interference, coherence, and diffraction. Waves in conductive medium, Simple model for conductivity.

Lectures 15

Text and ReferenceBooks

1. Introduction to Electrodynamics - D.J. Griffiths-Pearson Education Ltd., New Delhi,1991.
2. Classical Electrodynamics - J.D. Jackson-John & Wiley Sons Pvt. Ltd. New York, 2004.
3. Classical Electromagnetic Radiation - J.B. Marion-Academic Press, New Delhi, 1995.
4. Classical Electrodynamics: S.P. Puri, (Tata McGraw Hill, New Delhi)

SEMESTER-II

COURSE CODE: MPHL-2393

Condensed Matter Physics-I

Course Outcome of Condensed Matter Physics-I

After studying this course, the students will be able to understand:

CO1: Various structures of crystal. The students will be able to draw crystal planes through the knowledge of Miller indices.

CO2: Students have learned about crystal diffraction. How the diffraction takes place and the various methods through which it can be observed.

CO3: The students have learned about lattice vibrations through the concept of phonons. Different models of specific heat, i.e. Einstein model and hence Debye model of specific heat.

CO4: Students have studied about the Fermi Dirac statistics and its applications. Students will be able to find the distinction between metals and insulators, semiconductors.

SEMESTER II

COURSE CODE: MPHL-2393

Condensed Matter Physics-I

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**
Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

Unit-I

Lattice Specific Heat and Elastic Constants:

Different theories of lattice specific heat of solids, Einstein model of the Lattice Specific heat, Density of modes of vibration, Debye model of Lattice specific heat, Born cut-off procedure, Specific heat of metals.Elastic strain and stress components, Elastic compliance and stiffness constants, Elastic constants of cubic crystals, Elastic waves in cubic crystals.

Unit-II

Defects and Diffusion in Solids:

Point defects: Impurities, Vacancies-Schottky and Frankel vacancies, Diffusion, Fick's law, Self diffusion in metals, Color centers and coloration of crystals, F-centres, V-centres, Line defects, Edge and screw dislocations, Burgers vectors, Stress field of dislocations, Grain boundaries, Low angle grain boundaries, dislocation densities, Dislocation multiplication and slips, dislocation and crystal growth.

Unit-III

Conductivity of metals and ionic crystals

Electrical conductivity of metals, Drift velocity and relaxation time, The Boltzmann transport, equation, The Sommerfield theory of conductivity, Mean free path in metals, Qualitative, discussion of the features of the resistivity, Mathiesson's rule.Thermal conductivity of metals, Wiedemann-Franz law. Hydration energy of ions, Activation energy for formation of defects in ionic crystals, Ionic conductivity in pure alkali halides.

Unit-IV

Dielectrics and Ferro Electrics:

Macroscopic field, The local field, Lorentz field, The Claussius-Mossotti relations, Different contribution to polarization: dipolar, electronic and ionic polarizabilities, Ferroelectric crystals: Classifications and their general properties, Structure and properties of BaTiO3, The dipole theory of ferroelectricity, objection against dipole theory, Thermodynamics of ferroelectric transitions.

Books:

1. Solid State Physics by A.J. Dekker-Prentice Hall, 1965.

2. An Introduction to Solid State Physics by C. Kittle-Wiley, 1958

3. Elementary Solid State Physics by Omar, Addison Welly, 1975.

4. Principles of Solid State Physics by R.A. Levey-Academic Press, 1968

5. Introduction of Solid State Physics by Ashroft-Cengage Learning, 1999

SEMESTER-II

COURSE CODE: MPHL-2394

ATOMIC AND MOLECULAR SPECTROSCOPY

COURSE OUTCOMES

Students will have achieved the ability to

CO 1. Describe the atomic spectra of one and two valance electron atoms. the student will understand the relativistic corrections for the energy levels of the hydrogen atom and their effect on optical spectra and the key properties of many electron atoms

CO 2. Explain the change in behaviour of atoms in external applied electric and magnetic field.

CO 3. Explain rotational, vibrational, electronic and Raman spectra of molecules.

CO 4. Explain the role of Frank Condon principle in determining electronic spectra of the molecule. The student will also learn about the dissociation and pre-dissociation energies.

CO 5. state and justify the selection rules for various optical spectroscopies in terms of the symmetries of molecular vibrations

SEMESTER-II

COURSE CODE: MPHL-2394

ATOMIC AND MOLECULAR SPECTROSCOPY

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**

Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

UNIT-I: Spectra of one and two valance electron systems

Magnetic dipole moments, Larmor's theorem, Space quantization of orbital, spin and total angular momenta, Vector model for one and two valance electron atoms, Spin-orbit interaction and fine structure of hydrogen, Lamb shift, Spectroscopic terminology, Spectroscopic notations for L-S and J-J couplings, Spectra of alkali and alkaline earth metals, Interaction energy in L-S and J-J coupling for two electron systems, Selection and Intensity rules for doublets and triplets.

15Lectures

UNIT-II: Breadth of spectral line and effects of external fields

The Doppler effect, Natural breadth from classical theory, natural breadth and quantum mechanics, External effects like collision damping, asymmetry and pressure shift and stark broadening, The Zeeman Effect for two electron systems, Intensity rules for the Zeeman effect, The calculations of Zeeman patterns, Paschen-Back effect, LS coupling and Paschen–Back effect, Lande's factor in LS coupling, Stark effect.

15Lectures

UNIT-III: Microwave and Infra-Red Spectroscopy - rigid rotator, Intensity of rotational lines, Effect of isotopic substitution, Microwave spectrum of polyatomic molecules, Microwave oven, the vibrating diatomic molecule as a simple harmonic and anharmonic oscillator, Diatomic vibrating rotator, The vibration-rotation spectrum of carbon monoxide, The interaction of rotation and vibrations, Outline of technique and instrumentation, Fourier transform Spectroscopy.

15Lectures

UNIT-IV: Raman and Electronic Spectroscopy

Quantum and classical theories of Raman Effect, Pure rotational Raman spectra for linear and polyatomic molecules, Vibrational Raman spectra, Structure determination from Raman and infra-red spectroscopy, Electronic structure of diatomic molecule, Electronic spectra of diatomic molecules, Born Oppenheimer approximation, The Franck Condon principle, Dissociation and pre-dissociation energy, The Fortrat diagram, Example of spectrum of molecular hydrogen.

15Lectures

Text and Reference Books

1. Atomic and molecular Spectra: Laser by Raj Kumar, Kedarnath Ram Nath
2. Fundamentals of molecular spectroscopy by C.B.Banwell-TataMcGrawHill,1986.
3. Spectroscopy Vol. I,II&III by Walker&Straughen,Chapman&Hall1976
4. Introduction to Molecular spectroscopy by G.M.Barrow-TokyoMcGrawHill,1962.
5. Spectra of diatomic molecules by Herzberg-NewYork,1944.

SEMESTER-II

COURSE CODE: MPHP-2395

CONDENSED MATTER PHYSICS LAB-I

COURSE OUTCOMES

Student upon completion of this course will be able to

CO 1. successfully apply the theoretical techniques presented in the course to practical problems

CO 2. Understand Hall Effect and demonstrate concept of Pn junction g-factor using ESR, formation and analysis of Hysteresis loop.

CO 3. Demonstrate experimental determination of Energy gap using Four Probe Method and characteristics of photovoltaic cell.

SEMESTER-II

COURSE CODE: MPHP-2395

CONDENSED MATTER PHYSICS LAB-I

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**

Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Practical Examiners:

Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar

LIST OF EXPERIMENTS

1. To determine Hall coefficient by Hall Effect.
2. To determine the band gap of a semiconductor using p-n junction diode.
3. To determine the magnetic susceptibility of a material using Quink's method.
4. To determine the g-factor using ESR spectrometer.
5. To determine the energy gap and resistivity of the semiconductor using four probe method.
6. To trace hysteresis loop and calculate retentivity, coercivity and saturation magnetization.
7. To determine dielectric constant of a dielectric material.
8. To study the series and parallel characteristics of a photovoltaic cell.
9. To study the spectral characteristics of a photovoltaic cell.

SEMESTER-II

COURSE CODE: MPHP-2396

SPECTROSCOPY LAB

Course Outcomes

On successful completion of the course students will be able to:

CO 1. develop analytical, laboratory skills through laboratory which involve the application of physics to various spectroscopy systems.

CO 2. successfully apply the theoretical techniques presented in the course to practical problems

CO 3. set up the Fabry Parot interferometer, Michelson Morley interferometer, Zeeman experimental instrument and constant deviation spectrometer.

SEMESTER-II

COURSE CODE: MPHP-2396

SPECTROSCOPY LAB

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**

Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Practical Examiners:

Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar

LIST OF EXPERIMENTS

1. To find the wavelength of monochromatic light using Febry Perot interferometer.
2. To find the wavelength of monochromatic light using Michelson interferometer.
3. To calibrate the constant deviation spectrometer with white light and to find the wavelength of unknown monochromatic light.
4. To find the wavelength of He-Ne Laser using Vernier Calliper and the grating element of the given grating.
6. To verify the existence of Bohr's energy levels with Frank-Hertz experiment.
7. To determine the charge to mass ratio (e/m) of an electron with normal Zeeman Effect
8. To determine the velocity of ultrasonic waves in a liquid using ultrasonic interferometer
9. Particle size determination by diode laser

SEMESTER III

COURSE CODE: MPHL-3391

QUANTUM MECHANICS-II

Course outcomes

CO 1. Quantum mechanics-II aim at the applications of quantum mechanics. The course should give deeper knowledge about the foundations of quantum mechanics and skills in problem solving in quantum mechanics.

CO 2. Make students familiar with various approximation methods applied to atomic, nuclear and solid-state physics, and to scattering.

CO 3. The students will learn the applications of Time-independent and time-dependent perturbation theory in quantum mechanics and will develop a knowledge and understanding of perturbation theory, level splitting, and radiative transitions;

CO 4. Develop a knowledge and understanding of the scattering matrix and partial wave analysis; and to solve quantum mechanics problems;

SEMESTER III

COURSE CODE: MPHL-3391
QUANTUM MECHANICS-II

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**
Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. **Each question carries 16 marks.**

Unit-I: Perturbation Theory

First and second order perturbation theory for non degenerate and degenerate systems. Perturbation of an oscillator and anharmonic oscillator, the variation method. First order time dependent perturbation theory, constant perturbation, Calculation of transition probability per unit time for harmonic perturbation. The Helium atom problem, Stark effect.

Unit-II: Scattering Theory

Born approximation, extend to higher orders. Validity of Born approximation for a square well potential, Optical theorem. Partial wave analysis, unitarity and phase shifts. Determination of phase shift, applications to hard sphere scattering. Low energy scattering in case of bound states. Resonance scattering.

Unit-III: Relativistic Quantum Mechanics

Klein Gordon equation. Dirac Equation, Lorentz covariance of Dirac equation. Positive and negative energy solutions of Dirac equation, positrons. Properties of gamma matrices. Parity operator and its action on states. Magnetic moments and spin orbit energy.

Unit-IV: Identical Particles

Brief introduction to identical particles in quantum mechanics, Fermions and Bosons, wave function of n-identical particles and Slater’s determinant, symmetrisation postulates, Exchange operators and exchange degeneracy, Application to 2 and 3 electron systems. Pauli Exclusion Principle,

References :

1. Quantum Mechanics by L I Schiff-Tokyo McGraw Hill, 1968.
2. A textbook of quantum mechanics by P.M. Methews and K. Venktasen Mcgraw Hill Education, 2017

3. Introduction to Quantum Mechanics by David J. Griffiths, pearson, 2015

SEMESTER III

COURSE CODE: MPHL-3392
Electrodynamics-II

Course outcomes

After passing this course the students will be able to:

CO1: Understand different types of waveguides. The transmission of electromagnetic signals through waveguide. The attenuation and loss of signal in waveguides

CO2: Correlate Einstein's special theory of relativity with classical mechanics and electrodynamics in terms of tensor notation.

CO3: Study the fields around electric dipole, magnetic dipole and electric quadruple. The transition of signal from full wave and half wave antennas.

CO4: Understand fields due to moving charges in terms of vectors and in terms of relativistic mechanics.

SEMESTER III

COURSE CODE: MPHL-3392

Electrodynamics-II

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**
Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

UNIT-I

Wave Guides: Field at the surface of and within a conductor. Cylindrical cavities and waveguides, modes in a rectangular wave guide, energy flow and attenuation in wave guides.
Perturbation of boundary conditions, resonant cavities, power loss in cavity and quality factor.

UNIT-II

Relativistic Formulation of Electrodynamics: Special theory of relativity, simultaneity, length contraction, time dilation and Lorentz's transformations, Structure of space-time, four scalars, four vectors and tensors, relativistic mechanics: proper time and proper velocity, relativistic energy and momentum. Relativistic electrodynamics: Magnetism as a relativistic phenomenon and field transformations. Field tensor. Recasting Maxwell equations in the language of special relativity, covariance and manifest covariance.

UNIT-III

Radiating Systems: In **h**omogenous Wave Equation for potentials: Retarded Potentials ,Fields of radiation of localized oscillating sources, electric dipole fields and radiation, magnetic dipole and electric quadrupole fields, central fed antenna, brief introduction to radiation damping and radiation reaction.

UNIT-IV

Fields of Moving Charges: Lienard Wiechert potential, field of a moving charge. Radiated power from an accelerated charge at low velocities, Larmour's power formula and its relativistic generalization; Angular distribution of radiation emitted by an accelerated charge.

Text and Reference Books:

1. Classical Electrodynamics by J.D. Jackson-John Wiley & Sons Pvt. Ltd., New York.
2. Introduction to Electrodynamics by D.J. Griffiths-Pearson Education Ltd.
3. Classical Electromagnetic Radiation by J.B. Marion-Academic Press, New Delhi.

SEMESTER III

COURSE CODE: MPHL-3393

Condensed Matter Physics-I

Course Outcome of Condensed Matter Physics-I

After studying this course, the students will be able to understand:

CO1: Various structures of crystal. The students will be able to draw crystal planes through the knowledge of Miller indices.

CO2: Students have learned about crystal diffraction. How the diffraction takes place and the various methods through which it can be observed.

CO3: The students have learned about lattice vibrations through the concept of phonons. Different models of specific heat, i.e. Einstein model and hence Debye model of specific heat.

CO4: Students have studied about the Fermi Dirac statistics and its applications. Students will be able to find the distinction between metals and insulators, semiconductors.

SEMESTER III

COURSE CODE: MPHL-3393

Condensed Matter Physics-I

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**

Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

Unit-I

Lattice Specific Heat and Elastic Constants:

Different theories of lattice specific heat of solids, Einstein model of the Lattice Specific heat, Density of modes of vibration, Debye model of Lattice specific heat, Born cut-off procedure, Specific heat of metals. Elastic strain and stress components, Elastic compliance and stiffness constants, Elastic constants of cubic crystals, Elastic waves in cubic crystals.

Unit-II

Defects and Diffusion in Solids:

Point defects: Impurities, Vacancies-Schottky and Frankel vacancies, Diffusion, Fick's law, Self diffusion in metals, Color centers and coloration of crystals, F-centres, V-centres, Line defects, Edge and screw dislocations, Burgers vectors, Stress field of dislocations, Grain boundaries, Low angle grain boundaries, dislocation densities, Dislocation multiplication and slips, dislocation and crystal growth.

Unit-III

Conductivity of metals and ionic crystals

Electrical conductivity of metals, Drift velocity and relaxation time, The Boltzmann transport equation, The Sommerfield theory of conductivity, Mean free path in metals, Qualitative discussion of the features of the resistivity, Mathiesson's rule. Thermal conductivity of metals, Wiedemann-Franz law. Hydration energy of ions, Activation energy for formation of defects in ionic crystals, Ionic conductivity in pure alkali halides.

Unit-IV

Dielectrics and Ferro Electrics:

Macroscopic field, The local field, Lorentz field, The Claussius-Mossotti relations, Different contribution to polarization: dipolar, electronic and ionic polarizabilities, Ferroelectric crystals: Classifications and their general properties, Structure and properties of BaTiO3, The dipole theory of ferroelectricity, objection against dipole theory, Thermodynamics of ferroelectric transitions.

Books:

1. Solid State Physics by A.J. Dekker-Prentice Hall, 1965.

2. An Introduction to Solid State Physics by C. Kittle-Wiley, 1958

3. Elementary Solid State Physics by Omar, Addison Welly, 1975.

4. Principles of Solid State Physics by R.A. Levey-Academic Press, 1968

5. Introduction of Solid State Physics by Ashroft-Cengage Learning, 1999

SEMESTER III

COURSE CODE: MPHL-3394

NUCLEAR PHYSICS

Course Outcomes

Upon completion of this course, the student will be able to:

CO 1. Identify basic nuclear properties and outline their theoretical descriptions.

CO 2. Understand the nature of nuclear forces that bind atomic nuclei together and the structure and dynamics of nuclei.

CO 3. Apply the semi-empirical mass formula to evaluate the binding energy of a nucleus and other binding energy related properties.

CO 4. Describe the role of spin-orbit coupling in the shell structure of atomic nuclei, and predict the properties of nuclear ground and excited states based on the shell model.

CO 5. Understand the various decay properties of unstable nuclei such as beta decay, gamma decay, and parity violation.

CO 6. Compare different nuclear reaction mechanisms in relation to cross-sections, excitation functions and angular distributions.

SEMESTER III

COURSE CODE: MPHL-3394

NUCLEAR PHYSICS

Syllabus

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**

Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on mid-semester test/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters for final examination: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. **Each question carries 16 marks.**

Unit-I

Properties of nucleus and nuclear forces: size, spin, parity, magnetic moment, quadrupole moment and binding energy of a nucleus. Two nucleon system, deuteron problem, tensor forces, pp and pn scattering experiments at low energy, scattering length, effective range theory, spin dependence of nuclear forces, charge independence and charge symmetry of nuclear forces, exchanges forces: Bartlett, Heisenberg, Majorana forces and potentials, meson theory of nuclear forces.

Unit-II

Nuclear Models: Liquid drop model, semi-empirical mass formula, Bohr-Wheeler theory of fission, experimental evidence for shell structure of nucleus, shell model, spin-orbit coupling, applications of shell model like angular momenta, parities, magnetic moments (Schmidt lines) of nuclear ground states, collective model, nuclear vibrations spectra and rotational spectra, Nilsson model.

Unit-III

Nuclear Decay: Beta decay: Types of beta decay, neutrino hypothesis, Fermi theory of beta decay, detection of neutrino, total decay rate, comparative half-lives, angular momentum and parity selection rules in beta decay, allowed and forbidden transitions, parity violation in beta decay. Gamma decay: Multipole transitions in nuclei, angular momentum and parity selection rules in gamma decay, internal conversion, nuclear isomerism.

Unit-IV

Nuclear Reactions: Introduction to nuclear reactions, conservations laws, cross sections in terms of partial wave amplitudes, compound and direct nuclear reaction mechanisms, Breit Winger one level formula, Resonance scattering. Nuclear fission, nuclear fusion.

Reference books:

1. Nuclear Physics by R.R. Roy and B.P. Nigam-New Age International Publishers
2. Introductory Nuclear Physics by K.S. Krane-Wiley, New York
3. Nuclear Physics by G.N. Ghoshal-S. Chand and Co.

SEMESTER III

COURSE CODE: MPHL-3395
CONDERNSED MATTER LAB-II

Course Outcomes

Upon completion of this course, the student will be able to:

CO 1. Understand the mechanism of domain formation in ferromagnetic materials and to

CO 2. find the energy losses in various ferromagnetic materials

CO 3. Understand the concept of Curie temperature.

CO 4. Understand the concept of charge storage mechanism in p-n junction diodes

CO 5. Understand the phonon and photon interactions in materials

CO 6. Will learn to work with the travelling, transmission and reflection of microwaves.

SEMESTER III

COURSE CODE: MPHL-3395
CONDERNSED MATTER LAB-II
Syllabus

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**
Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on mid-semester test/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

1. To determine the energy loss in transformer and ferrite cores using B-H curve.
2. To determine Curie temperature of ferrites.
3. To determine Stefan's constant using Boltzmann's Law.
4. To study the depletion capacitance and its variation with reverse bias in a p-n junction.
5. To determine the lattice dynamics and dispersion relation for the monatomic and diatomic lattices.
6. To find the Young's modulus of a material using ultrasonic interferometer for solids
7. Experiments with Microwaves set up.

SEMESTER III

COURSE CODE: MPHL-3396
NUCLEAR PHYSICS LAB
Course Outcomes

Upon completion of this course, the student will be able to:

CO 1. Carry out experimental work using NaI (Tl) scintillation detector and GM counter in the field of radiation shielding and radioactive analysis of various materials.

CO 2. Understand the interaction of beta particles, alpha particles and gamma ray with matter.

CO 3. Understand the importance of statistical nature of radioactivity in the field of radioactive analysis.

CO 4. Investigate the attenuation power of various materials for alpha, beta and gamma radiation.

SEMESTER III

COURSE CODE: MPHL-3396
NUCLEAR PHYSICS LAB
Syllabus

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**
Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on mid-semester test/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

1. Pulse-Height Analysis of Gamma Ray Spectra.
2. Energy calibration of Scintillation Spectrometer.
3. Least square fitting of a straight line.
4. Study of absorption of gamma rays in matter.
5. Study of the characteristics of a G.M. Counter.
6. Study of the Dead time of a G.M. Counter.
7. Study of absorptions of Beta Particles in Matter.
8. Window thickness of a G.M. Tube.
9. Investigation of the statistics of radioactive measurements.
10. Study of Poisson Distribution.
11. Study of Gaussian Distribution.
12. Study of absorption alpha-particles in matter.

SEMESTER IV

COURSE CODE: MPHL-4391

PARTICLE PHYSICS

Course Outcomes

CO1: After completing this course the students will understand the fundamental principles and concepts governing particle physics. The students will learn various experimental techniques used in discovering the elementary particles and their various properties such as mass, lifetime, parity and spin.

CO2: Students will be able to understand the role of symmetries in particle physics. They will acquire basic knowledge on the fundamental forces of universe and various conservation laws followed in these forces (interactions).

CO3: Students will also learn the concept of CP violation in detail which will lead them to their knowledge about current area of research on the missing antimatter of universe.

CO4: The students will learn the Feynman rules and their application in calculating the cross sections for various particle interactions.

CO5: They will also be able to understand the theory of spontaneous breaking symmetry and its application to Higgs mechanism. Students will also have a broad overview of the standard model of particle physics and its predictions.

SEMESTER IV
COURSE CODE: MPHL-4391
PARTICLE PHYSICS

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**
Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on mid-semester test/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters for final examination: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. **Each question carries 16 marks.**

Unit-I

Elementary Particles and Their Properties: Historical survey of elementary particles and their classification, fundamental forces of nature, determination of mass, life time, decay mode, spin and parity of muons, pions, kaons and hadrons, introduction to antiparticles, relativistic kinematics.

Unit-II

Symmetries and Conservation Laws: Conserved quantities and symmetries, the electric charge, baryon number, lepton number, hypercharge (strangeness), the nucleon isospin, isospin invariance, isospin of particles, Gellmann-Nishijima formula, parity operation, charge conjugation, positronium decay, CP violation and $K^o - \overline{K^o}$ doublet, time reversal invariance, CPT theorem, Gellmann's eightfold way of hadrons, quark model.

Unit-III

Week Interactions: Classification of weak interactions, τ-θ puzzle, parity violation in beta decay, parity violation in Λ-decay, the two component neutrino theory, measurement of neutrino helicity (Goldhaber's experiment), the V-A interaction, weak decays of strange-particles and Cabibbo's theory, GIM mechanism, CKM matrix.

Unit-IV

Gauge theory and neutrino oscillation: Gauge symmetry, field equations for scalar (spin 0), spinor (spin ½), vector (spin-1) and fields, global gauge invariance, local gauge invariance, Feynmann rules, spontaneously broken symmetries in the field theory, Higgs mechanism, neutrino mass, neutrino oscillations.

Reference books:

1 Nuclear Physics by S.N. Ghoshal-S. Chand and Co.
2 Introduction to Elementary Particles by D. Griffiths-Wiley-VCH.
3 Introduction to High Energy Physics by D.H Perkins-Cambridge University Press.

SEMESTER IV

COURSE CODE: MPHL-4392
CONDENSED MATTER PHYSICS-II

Course outcomes

- CO 1. Condensed Matter Physics-II aim at the applications of Solid state Physics. The course should give deeper knowledge about magnetic materials.
- CO 2. Make students familiar with various concepts like curie's temperature, super exchange interaction and properties of hysteresis loop.
- CO 3. The students will have knowledge of superconductors and its types and how its properties can be applicable in the research field.
- CO 4. Develop a knowledge and understanding of the optical properties and students will get the knowledge how these properties are beneficial in the field of research.

SEMESTER IV

COURSE CODE: MPHL-4392

CONDENSED MATTER PHYSICS-II

Syllabus

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**

Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. **Each question carries 16 marks.**

Unit- I

Classification of magnetic materials, Origin of permanent magnetic dipoles, Diamagnetic susceptibility, Langevin diamagnetic equation, Classical theory of paramagnetism, Quantum theory of paramagnetism, Quenching of orbital angular momentum, Cooling by adiabatic demagnetization, Paramagnetic susceptibility of conduction electrons, Determination of susceptibilities of para and diamagnetic materials: Theory, Gouy method and Quincke's method

Unit - II

Ferromagnetism, Curie point and the exchange integral, Weiss molecular field, the interpretation of the Weiss field, Temperature dependence of spontaneous magnetization, Saturation magnetization at absolute zero, Ferromagnetic domains, Anisotropy energy, Transition region between domains: Bloch wall, Origin of domains, Coercivity and hysteresis, Spin waves, Quantization of spin waves, Thermal excitations of magnons, Neutron Magnetic Scattering, Ferrimagnetic Order, Curie temperature and susceptibility of ferrimagnets, Antiferromagnetism, Two sublattice model.

Unit – III

Superconductivity, zero resistivity, critical temperature, Meissner effect, Type I and Type II superconductors, specific heat and thermal conductivity,Thermodynamics of superconducting transition, London's equation, Coherence length, BCS theory of conventional superconductors, BCS ground states, Flux quantization on a superconducting ring, Duration of persistent current, Josephson effect: dc Josephson effect, ac Josephson effect, macroscopic quantum interference, Superconducting magnet and SQUID, High temperature superconductors: Structure and properties.

Unit - IV

Interaction of light with solids, Atomic and electronic interactions, Optical properties of metals and non-metals: Reflection, Refraction, Absorption, Transmission, Fundamentals of direct and indirect band gap, Exciton absorption, Free carrier absorption, Absorption process involving impurities, Photoconductivity, Luminescence, excitation and emission, Decay mechanisms, Thallium activated alkali halides, Sulphide phosphors.

Books Recommended:

1. An Introduction to Solid State Physics by C. Kittel-WielyEstem Ltd., New Delhi.
2. Solid State Physics by A.J. Dekkar-Maemillan India Ltd., New Delhi.
3. Material Science and Engineering by William D. Callister JR, Wiley
4. Elementary Solid State Physics by Omar, Addison Wesly.
5. Principles of Solid State Physics by R.A. Levy-New York Academy.
6. Solid State Physics by Aschroft and Mermin-New York Holt.

SEMESTER IV

COURSE CODE: MPHL- 4393 (OPT-II)

COURSE TITLE: RADIATION PHYSICS

Course outcomes

CO 1. Radiation Physics aim at study the knowledge of ionizing Radiation and Radiation Quantities.

CO 2. Make students familiar with various types of dosimeters.

CO 3. The students will have knowledge of Radiation effects and its protection.

CO 4. Develop a knowledge and understanding of the radiation shielding.

SEMESTER IV

COURSE CODE: MPHL- 4393 (OPT-II)

COURSE TITLE: RADIATION PHYSICS

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**

Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. **Each question carries 16 marks.**

Unit – 1

Ionizing Radiations and Radiation Quantities:

Types and sources of ionizing radiation, fluence, energy fluence, kerma, exposure rate and its measurement - The free air chamber and air wall chamber, Absorbed dose and its measurement ; Bragg Gray Principle, Radiation dose units - rem, rad, Gray and sievert dose commitment, dose equivalent and quality factor.

Unit- II

Dosimeters:

Pocket dosimeter, films, solid state dosimeters such as TLD, SSNTD, chemical detectors and neutron detectors. Simple numerical problems on dose estimation.

Unit- III

Radiation Effects and Protection:

Biological effects of radiation at molecular level, acute and delayed effects, stochastic and nonstochastic effects, Relative Biological Effectiveness (RBE), Linear energy transformation (LET), Dose response characteristics. Permissible dose to occupational and non-occupational workers, maximum permissible concentration in air and water, safe handling of radioactive materials, The ALARA, ALI and MIRD concepts, single target, multitarget and multihit theories, Rad waste and its disposal, simple numerical problems.

Unit - IV

Radiation Shielding:

Thermal and biological shields, shielding requirement for medical, industrial and accelerator facilities, shielding materials, radiation attenuation calculations-The point kernal technique, radiation attenuation from a uniform plane source. The exponential point-Kernal. Radiation attenuation from a line and plane source. Practical applications of some simple numerical problems.

Books :

1. Nuclear Reactor Engineering by . S. Glasstone and A. Sesonke ,Van Nostrand Reinhold.
2. Radiation Theory by Alison. P. Casart
3. Radiation Biology-Radiation Bio by A. Edward Profio /Prentice Hall.
4. Introduction to Radiological Physics and Radiation Dosimetry by F.H. Attix -Wiley-VCH.

SEMESTER IV

COURSE CODE: MPHL- 4394 (OPT-III)

COURSE TITLE: REACTOR PHYSICS

Course Outcomes-

CO1. Reactor Physics aims to give an insight on functioning of Reactors.

CO2. To learn about Reactor safety and control

CO3.Types of reactors and detailed working of Indian nuclear reactors

SEMESTER IV

COURSE CODE: MPHL- 4394 (OPT-III)

COURSE TITLE: REACTOR PHYSICS

Syllabus

Maximum Marks: 100 (External 80 + Internal 20) **Examination Time: 3 Hours**

Pass Marks: 40 **Total Teaching hours: 60**

Out of 100 Marks, internal assessment (based on one mid-semester tests/ internal examinations, written assignment/project work etc. and attendance) carries 20 marks, and the final examination at the end of the semester carries 80 marks.

Note for the Paper Setters: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. **Each question carries 16 marks.**

Interaction of Neutrons with Matter in Bulk:

Thermal neutron diffusion, Transport and diffusion equations, transport mean free path, solution of diffusion equation for a point source in an infinite medium and for an infinite plane source in a finite medium, extrapolation length and diffusion length-the albedo concept.

Lectures 15

Moderation of Neutron:

Mechanics of elastic scattering, energy distribution of thermal neutrons, average logarithmic energy decrement, slowing down power and moderating ration of a medium. Slowing down density, slowing down time, Fast neutron diffusion and Fermi age theory, solution of age equation for a point source of fast neutrons in an infinite medium, slowing down length and Fermi age.

Lectures 15

Theory of Homogeneous Bare Thermal and Heterogeneous Natural Uranium Reactors

Neutron cycle and multiplication factor, four factor formula, neutron leakage, typical calculations of critical size and composition in simple cases, The critical equation, material and geometrical bucklings, effect of reflector, Advantages and disadvantages of heterogeneous assemblies, various types of reactors with special reference to Indian reactors and a brief discussion of their design feature.

Lectures 15

Power Reactors Problems of Reactor Control

Breeding ratio, breading gain, doubling time, Fast breeder reactors, dual purpose reactors, concept of fusion reactors, Role of delayed neutrons and reactor period, In hour formula, excess reactivity, temperature effects, fission product poisoning, use of coolants and control rods.

Lectures 15

Books:

1. The elements of Nuclear reactor Theory by Glasstone&Edlund-VamNostrand, 1952.
2. Introductions of Nuclear Engineering by Murray-Prentice Hall, 1961.

SEMESTER IV

ASSIGNMENT/PROJECT

Course No. MPHD-4395

Maximum Marks: 50 (External 40 + Internal 10) **Examination Time: 3 Hours**
Pass Marks: 20 **Total Teaching hours: 90**

Assignment and Project should be based on following techniques in:
1. Material Science
2. Computational Physics
3. Nuclear Physics
4. Advanced Theoretical Physics
5. Radiation Physics
6. Electronics

Note:
Evaluation committee will consist of following members:
1. External examiner
2. HOD, College/ Internal Examiner