FACULTY OF SCIENCES

SYLLABUS FOR THE BATCH FROM THE YEAR 2023 TO YEAR 2026

Programme Code: BSHP

Programme Name: B.Sc. (Hons.) Physics

(Semester I-IV)

Examinations: 2024-25

Department of Physics

Khalsa College, Amritsar

(An Autonomous College)

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(b)) Subject to change in the syllabi at any time.
(c) Please visit the college website time to time.

S.No.	PROGRAMME OBJECTIVES
1.	To develop human resource with knowledge, abilities and insight in Physics and related fields required for career in academia and industry.
2.	To apply principles of basic science concepts in understanding, analysis and prediction of physical systems.
3.	To understand the concepts and significance of the various physical phenomena.
4.	To carry out experiments to understand the laws and concepts of Physics.
5.	To acquire a wide range of problem solving skills and to apply them.

S.No.	PROGRAMME SPECIFIC OUTCOMES (PSOs)
PSO-1	To Demonstrate knowledge of classical mechanics, electromagnetism and modern physics and be able to apply this knowledge to analyse a variety of physical phenomena.
PSO-2	To demonstrate proficiency in mathematics and the mathematical concepts needed for a proper understanding of physics.
PSO-3	To demonstrate the ability to use skills in Physics and its related areas of technology for formulating and tackling Physics-related problems and identifying and applying appropriate physical principles and methodologies to solve a wide range of problems associated with Physics.
PSO-4	To analyse scientific reasoning for various things.
PSO-5	To enable students to be capable of analyzing the problems through different prospective and hence instill higher order thinking and learning.
PSO-6	To find ample career openings both in public as well as private sector enterprises. They can apply for all government jobs and find various opportunities in government organizations like DRDO, ISRO, BARC, IIT etc.

COURSE SCHEME											
SEMESTER-I											
Course Code	Course Title	Teaching Hours/ Week	Credits			Total Credits	Max. Marks			Total Marks	Page No.	Syllabus Changed /Same as 2022-23
			L	T	P		Th	P	IA			
BHP-111	MECHANICS-I	4	3	1	0	4	75		25	100	7-8	Changed
BHP -112	ELECTRICITY AND MAGNETISM-I	4	3	1	0	4	75		25	100	9-10	Changed
MAP -111	MATHEMATICS –I	4	3	1	0	4	75		25	100	11-12	Changed
CHX -111	ORGANIC CHEMISTRY-I	3	3	0	0	3	56		19	75	13-14	Changed
BCEN-1123	COMMUNICATIVE ENGLISH	5	3	0	1	4	75		25	100	15-16	Changed
BHPB-1101	ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ –I	4	4	0	0	4	75		25	100	17-18	Changed
BPBI-1102 BPHC-1104	ਮੁੱਢਲੀ ਪੰਜਾਬੀ–I (In Lieu of Compulsory Punjabi) or PUNJAB HISTORY & CULTURE(For those students who are not domicile of Punjab)	4	4	0	0	4	75		25	100	19-20 21-22	Changed
BHP -113	PHYSICS LAB-I	4	0	0	2	2		37	13	50	23	Changed
BHP -114	PHYSICS LAB-II	4	0	0	2	2		37	13	50	24	Changed
CHP-112	ORGANIC CHEMISTRY LAB-I	2	0	0	1	1		19	06	25	25-26	Changed
ZDA-111	DRUG ABUSE	2	2	0	0	2	50		-	50	27-28	Changed
						30				700		

Course Code	Course Title	Teaching Hours/ Week	Credits			Total Credits	Max. Marks			Total Marks	Page No.	Syllabus Changed /Same as 2022-23
			L	**T**	**P**		**Th**	**P**	**IA**			
						SEMESTER-II						

Course Code	Course Title	Teaching Hours/ Week	L	T	P	Total Credits	Th	P	IA	Total Marks	Page No.	Syllabus Changed /Same as 2022-23
BHP-121	ELECTRICITY & MAGNETISM-II	4	3	1	0	4	75		25	100	29-30	Changed
BHP-122	WAVES & OSCILLATIONS	4	3	1	0	4	75		25	100	31-32	Changed
MAP -121	MATHEMATICS – II	4	3	1	0	4	75		25	100	33-34	Changed
CHX -121	INORGANIC CHEMISTRY-II	3	3	0	0	3	56		19	75	35-36	Changed
BCEN-1223	COMMUNICATIVE ENGLISH	5	3	0	1	4	75		25	100	37-38	Changed
BHPB-1201	ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ –II	4	4	0	0	4	75		25	100	39-40	Changed
BPBI-1202 BPHC-1210	ਮੁੱਢਲੀ ਪੰਜਾਬੀ–II (In Lieu of Compulsory Punjabi)or PUNJAB HISTORY & CULTURE.(For those students who are not domicile of Punjab)	4	4	0	0	4	75		25	100	41-42 43-44	Changed
BHP -123	PHYSICS LAB-III	4	0	0	2	2		37	13	50	45-46	Changed
BHP -124	PHYSICS LAB-IV	4	0	0	2	2		37	13	50	47-48	Changed
CHP-122	INORGANIC CHEMISTRY LAB-II	2	0	0	1	1		19	06	25	49-50	Changed
ZDA-121	DRUG ABUSE	2	2	0	0	2	50		-	50	51-52	Changed
						30				700		

SEMESTER-III												
Course Code	Course Title	Teaching Hours/ Week	Credits			Total Credits	Max. Marks			Total Marks	Page No.	Syllabus Changed / Same as 2023-24
			L	T	P		Th	P	IA			
BHP-231	MECHANICS-II	4	3	1	0	4	75		25	100	53-54	Same as 2023-24
BHP -232	STATISTICAL AND THERMAL PHYSICS	4	3	1	0	4	75		25	100	55-57	Same as 2023-24
MAP -231	MATHEMATICS-III	4	3	1	0	4	75		25	100	58-59	Same as 2023-24
CHX -231	PHYSICAL CHEMISTRY-III	3	3	0	0	3	56		19	75	60-61	Same as 2023-24
ESL-221	ENVIRONMENTAL STUDIES-I	2	2	0	0	2	50		0	50	62-64	Same as 2023-24
IDPSY-2331	INTERDISCIPLINARY COURSE ID-I (Psychology)	3	3	0	0	3	56		19	75	65-66	Same as 2023-24
SEC–HP-231	BASICS OF COMPUTER: EXCEL SPREADSHEET	5	1	0	2	3	19	37	19	75	67	New Course
BHP -233	PHYSICS LAB-V	4	0	0	2	2		37	13	50	68-69	Changed
BHP -234	PHYSICS LAB-VI	4	0	0	2	2		37	13	50	70-71	New Course
CHX -232	PHYSICAL CHEMISTRY LAB-III	2	0	0	1	1		19	6	25	72-73	Same as 2023-24
						26				650		

Course Code	Course Title	Teaching Hours / Week	Credits			Total Credits	Max. Marks			Total Marks	Page No.	Syllabus Changed / Same as 2023-24
			L	T	P		Th	P	IA			
BHP-241	OPTICS	4	3	1	0	4	75		25	100	74-75	Same as 2023-24
BHP -242	MODERN PHYSICS	4	3	1	0	4	75		25	100	76-77	Same as 2023-24
MAP -241	MATHEMATICS-IV	4	3	1	0	4	75		25	100	78-79	Same as 2023-24
CHX -241	MOLECULAR SPECTROSCOPY-IV	3	3	0	0	3	56		19	75	80-81	Same as 2023-24
ESL-222	ENVIRONMENTAL STUDIES-II	2	2	0	0	2	50		0	50	82-84	Same as 2023-24
BGEO-2432	INTERDISCIPLINARY COURSE ID-II (Geography)	4	2	0	1	3	56		19	75	85-86	Same as 2023-24
SEC- HP-241	**PC BASED PHYSICS EXPERIMENT**	**5**	**1**	**0**	**2**	**3**	**19**	**37**	**19**	**75**	**87-88**	**New Course**
BHP -243	PHYSICS LAB-VII	4	0	0	2	2		37	13	50	89-90	Changed
BHP -244	**PHYSICS LAB-VIII**	**4**	**0**	**0**	**2**	**2**		**37**	**13**	**50**	**91-92**	**New Course**
CHX -242	PHYSICAL CHEMISTRY LAB -IV	2	0	0	1	1		19	6	25	93-94	Same as 2023-24
						26				650		

B.SC. (HONS.) PHYSICS SEMESTER I
BHP-111
MECHANICS-I

Teaching Hours (per week): 4
Total Credits: 4
Credits: LTP: 310
Total Hours: 60

Time: 3 Hours
Maximum Marks: 100
(Theory Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

Note for paper setter and students:
1. There will be five sections.
2. Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The candidate will have to attempt any 6 questions in this section.
3. Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections. Each question in these sections should not have more than two subparts.
4. Non-Programmable Scientific calculator is allowed.

Course Objectives: The purpose of the course is to provide the basic information about co-ordinate system and motion of particles in it, to understand the conservation laws and also to determine the difference between elastic and inelastic collisions. It includes applications of central force to the stability of circular orbits, Kepler's laws of planetary motion, orbital precession and Rutherford scattering, dynamics of rotating objects i.e. rigid bodies, angular velocity, the moment of inertia, the motion of rigid bodies and Euler equations. It also helps to understand the differences between types of forces and the inverse square force field.

Course Contents:

UNIT-I

Co-ordinate system and Motion of a Particle: Cartesian, **Plane polar** and spherical polar co–ordinate systems, area, volume, velocity and Acceleration in these systems. Solid angle, **Homogeneity of space and time, isotropy of space**, Symmetry principles and Laws of Conservation.

UNIT-II

Conservation of Momentum and Collisions: Internal forces and momentum conservation. Centre of mass, Elastic collisions in laboratory and center 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, Rutherford scattering, **Cross-section elastic scattering and impact parameter**.

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, Two body problem and concept of reduced mass, Motion of a body under central force, equation of orbit in inverse-square force field, **Physical insight into the nature of motion,** Kepler's laws and their derivation, **Newton's law of gravitation from Kepler's law of planetary motion.**

UNIT-IV

Dynamics of Rigid Bodies: Rigid body, Moment of inertia of a rigid body, Equation of motion of a rigid body, rotational motion of a rigid body in general and in a 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.

Tutorial: Relevant problem on the topics covered in the course.

Books Prescribed:
1. Mechanics-Berkeley Physics Course, Vol-I (second edition):C. Kittel, W. D. Knight, M. A. Ruderman, C. A. Helmholtz and R. J. Moyer-Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
2. Fundamentals of Physics: D. Halliday, R. Resnick and J. Walker (sixth edition)-Wiley India Pvt. Ltd.

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the basic information about co-ordinate system and motion of particles in it.
CO2	Understand the conservation laws and also to determine the difference between elastic and inelastic collisions.
CO3	Explain the applications of central force to the stability of circular orbits, Kepler's laws of planetary motion, orbital precession and Rutherford scattering.
CO4	Understand the dynamics of rotating objects i.e. rigid bodies, angular velocity, the moment of inertia, the motion of rigid bodies and Euler equations.
CO5	Understand the differences between types of forces and also able to explain the inverse square force field.

B.SC. (HONS.) PHYSICS SEMESTER I
BHP-112
ELECTRICITY AND MAGNETISM-I

Teaching Hours (per week): 4
Total Credits: 4
Credits:LTP:310
Total Hours: 60

Time: 3 Hours

Maximum Marks: 100
(Theory Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

Note for paper setter and students:
1. **There will be five sections.**
2. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The candidate will have to attempt any 6 questions in this section.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections. Each question in these sections should not have more than two subparts.**
4. **Non-Programmable Scientific calculator is allowed.**

Course Objectives: Objectives of this course are to understand vectors calculus. To understand the fundamental laws and concepts in electricity and magnetism and their applications. To understand electric current and related concepts. To understand dielectrics, resistors, capacitors, and inductors. To understand the relativistic approach in electricity and magnetism.

Course Contents:

UNIT-I

Basic Ideas of Vector Calculus; Introduction to gradient, divergence & curl **and** their physical significance; **Laplacian and its formulation in rectangular, cylindrical and spherical coordinates systems**; Rules for vector derivatives; useful relations involving gradient, divergence & curl; Solenoidal and irrotational fields; Fundamental theorem for gradients- Gauss's and Stoke's theorems, Helmholz and Greens theorem.

UNIT-II

Electric charge and its properties; Coulombs law; Principal of Superposition; The electric field due to a point charge and continuous charge distributions; Electric field due to finite and infinite lines of charges; Field due to **sheet of charge**, electric dipole; **Electric** field lines **and** flux; Gauss's law; **differential form of Gauss's law**; applications of Gauss's law; Curl of electric field; **work and potential difference; potential difference as line integral of field**; Relation between potential and electric field; Poisson's and Laplace's equations; Electric potential due to

different charge distribution-Wire, Ring, Disc, Spherical Sheet, Sphere, dipole etc.; The energy for a point and continuous charge distribution.

UNIT-III

Concept of electrical images; Calculation of electric potential and field due to a point charge placed near an infinitely conducting sheet; Conductors in the electrostatic field; Capacitors; Current and current density; drift velocity; expression for current density vector; Equation of continuity; microscopic form of Ohm's law and electrical conductivity; limitations of Ohm's law; Multipoles and multipole moments; Equipotential surface method of electrical images.

UNIT-IV

Dielectrics, Non Polar and Polar Molecules, Polarisation of Dielectric, Polarization Vector, Atomic polarizability, Dielectric Constant, Capacity of a Capacitor, Electric Susceptibility, Free and Bound Charges, Gauss Law in Dielectric, and Displacement Vector, Energy stored in Capacitor having Dielectric Medium, Energy Density of a Dielectric Medium.

Tutorial: Relevant problem on the topics covered in the course.

Books Prescribed:
1. Introduction to Electrodynamics -D.J. Griffiths, Pearson Prentice Hall, New Delhi.
2. Electricity & Magnetism-T.S. Bhatia and Gurpreet Singh, Vishal Publications.
3. Berkeley Physics Course Vol. II (Electricity & Magnetism)- E.M.Purcell, Mc Graw hill, New York.
4. Fundamental of Physics -D. Halliday, R. Resnick and J. Walker (6th edition)-John Wiley, India Pvt. Ltd.
5. Electricity and Magnetism – A. K. Sikri, Pradeep Publications

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand vectors calculus.
CO2	Understand the fundamental laws and concepts in electricity and magnetism and their applications.
CO3	Understand electric current and related concepts.
CO4	Understand dielectrics, resistors, capacitors, and inductors.
CO5	Understand the relativistic approach in electricity and magnetism.

B.SC. (HONS.) PHYSICS SEMESTER I
MAP-111
MATHEMATICS –I

Teaching Hours (per week): 4
Total Credits: 4
Credits:LTP:310
Total Hours: 60
Time: 3 Hours   **Maximum Marks: 100**
(Theory Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit) Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. The Section-A will consists of eight short answer type questions, each of 2.5 marks. Students are to attempt any six.
3. The Sections–B, C, D & E will consist of two questions each (each question should be subdivided into atmost two parts). Students are to attempt any four questions in total by selecting one question from each section. Each question carries 15 marks.
4. Teaching time for this paper would be six periods per week.

Course Objectives:

- To acquire the knowledge of Functions and Derivatives.
- To have an idea about the Taylor and Maclaurin formulas.
- To get familiar with the concept of definite integrals and matrices.

Course contents:

UNIT-I

Functions and Derivatives: Limit, continuity and derivative of a function, geometrical significance of derivative, successive differentiation, Leibnitz theorem, maxima and minima of a function of single variable, partial derivatives, total derivative, chain rule

UNIT-II

Differential Calculus: Rolle's theorem, mean value theorem, Taylor and Maclaurin formulas, Taylor series; concavity, point of inflexion, cusp point; asymptotes; graphs of standard planar curves in Cartesian coordinates.

UNIT-III

Anti derivatives: Indefinite integral as an anti derivative, method of substitution, partial fractions, integration by parts; reduction formulae; Definite integrals: Definite integral as a limit of a sum, geometrical interpretation; double and triple integrals, applications of multiple integrals to determine centre of gravity and moments of inertia.

UNIT-IV

Matrices: Orthogonal matrices, Hermitian matrices, Unitary matrices; Cayley Hamilton theorem and its applications; rank of a matrix, consistency of a system of linear equations, eigen values and eigenvectors, diagonalization of matrices.

Reference Books:

1. Differential Calculus: Shanti Narayan, New Delhi, Shyam Lal, 1983.
2. Integral Calculus: Shanti Narayan, Delhi, S. Chand, 1968.
3. Higher Engineering Mathematics: B.S. Grewal, Delhi, Khanna, 1995.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the concept of functions and derivatives.
CO2	Knowledge of differential calculus and its applications.
CO3	Apply methods to solve system of equations in matrices.

B.Sc. (Hons) Physics Semester-I
CHX 111
Organic Chemistry-I

Teaching Hours (per week): 3
Total Credits: 3
Credits:LTP:210
Total Hours: 45
Time: 3 Hours **Maximum Marks: 75**
(Theory Marks: 56+Internal Assessment: 19)
Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS AND CANDIDATES
(Scientific calculator is allowed)

I. Examiner will make five sections of paper namely Section-I, II, III, IV and V
II. Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
III. Section-I will consist of 8 short questions carrying 2 Mark each and student have to attempt any six parts.
IV. Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 11 Marks.
V. The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

COURSE OBJECTIVES:

The objective of Organic Chemistry-I course is to enhance the knowledge of students on the topics of Stereochemistry especially in reference to the OPTICAL ISOMERISM. The course is also targeted to increase the knowledge of students for the various methods of preparation and properties of Alkanes, Alkenes, Alkynes, arenes, aromaticity and Nucleophilic addition and Substitution reactions

COURSE CONTENTS:

UNIT-I   11Hrs

Stereochemistry: Molecular chirality, enantiomers/symmetry in achiaral structures, chiral centresin chiral molecules, properties of chiral molecules-optical activity, absolute and relative configuration, the Cahn-IngoldPerlog R-S notional system physical properties of enantiomers. Resolution of enantiomers.

UNIT-II   11Hrs

Chemistry alkanes and alkenes: Conformations of alkanes and cycloalkanes: conformational analysis of ethane and n-butane; conformational analysis of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivative. Difference between configuration and conformation. Stereochemistry of alkenes, naming stereo isometric alkenes by the E-Z system, Mechanism of hydrogenation of alkenes, stereochemistry of hydrogenation of alkenes, Dehydration of alcohols and regioselectivity of these reactions. Acid catalysed dehydration of alcohols with complete mechanistic discussion,

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   11Hrs

Nucleophilic substitution and addition reaction:

(a) Functional group transformation by nucleophilicsubstituion, mechanismof nucleophilic substitution (SN^1/SN^2), stereochemistry of SN^1/SN^2 reactions, steric effect in SN^2 reactions, nucleophiles and nucleophilicity, carbocation stability and the rate of substitution, by the SN^1 mechanism, stereochemistry of SN^1 reactions, carbocation rearrangements in SN^1 reactions, solvent effects, substitution and elimination as competing reactions.

(b) Principles of nucleophillic addition to carbonyl groups : Hydration acetal formation, cyanohydrin formation ; reactions with primary and secondary amines, Wittig reaction, steroselective addition to carbonyl groups mechanism of halogenation, aldol condensation

UNIT-IV   12Hrs

Arenes and Aromaticity

Nomenclature of benzene derivatives.The aryl group. Aromatic nucleus and side chain.Structureof benzene: Molecular formula and Kekule structure. Stability and carbon carbon bondlengths ofbenzene, resonance structure, MO picture. Aromaticity : the Huckel's rule, aromatic ions.Aromatic electrophilic substitution–general pattern of the mechanism, role of σ and π complexes.Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel Crafts reaction.Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/pararatio. Side chain reactions of benzene derivatives.

BOOKS PRESCRIBED

1.   R.T. Morison and R.N. Boyd, Organic Chemistry.
2.   I.L. Finar, Organic Chemistry, Vol. I IV ed.
3.   Advanced Organic Chemistry, Reactions Mechanisms and Structure by J. March.
4.   Schaum's Outlines Series Theory and Problems of Organic Chemistry by Herbert Meislick and Jacob Sharefkin
5.   Problems and their solution in Organic chemistry by I.L. Finar, Modern Organic Chemistry by J.D. Robbert and M.C. Caserio.
6.   Organic Chemistry by D.J. Cram and G.S. Hammond.
7.   J.E. Banks, Naming Organic Compounds – Programmed Introduction to Organic Chemistry.
8.   E.L. Eliel, Stereochemistry of carbon compounds.
9.   W. Camp, Organic Spectroscopy.
10.   F.A. Carey, Organic Chemistry.

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Learn about SN1, SN2 and SNi Mechanism and the related stereochemistry.
CO2	Understand the concept, principle and applications of UV, IR and NMR Spectroscopy and the problems pertaining to the structure elucidation of simple organic compounds.
CO3	Solve the elimination reaction problems
CO4	Distinguish between type of addition, elimination and substitution reaction.
CO5	Learn E and Z nomenclature ,Stereo chemical principal, enantiomeric relationship R and S

B.SC. (HONS.) PHYSICS SEMESTER I
BCEN-1123
SEMESTER – I
COMMUNICATIVE ENGLISH -I
B.Sc.(Hons.) Physics, Chemistry, Botany, Zoology, Maths and Computational Statistics and Data Analytics

Teaching Hours (per week): 5
Total Credits: 4
Credits:LTP:301

Time: 3 Hours   (Theory 60 Marks +Practical 15 Marks+ Internal Assessment 25 Marks)

Pass Marks: 35%

Instructions for the Paper Setter and Distribution of Marks:
The question paper will consist of four sections and the distribution of marks will be as under:
Section A: 12 Marks
Section B: 12 Marks
Section C: 18 Marks
Section D: 18 Marks

Section A
1. Fifteen (15) Questions on the usage of Preposition, Articles, and Change of Voice will be set. The students will be required to attempt any Twelve (12).

(12X1= 12 Marks)

Section B

2. ONE question (with sub parts) based on Skills and Strategies development exercises in Unit-1 and Unit-2 of the prescribed text book *Making Connections* will be set.

(1X12= 12marks)

Section C

3. Five short answer type questions from Unit 1 and 2 of *Making Connections : A Strategic Approach To Academic Reading* will be set. The students will be required to attempt any three.

(3X2= 06 marks)

4. Four Essay type question (Two from each unit) from Unit 1 and 2 of *Making Connections: A strategic Approach to Academic Reading* will be set. The students will be required to answer any two, choosing at least one from each unit.

(2X6= 12 marks)

Section D

5. A Comprehension questions of an unseen passage will be set.   (1X6 = 6 marks)

6. A question requiring the students to write a Paragraph on ONE of the TWO given topics.

(1X6 =6 marks)

7. A question requiring the students to write an Official/Business Letter on ONE of the TWO given Topics.

(1X6 = 6 marks)

Course Objectives:
I: To develop competence in written communication.
II: To inculcate innovative and critical thinking among the students.

III: To enable them to grasp the application of communication theories.

IV: To acquire the knowledge of latest technology related with communication skills.

V: To provide knowledge of multifarious opportunities in the field of this programme.

Course Contents:

1. Reading and Comprehension Skills:

(a) Reading tactics and strategies; Reading purposes–kinds of purposes and associated comprehension; Reading for direct meanings.

(b) The Students will be required to read and comprehend the essays in Unit 1 and 2 of the book *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Third Edition.

2. Writing Skills: Guidelines for effective writing; writing styles for paragraph and official/ business letter.

3. Grammar: Preposition, Articles, and Change of Voice.

Prescribed Books:
Making Connections by Kenneth J. Pakenham 3rd Edn. CUP

Recommended Books:
1. *Oxford Guide to Effective Writing and Speaking* by John Seely.
2. *The Written Word* by Vandana R Singh, Oxford University Press

Course Outcomes:
The completion of this course enables students to:

1. Identify common errors in language and rectify them.

2. Develop and expand writing skills through controlled and guided activities.

3. Develop coherence, cohesion and competence in written discourse through intelligible pronunciation.

4. Develop the ability to handle the interview process confidently and learn the subtle nuances of an effective group discourse.

5. Communicate contextually in specific and professional situations with courtesy.

PRACTICAL (Marks: 15)

Course Contents:-

1. Reading dialogues (5 Marks)
2. Rapid reading (5 Marks)
3. Project File (5 Marks)

B.SC. (HONS.) PHYSICS SEMESTER I
BHPB-1101
Compulsory Course
ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ

Credit & Marks Distribution, Eligibility and Pre-Requisites of the Course

Course title & Code	Total Teaching Hours	Total Credits/ Hours per week	Credit distribution			Total Marks 100		Time Allowed in Exam	Eligibility criteria	Pre-requisite of the course (if any)
			L	T	P	Theory	IA			
ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ BHPB-1101	60	4	4	0	0	75	25	3 Hours	Class 12th pass in any stream	Studied Punjabi up to 10th Standard

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective	ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)
▪ ਵਿਦਿਆਰਥੀਆਂ ਵਿਚ ਸਾਹਿਤਕ ਰੁਚੀਆਂ ਪੈਦਾ ਕਰਨਾ। ▪ ਆਲੋਚਨਾਤਮਕ ਰੁਚੀਆਂ ਵਿਕਸਤ ਕਰਨਾ। ▪ ਮਾਤ ਭਾਸ਼ਾ ਦੀ ਸਮਝ ਨੂੰ ਵਿਕਸਤ ਕਰਨਾ।	▪ ਉਸ ਵਿਚ ਸਾਹਿਤ ਰੁਚੀਆਂ ਵਿਕਸਤ ਹੋਣਗੀਆਂ। ▪ ਉਸ ਵਿਚ ਸਾਹਿਤ ਸਿਰਜਣਾ ਦੀ ਸੰਭਾਵਨਾ ਵਧੇਗੀ। ▪ ਉਸ ਵਿਚ ਕਿਸੇ ਦੀ ਕਿਸੇ ਦਾ ਗਹਿਨ ਅਧਿਐਨ ਕਰਨ ਦਾ ਬੋਧ ਹੋਵੇਗਾ। ▪ ਉਹ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੇ ਨਿਕਾਸ ਤੇ ਵਿਕਾਸ ਬਾਰੇ ਗਿਆਨ ਹਾਸਲ ਕਰਨਗੇ।

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ। ਪਹਿਲੇ ਭਾਗ ਵਿਚ 1.5-1.5 (ਡੇਢ-ਡੇਢ) ਅੰਕ ਦੇ ਅਤਿ-ਸੰਖੇਪ (Objective Type) 10 ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜੋ ਕਿ ਸਾਰੇ ਸਿਲੇਬਸ ਵਿੱਚੋਂ ਹੋਣਗੇ ਅਤੇ ਸਾਰੇ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਲਾਜ਼ਮੀ ਹੋਣਗੇ। ਸਿਲੇਬਸ ਦੇ ਬਾਕੀ ਚਾਰ ਭਾਗਾਂ ਵਿਚ 02-02 ਲੇਖ ਨੁਮਾ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰੇਕ ਭਾਗ ਵਿੱਚੋਂ 01-01 ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੋਵੇਗਾ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 15 ਅੰਕ ਹੋਣਗੇ। ਪੇਪਰ ਸੈਂਟਰ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।
ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 25 ਅੰਕਾਂ ਦੀ ਹੈ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ 75+25=100 ਹਨ।

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਸਾਹਿਤ ਦੇ ਰੰਗ, ਡਾ. ਮਹਿਲ ਸਿੰਘ (ਸੰਪਾ.), ਰਵੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
ਭਾਗ ਪਹਿਲਾ – ਕਵਿਤਾ ਅਤੇ ਕਹਾਣੀ, ਡਾ. ਮਹਿਲ ਸਿੰਘ ਅਤੇ ਡਾ. ਆਤਮ ਰੰਧਾਵਾ (ਸਹਿ ਸੰਪਾ.)
(ਕਵਿਤਾ ਭਾਗ ਵਿੱਚੋਂ ਪ੍ਰਸੰਗ ਸਹਿਤ ਵਿਆਖਿਆ/ਵਿਸ਼ਾ-ਵਸਤੂ। ਕਹਾਣੀ ਭਾਗ ਵਿੱਚੋਂ ਸਾਰ/ਵਿਸ਼ਾ-ਵਸਤੂ)

ਭਾਗ-ਦੂਜਾ

ਪੰਜਾਬ ਦੇ ਮਹਾਨ ਕਲਾਕਾਰ (ਸੰਪਾ. ਕਲਵੰਤ ਗਾਰਗੀ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।
(ਅੰਮ੍ਰਿਤਾ ਸ਼ੇਰਗਿੱਲ ਤੋਂ ਭਾਈ ਸਮੁੰਦ ਸਿੰਘ ਤਕ)
(ਵਿਸ਼ਾ-ਵਸਤੂ/ਸਾਰ/ਨਾਇਕ ਬਿੰਬ)

ਭਾਗ-ਤੀਜਾ

(ੳ) ਪੈਰ੍ਹਾ ਰਚਨਾ (ਤਿੰਨਾਂ ਵਿੱਚੋਂ ਇਕ)
(ਅ) ਪੈਰ੍ਹਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ

ਭਾਗ-ਦੂਜਾ

(ੳ) ਭਾਸ਼ਾ ਵੰਨਗੀਆਂ: ਭਾਸ਼ਾ ਦਾ ਟਕਸਾਲੀ ਰੂਪ, ਭਾਸ਼ਾ ਅਤੇ ਉਪ-ਭਾਸ਼ਾ ਵਿਚਲਾ ਅੰਤਰ, ਪੰਜਾਬੀ ਉਪ-ਭਾਸ਼ਾਵਾਂ ਦੇ ਪਛਾਣ-ਚਿੰਨ੍ਹ।

(ਅ) ਪੰਜਾਬੀ ਭਾਸ਼ਾ: ਨਿਕਾਸ ਤੇ ਵਿਕਾਸ।

B.SC. (HONS.) PHYSICS SEMESTER-I

BPBI-1102
Compulsory Course
ਮੁਢਲੀ ਪੰਜਾਬੀ
(In Lieu of Compulsory Punjabi)

Credit & Marks Distribution, Eligibility and Pre-Requisites of the Course

Course title &Code	Total Teaching Hours	Total Credits/ Hours per week	Credit distribution			Total Marks 100		Time Allowed in Exam	Eligibility criteria	Pre- requisite of the course (if any)
			L	T	P	Theory	IA			
ਮੁਢਲੀ ਪੰਜਾਬੀ BPBI-1102	60	4	4	0	0	75	25	3 Hours	Class 12th pass in any stream	NOT Studied Punjabi up to 10th Standard

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective	ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)
• ਵਿਦਿਆਰਥੀ ਨੂੰ ਗੁਰਮੁਖੀ ਲਿਪੀ ਤੋਂ ਜਾਣੂ ਕਰਾਉਣਾ। • ਵਿਦਿਆਰਥੀ ਨੂੰ ਬੁਨਿ ਪੰਜਾਬੀ ਪੜ੍ਹਨਾ-ਲਿਖਣਾ ਸਿਖਾਉਣਾ। • ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀਆਂ ਵਿਆਕਰਣਕ ਕਾਰੀਕੀਆਂ ਤੋਂ ਜਾਣੂ ਕਰਾਉਣਾ। • ਬੁਨਿ ਸੰਚਾਰ ਨੂੰ ਵਿਕਸਤ ਕਰਨਾ।	• ਵਿਦਿਆਰਥੀ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਤੇ ਗੁਰਮੁਖੀ ਲਿਪੀ ਦੀ ਸਿਖਲਾਈ ਵਿਚ ਮੁਹਾਰਤ ਹਾਸਲ ਕਰਨਗੇ। • ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਵਿਚ ਮੁਹਾਵਰੀ, ਲਗਾਂ-ਮਾਤਰਾਂ, ਸਬਦ ਅਤੇ ਵਿਆਕਰਨ ਅੱਖਰਾਂ ਦੀ ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ ਸੰਬੰਧੀ ਸਮਝ ਵਿਕਸਿਤ ਹੋਵੇਗੀ। • ਵਿਦਿਆਰਥੀ ਬੁਨਿ ਪੰਜਾਬੀ ਲਿਖਣ-ਪੜ੍ਹਨ ਦੇ ਸਮਰੱਥ ਹੋਣਗੇ। • ਉਹ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੇ ਬੁਨਿ ਰੂਪਾਂ ਦੀ ਜਾਣਕਾਰੀ ਹਾਸਲ ਕਰਨਗੇ।

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ। ਪਹਿਲੇ ਭਾਗ ਵਿਚ 01-01 ਅੰਕ ਦੇ ਅਤਿ-ਸੰਖੇਪ ਉੱਤਰ ਵਾਲੇ (Objective Type) 11 ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜੋ ਕਿ ਸਾਰੇ ਸਿਲੇਬਸ ਵਿੱਚੋਂ ਹੋਣਗੇ ਅਤੇ ਸਾਰੇ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਲਾਜ਼ਮੀ ਹੋਣਗੇ। ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਦੂਸਰੇ ਭਾਗ ਵਿਚ, ਸਿਲੇਬਸ ਦੇ ਪਹਿਲੇ ਭਾਗ ਵਿੱਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿਨ੍ਹਾਂ ਵਿੱਚੋਂ ਕੋਈ ਦੋ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 8-8 ਅੰਕ ਹੋਣਗੇ। ਇਸੇ ਤਰ੍ਹਾਂ ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਤੀਸਰੇ ਭਾਗ ਵਿਚ ਤਿੰਨ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜਿਨ੍ਹਾਂ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 8-8 ਅੰਕ ਹੋਣਗੇ। ਭਾਗ ਚੌਥੇ ਵਿਚ ਪੰਜ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿਨ੍ਹਾਂ ਵਿੱਚੋਂ ਚਾਰ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 4-4 ਅੰਕ ਹੋਣਗੇ। ਭਾਗ ਪੰਜਵੇਂ ਵਿਚ ਦਸ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿਨ੍ਹਾਂ ਵਿੱਚੋਂ 8 ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਲਾਜ਼ਮੀ ਹੋਣਗੇ। ਹਰ ਪ੍ਰਸ਼ਨ ਦੇ 2-2 ਅੰਕ ਹੋਣਗੇ।

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 25 ਅੰਕਾਂ ਦੀ ਹੈ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ 75+25=100 ਹਨ।

ਪਾਠ-ਕ੍ਰਮ
ਭਾਗ-ਪਹਿਲਾ

(ੳ) ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਤੇ ਗੁਰਮੁਖੀ ਲਿਪੀ:

ਨਾਮਕਰਣ ਤੇ ਸੰਖੇਪ ਜਾਣ-ਪਛਾਣ: ਗੁਰਮੁਖੀ ਵਰਣਮਾਲਾ, ਅੱਖਰ ਕ੍ਰਮ, ਸਵਰ ਵਾਹਕ (ੳ, ਅ, ੲ), ਲਗਾਂ-ਮਾਤਰਾਂ, ਪੈਰ ਵਿਚ ਬਿੰਦੀ ਵਾਲੇ ਵਰਨ, ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਨ, ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ

(ਅ) ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ

ਭਾਗ-ਦੂਜਾ

ਗੁਰਮੁਖੀ ਆਰਥੋਗਰਾਫੀ ਅਤੇ ਉਚਾਰਨ:

ਸਵਰ, ਵਿਅੰਜਨ: ਮੁਢਲੀ ਜਾਣ-ਪਛਾਣ ਅਤੇ ਉਚਾਰਨ, ਮੁਹਾਵਨੀ, ਲਗਾਂ-ਮਾਤਰਾਂ ਦੀ ਪਛਾਣ

ਭਾਗ-ਤੀਜਾ

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਜੋੜ: ਮੁਕਤਾ (ਦੋ ਅੱਖਰਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਤਿੰਨ ਅੱਖਰਾਂ ਵਾਲੇ ਸ਼ਬਦ), ਸਿਹਾਰੀ ਵਾਲੇ ਸ਼ਬਦ, ਬਿਹਾਰੀ ਵਾਲੇ ਸ਼ਬਦ, ਅੱਕੜ ਵਾਲੇ ਸ਼ਬਦ, ਦੁਲੈਂਕੜ ਵਾਲੇ ਸ਼ਬਦ, ਲਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਦੁਲਾਵਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਹੋੜੇ ਵਾਲੇ ਸ਼ਬਦ, ਕਨੌੜੇ ਵਾਲੇ ਸ਼ਬਦ, ਲਗਾਖਰ (ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ) ਵਾਲੇ ਸ਼ਬਦ

<div align="center">ਭਾਗ-ਚੌਥਾ</div>

ਸੁੱਧ-ਅਸ਼ੁੱਧ ਸ਼ਬਦ

B.SC. (HONS.) PHYSICS SEMESTER I
BPHC-1104
PUNJAB HISTORY & CULTURE (From Earliest Times to C 320 BC)

(Special Paper in lieu of Punjabi compulsory)
(For those students who are not domicile of Punjab)
B. A.; B.A. (SS); B. A. (Hons. – English); B. Com. (Hons., R, Ac. & Finance); B. Sc. /Bio-Tech./Comp. Sc./Eco./FD/Food Sc./IT/Med./N.Med.; B.Sc. (Hons. –Botany, Chemistry, Mathematics, Physics, Zoology); B. of Mult.; B. in Int. & Mob. Tech.; BBA;BCA;BJMC; B. Voc. (Software Development, Theatre and Stage Craft, Food Processing, Textile Design & Apparel Technology)

Teaching Hours (per week): 4
Total Credits: 4
Credits:LTP:400
Total Hours: 60
Time: 3 Hours   **Maximum Marks: 100**
(Theory Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

Instructions for the Paper Setters:

    Question paper should consist of two sections—Section A and Section B. The paper setter must ensure that questions in Section–A do not cover more than one point, and questions in Section–B should cover at least 50 per cent of the theme.

    Section–A: The examiner will set 15 objective type questions out of which the candidate shall attempt any 10 questions, each carrying 1½ marks. The total weightage of this section will be 15 marks. Answer to each question should be in approximately one to two sentences.

    Section–B: The examiner will set 8 questions, two from each Unit. The candidate will attempt 4 questions selecting one from each Unit in about 1000 words. Each question will carry 15 marks. The total weightage of this section will be 60 marks.

Note: **The examiner is to set the question paper in two languages: English & Hindi.**

Course Objectives: The main objective of this course is to educate the history and culture of the Ancient Punjab to the students who are not domicile of the Punjab. It aims to familiarize these students with the physical features of ancient Punjab and its impact on its history and culture. It also provides them information about the different sources to construct the history and culture of the ancient Punjab. The course intends to provide knowledge of social, economic, religious life of the Harappan civilization, Indo-Aryans, teachings and impact of Jainism and Buddhism in the Punjab.

Unit-I

1.   Physical features of the Punjab and impact on history.

2.   Sources of the ancient history of Punjab.

Unit-II

3.   Harappan Civilization: Town planning; social, economic and religious life of the Indus Valley People.

4.   The Indo-Aryans: Original home and settlement in Punjab.

Unit-III

5.   Social, Religious and Economic life during Rig Vedic Age.

6.   Social, Religious and Economic life during later Vedic Age.

Unit-IV

7.   Teachings and impact of Buddhism.

8.   Jainism in the Punjab.

Suggested Readings:-

L. Joshi (ed), *History and Culture of the Punjab*, Art-I, Patiala, 1989 (3rd edition)

L.M. Joshi and Fauja Singh (ed*), History of Punjab*, Vol. I, Patiala 1977.

Budha Parkash, *Glimpses of Ancient Punjab*, Patiala, 1983.

B.N. Sharma, *Life in Northern India*, Delhi. 1966.

Course Outcomes:

On Completing the Course, the Students will be able to :

CO-1 Learn the history and culture of the Ancient Punjab.
CO-2 Study the physical features of ancient Punjab.
CO-3 Understand about the sources of the history of the Punjab.
CO-4 Analyse the social, economic, religious life of the Harappan civilization and Vedic-Aryans.
CO-5 Learn the teachings and impact of Jainism and Buddhism in the Punjab.

B.SC. (HONS.) PHYSICS SEMESTER I
BHP-113
PHYSICS LAB-I

Teaching Hours (per week): 4
Total Credits: 2
Credits:LTP:002
Total Hours 60
Time: 3 Hours **Maximum Marks: 50**
(Max. Marks: 37+Internal Assessment: 13)
Pass Marks: 35%

General Guidelines for Practical Examination
I. The distribution of marks is as follows:
i) One experiment **15 Marks**
ii) Brief Theory **5 Marks**
iii) Viva–Voce **10Marks**
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.

Course Objectives: The purpose of the course isto understand the concept of moment of inertia, torque and angular acceleration with the help of fly wheel, conservation laws in elastic collision using one dimensional hanging spheres, modulus of rigidity, Young's modulus and Poisson's ratio.

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 toque 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.

Books Prescribed
1. Practical Physics Vol. I, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications.

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

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the concept of moment of inertia, torque and angular acceleration with the help of fly wheel.
CO2	Understand the conservation laws in elastic collision using one dimensional hanging sphere.
CO3	Determine modulus of rigidity of a wire
CO4	Determine Young's modulus of a beam.
CO5	Determine Poisson's ratio of rubber.

B.SC. (HONS.) PHYSICS SEMESTER I
BHP-114
PHYSICS LAB-II

Teaching Hours (per week): 4
Total Credits: 2
Credits:LTP:002
Total Hours 60

Time: 3 Hours   **Maximum Marks: 50**
(Max. Marks: 37+Internal Assessment: 13)
Pass Marks: 35%

General Guidelines for Practical Examination

I. The distribution of marks is as follows:

v) One experiment **15 Marks**

vi) Brief Theory **5 Marks**

vii) Viva–Voce **10Marks**

viii)   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.

Course Objectives: The purpose of the course is to understand the concept of charging and discharging of capacitor. It includes experiments to calculate low resistance with Carey Foster's Bridge and also to find out the capacitance and permittivity of a medium by de-Sauty's bridge.

LIST OF EXPERIMENTS

1. To determine low resistance with Carey-Foster's   Bridge.

2. To determine the resistance and specific resistance of a copper wire with the help of Kelvins double bridge.

3. To find the unknown capacitance of a capacitor by flashing and quenching of a neon lamp.

4. Measurement of capacitance, determination of permittivity of a medium air and relative permittivity by de-Sauty's bridge.

5. To study the variation in resistance of filament of a bulb with temperature.

6. To study the flow of water through a capillary tube as a function of pressure head using two tubes of same length but different radii.

7. To study the flow of water through a capillary tube as a function of pressure head using two tubes of different length but of same radii.

Books Prescribed

1. Practical Physics Vol. I, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications.

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

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Find out unknown capacitance.
CO2	Find out specific resistance of wire
CO3	To study the filament resistance.
CO4	Find out low resistance with Carey Foster's Bridge.
CO5	Find out the capacitance and permittivity of a medium by de-Sauty's bridge.

B.SC. (HONS.) PHYSICS SEMESTER I
CHP-112
Organic Chemistry Lab-I

Teaching Hours (per week): 2
Total Credits: 1
Credits:LTP:001
Total Hours 30
Time: 3 Hours   **Maximum Marks: 25**
(Max. Marks: 19+Internal Assessment: 06)
Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS AND CANDIDATES:
I. Examiner will give one organic salt to the students.
II. Each student will get different salt and analyse it for elements, functional group and prepare its derivatives.
III. The question paper will be 19 marks with split as under:
       (Write up = 6, Performance = 6, Viva-voce = 5, Practical note book = 2)

COURSE OBJECTIVES:
In organic chemistry practical students will learn about the Evaluation of organic compounds for the detection of element, functional group and preparation of their derivatives. It includes following functional groups:Acids, ketones, aldehyde, carbohydrates, aromatic hydrocarbons, aromatic amines and phenols.

COURSE CONTENTS:

The preliminary examination of physical and chemical characteristics (physical state, colour, odour 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 analyzed.
-phenols, carboxylic acids
-carbonyl compounds - ketones, aldehydes
-carbohydrates
-aromatic amines
-aromatic hydrocarbons

BOOKS PRESCRIBED:
Practical Organic Chemistry by F.G. Mann and B.C. Saunders

COURSE OUTCOMES:

S. No.	On completing the course, the outcomes
CO1	Performed functional group analysis
CO2	Preparation of derivatives of organic compounds
CO3	Determination of physical constant: Melting point, Boiling point.
CO4	Different separation techniques.
CO5	How to perform TLC

B.Sc. (HONS.) PHYSICS SEMESTER–I
Course Code: ZDA111
Course Title- Drug Abuse: Problem, Management and Prevention
PROBLEM OF DRUG ABUSE
(Compulsory for all Under Graduate Classes)

Teaching Hours (per week): 2
Total Hours 30
Time: 3 Hours
Maximum Marks: 50
Pass Marks: 35%

Instructions for the Paper Setters:
1) There will be a total of 9 questions of which 5 are to be attempted.
2) Question 1 is compulsory and having 10 short answer type questions (1 mark each).
3) The remaining 8 questions (10 marks each) shall include 2 questions from each unit. Candidates shall be required to attempt 4 questions, one from each unit. Preferably, the question should not be split into more than two sub-parts.

Course Objectives- The course aims to:

CO-1.	Generate the awareness against drug abuse.
CO-2.	Describe a variety of models and theories of addiction and other problems related to substance abuse.
CO-3.	Describe the behavioral, psychological, physical health and social impact of psychoactive substances.
CO-4.	Provide culturally relevant formal and informal education programs that raise awareness and support for substance abuse prevention and the recovery process.
CO-5.	Describe factors that increase likelihood for an individual, community or group to be at risk of substance use disorders.

UNIT-I

- **Meaning of Drug Abuse**

Meaning of Drug Abuse

Nature and extent of drug abuse: state and national scenario

UNIT-II
- **Consequences of Drug Abuse for**
  Individual: Education, Employment, Income.
  Family   : Violence.
  Society   : Crime.
  Nation   : Law and Order problem.

UNIT-III
- **Management of Drug Abuse**
  Medical Management: Medication for treatment of different types of drug abuses.
  Medication to reduce withdrawal effects.

UNIT-IV
- Psychiatric Management: Counseling, Behavioral and Cognitive therapy.

- Social Management: Family, Group therapy and Environmental Intervention.

References:

1. Ahuja, Ram (2003), Social Problems in India, Rawat Publication, Jaipur.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. The Drug Crime Connection. Beverly Hills: Sage Publications. 23
4. Jasjit Kaur Randhawa & Samreet Randhawa, "Drug Abuse-Problem, Management & Prevention", KLS, ISBN No. 978-81-936570-6-5, (2018).
5. Jasjit Kaur Randhawa & Samreet Randhawa, "Drug Abuse Problem, Management & Prevention", KLS, ISBN No. 978-81-936570-8-9, (2019).
6. Jasjit Kaur Randhawa & Samreet Randhawa, "voZrI d[otos'A^(BPky'oh) ;wZf;nk, gqpzXB ns/o'eEkw", KLS, ISBN No. 978-81-936570-7-1, (2018).
7. Jasjit Kaur Randhawa, "Drug Abuse -Management & Prevention", KLS, ISBN No. 978-93-81278-80-2, (2018).
8. Kapoor. T. (1985) Drug epidemic among Indian Youth, New Delhi: Mittal Pub.
9. Modi, Ishwar and Modi, Shalini (1997) Drugs: Addiction and Prevention, Jaipur: Rawat Publication.
10. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
11. Rama Gandotra & Jasjit Kaur Randhawa, "voZrI d[otos'A^(BPky'oh) gqpzXB ns/ o'eEkw", KLS, ISBN No. 978-93-81278-87-1, (2018).
12. Sain, Bhim 1991, Drug Addiction Alcoholism, Smoking obscenity New Delhi: Mittal Publications.
13. Sandhu, Ranvinder Singh, 2009, Drug Addiction in Punjab: A Sociological Study. Amritsar. Guru Nanak Dev University.
14. Singh, C. P. 2000. Alcohol and Dependence among Industrial Workers: Delhi: Shipra.
15. Sussman, S and Ames, S.L. (2008). Drug Abuse: Concepts, Prevention and Cessation, Cambridge University Press.
16. World Drug Report 2010, United Nations office of Drug and Crime.
17. World Drug Report 2011, United Nations office of Drug and Crime.

Course Outcomes:

The students will be able:

CO-1.	To describe issues of cultural identity, ethnic background, age and gender in prevention, treatment and recovery.
CO-2.	To describe warning sign, symptoms, and the course of substance use disorders.
CO-3.	To describe principles and philosophy of prevention, treatment and recovery.
CO-4.	To describe current and evidenced-based approaches practiced in the field of drug addiction.

B.Sc. (HONS.) PHYSICS SEMESTER–II
BHP-121
ELECTRICITY & MAGNETISM-II

Teaching Hours (per week): 4
Total Credits: 4
Credits:LTP:310
Total Hours: 60
Maximum Marks: 100
(Theory Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

Time: 3 Hours

Note for paper setter and students:
1. **There will be five sections.**
2. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The candidate will have to attempt any 6 questions in this section.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections. Each question in these sections should not have more than two subparts.**
4. **Non-Programmable Scientific calculator is allowed.**

Course Objectives: Objectives of this course are to understand the magnetic effects of electric current. To understand magnetic properties of matter. To understand the concept of diamagnetism, paramagnetism and ferromagnetism. To understand the concept and applications of electromagnetic induction. To understand science and applications of electromagnetic waves.

Course Contents:

UNIT-I

Magnetic Effect of Electric Current; Direction of Field Lines due to current Flowing in a straight Conductor; Magnetic Field Density; Magnitude of Magnetic Flux; Magnetic and Lorentz Forces; Biot-Savart's Law; Magnetic Field Due to along Straight Conductor; Magnetic Field Intensity at point on the axis of a current loop; Variation of Field along the axis of the coil; Magnetic Field intensity inside a long Solenoid; Definition of Ampere; Ampere's Circuital Law; **Ampere's law and shape of path**; **Generalised form of Ampere's law**; Applications of Ampere's Circuital Law; **Comparison between Gauss's law and Ampere's law**; Solenoid Nature of Vector Field; Diversion of magnetic field; Properties of the Magnetic Field; **Magnetic scalar and Vector Potentials; expression for magnetic vector potential**; Surface Current Density; Changes in Magnetic Field at a current Sheet; Hall Effect,; Comparison of Electrostatic Field and Magnetic Field.

UNIT-II

Some Important Terms associated with Magnetic Materials; Torque on current Loop; Magnetic Dipole in a Magnetic Field; Potential Energy of Magnetic Dipole; Force on Magnetic Dipole In

Non-Uniform Magnetic Field; Magnetic Dipole Moment of an Atom; Expression of orbital Magnetic dipole moment of Electron; Electron Spin Magnetic Moment; Free and Bound Currents; Uniformly and Non Uniformly Magnetised **Materials**; Diamagnetism; Langevin's theory of diamagnetic behaviour; Paramagnetism and Langevin's Theory of Paramagnetic Susceptibility; Ferromagnetism; Domain theory of Magnetism; Hystersis Curve; Energy Loss Due to Hystersis and its Importance; **applications of hysteresis loop**; **current advances in magnetic materials.**

UNIT-III

Electromagnetic Induction; Faraday's Induction Experiments; Faraday's Laws of Electromagnetic Induction (Integral And Differential Forms); Lenz's law; **method of generating induced emf; mechanism of induced emf**; Self Induction; Neumann's Formula; Self Inductance of a Solenoid and a Torodial; Mutual Induction; Expression for Coefficient of Mutual Induction and Reciprocity theorem; Mutual Inductance of **two coils**, two **coaxial** Solenoids; 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

Mechanical waves versus electromagnetic waves; Production of em waves, **EM wave spectrum, Linear, isotropic and homogenous dielectric medium**; **conducting and dielectric media**; **differential equations for electromagnetic waves**; Nature of em waves; **velocity of electromagnetic waves in vacuum**; EM wave equation for a medium having finite μ and ε but $\sigma = 0$; Wave equation for plane polarized em waves and their solutions; Relation between electric and magnetic field of an em wave; **electromagnetic wave propagation in a dielectric medium**; Impedence 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; **current advances in em waves**.

TUTORIAL: Relevant problem on the topics covered in the course.

Books Prescribed

1. Electricity & Magnetism-T.S. Bhatia and Gurpreet Singh, Vishal Publishing Co.
2. Waves and Vibrations, T.S. Bhatia, Vishal Publishing Co.
3. Field & wave Electromagnetics by David & Cheng, Addison Wesley Publishing co
4. Electricity & Magnetism- A.K. Sikri, Pradeep Publications

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the magnetic effects of electric current.
CO2	Understand magnetic properties of matter.
CO3	Understand diamagnetism, paramagnetism and ferromagnetism.
CO4	Understand the concept and applications of electromagnetic induction.
CO5	Understand electromagnetic waves.

B.Sc. (HONS.) PHYSICS SEMESTER–II
BHP-122
WAVES & OSCILLATIONS

Teaching Hours (per week): 4
Total Credits: 4
Credits:LTP:310
Total Hours: 60
Time: 3 Hours   **Maximum Marks: 100**
(Theory Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

Note for paper setter and students:
1. **There will be five sections.**
2. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The candidate will have to attempt any 6 questions in this section.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections. Each question in these sections should not have more than two subparts.**
4. **Non-Programmable Scientific calculator is allowed.**

Course Objectives: The purpose of the course is to understand the physical characteristics of SHM and obtaining solution of the oscillator using differential equations, to calculate logarithmic decrement relaxation time and quality factor of a harmonic oscillator. This course provides information to understand the difference between simple harmonic vibrations of same frequencies and different frequencies, wave equation and to understand the significance of transverse waves and longitudinal waves, coupled mechanical as well as electrical oscillators.

Course Contents:
UNIT-I

Simple and Damped Oscillations: Simple Harmonic Motion, **Differential equation of SHM**, **Graphical representation of SHM,** Energy of SHM, Compound pendulum, Torsional pendulum, 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 displacement, 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, 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.

TUTORIAL: Relevant problem on the topics covered in the course.

Books Prescribed

1. Waves and Vibrations, T.S. Bhatia, Vishal Publishing Co.
2. The Physics of Vibrations and Waves- H.J. Pain, **John Wiley and Sons Ltd , University of Chichester, 2005.**
3. **Waves and Oscillations – N. Subrahmanyam and Brij Lal, Vikas Publishing House Pvt. Ltd, 2013**

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the physical characteristics of SHM and obtaining solution of the oscillator using differential equations.
CO2	Calculate logarithmic decrement relaxation time and quality factor of a harmonic oscillator.
CO3	Understand the difference between simple harmonic vibrations of same frequencies and different frequencies.
CO4	Solve wave equation and to understand the significance of transverse waves and longitudinal waves.
CO5	Explain the concept of coupled mechanical as well as electrical oscillators.

B.Sc. (HONS.) PHYSICS SEMESTER–II
MAP-121
MATHEMATICS –II

Teaching Hours (per week): 4
Total Credits: 4
Credits:LTP:310
Total Hours 60
Time: 3 Hours   **Maximum Marks: 100**
(Max. Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS

2. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit) Section–B, C, D and E from Unit-I, II, III and IV, respectively.

3. The Section-A will consists of eight short answer type questions, each of 2.5 marks. Students are to attempt any six.

4. The Sections–B, C, D & E will consist of two questions each (each question should be sudivided into atmost two parts). Students are to attempt any four questions in total by selecting one question from each section. Each question carries 15 marks.

5. Teaching time for this paper would be six periods per week.

Course contents:

COURSE OBJECTIVES:
- To acquire the knowledge of two dimensional geometry.
- To have an idea about the Solid geometry and its applications.
- To perceive knowledge about Polynomial equations.

UNIT-I

Coordinates Geometry(2D):Transformation of axes, shifting of origin, Rotation of axes, Parabola, Ellipse, Hyperbola and their properties; Tangent and normal, pair of tangents, Chord of contact for all the conics; Identifications of curves represented by second degree equation (without derivation)

UNIT-II

Solid Geometry:Straight line and planes in Intersection of two and three planes, Intersection of a line and plane; Sphere, Section of a sphere by a plane, Intersection of a line and sphere, Intersection of two spheres; Right circular Cone, Right circular Cylinder, Tangent lines, Tangent planes, and normal lines to these surfaces.

UNIT-III

Polynomial equations: Relation between the roots and co-efficients of polynomial equations (in one variable), Horner's method, Transformation of equations and symmetric functions of roots, Descartes rule of signs, Newton's method of divisors, Cardon's method, Solutions of biquadratic polynomial equations by Descartes and Ferrari's methods.

UNIT-IV

Introduction to Groups: Binary operations, Groups, Subgroups, Group table, Algebraic property, some standard algebraic properties (without proofs), Use of closure property, addition, identity and inverse with applications

Reference Books:

1. Narayan, S.: Coordinate Geometry, Sultan Chand & Sons (2005).

2. Narayan, S.: Analytical Solid Geometry, Sultan Chand & Sons (2005).

3. Higher Engineering Mathematics: B.S. Grewal, Delhi, Khanna, 1995.

4. Mohan Singh, Topics in Maths, Lakshmi Publication, New Delhi, (1997)

5. N. S. Gopalakrishnan.: University Algebra, New Age International Publishers. (2007)

COURSE OUTCOMES: On completing the course students will be able to:

1. Understand the concept of axes.

2. Knowledge of parabola and its applications.

3. Implement knowledge of binary opeartions of groups.

B.Sc. (HONS.) PHYSICS SEMESTER–II
CHX 121

Inorganic Chemistry-II

Teaching Hours (per week): 3
Total Credits: 3
Credits:LTP:210
Total Hours: 45
Time: 3 Hours   **Maximum Marks: 75**
(Theory Marks: 56+Internal Assessment: 19)
Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS AND CANDIDATES

(Scientific calculator is allowed)

I.   Examiner will make five sections of paper namely Section-I, II, III, IV and V
II.   Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
III.   Section-I will consist of 8 short questions carrying 2 Mark each and student have to attempt any six parts.
IV.   Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 11 Marks.
V.   The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

COURSE OBJECTIVES:

Students will learn naming of coordination complexes, Factors affecting co-ordination numbers and stereo-chemistry. The objective of the course is to teach the various theories dealing with the bonding in co-ordination compounds like VBT theory, CFT and MOT theory applied to homoneuclear diatomic molecules and heteronuclear Diatomic molecules.charge transfer transitions, π-Acid Ligands, and Alkali metal and alkaline earth metal chelators

COURSE CONTENTS:

UNIT-I   11Hrs

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,

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.

<div align="center">UNIT-II   11Hrs</div>

Crystal field theory: Splitting of d-orbitals in octahedral, tetrahedral. Pairing Energy, 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 and Hydration energies.

<div align="center">UNIT-III   11Hrs</div>

Electronic spectra, Beer Lambert Law, Angular Momentum of electron spectra, Total angular momentum, Microstates and spectroscopic terms, a calculation of spectroscopic terms for, electronic configurations, L S coupling, Hund's rule for finding the ground state terms, Electronic spectral properties of Ist transition series, Orgel Diagrams for d^1 - d^{10} systems, for weak field octahedral and tetrahedral complexes, limitations of C.F.T

<div align="center">UNIT-IV   12Hrs</div>

Alkali metal and alkaline earth metal chelators: Macrocyclic ligands, macrocyclic effect, crownethers 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.

BOOKS PRESCRIBED:

1.	J.E. Huheey, Inorganic Chemistry, 3rd Ed.
2.	F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry.

3.	B.E. Douglas and D.H. McDaniel, Concepts and Models of Inorganic Chemistry.

4.	R. Hilgenfeld and W. Saengar, Topics in current chemistry Vol-II.

COURSE OUTCOMES:

Sr. No.	On completing the course,
CO1	Students learned about the coordination compounds, theory, their nature of bonding,
CO2	Students gained knowledge to apply ligand field theory CFT on simple molecules.
CO3	able to learned about Molecular orbital theory
CO4	Learned about VSEPR theory, VBT
CO5	HSAB principle, Orgel Diagram, Macrocyclic ligands

B.Sc. (HONS.) PHYSICS SEMESTER–II
BCEN-1223
SEMESTER – II
COMMUNICATIVE ENGLISH-II
B.Sc.(Hons.) Physics, Chemistry, Botany, Zoology, Maths and Computational Statistics and Data Analytics

Teaching Hours (per week): 5
Total Credits: 4
Credits:LTP:301

Time: 3 Hours   (Theory 60 Marks +Practical 15 Marks+ Internal Assessment 25 Marks)

Pass Marks: 35%

Instructions for the Paper Setter and Distribution of Marks:
The question paper will consist of four sections and the distribution of marks will be as under:
Section A: 12 Marks
Section B: 12 Marks
Section C: 18 Marks
Section D: 18 Marks

Section A

1. Fifteen (15) Questions on the usage of Tenses, Conjunctions, and Subject-Verb Agreement will be set. The students will be required to attempt any Twelve (12).

(12X1= 12 Marks)

Section B

2. ONE question (with sub parts) based on Skills and Strategies development exercises in Unit-3 and Unit-4 of the prescribed text book *Making Connections* will be set.

(1X12= 12marks)

Section C

3. Five short answer type questions from Unit 3 and 4 of *Making Connections : A Strategic Approach To Academic Reading* will be set. The students will be required to attempt any three.

(3X2= 06 marks)

4. Four Essay type question (Two from each unit) from Unit 3 and 4 of *Making Connections: A strategic Approach to Academic Reading* will be set. The students will be required to answer any two, choosing at least one from each unit.

(2X6= 12 marks)

Section D

5. Transcoding (given dialogue to prose or given prose to dialogue).

(1X6= 6 Marks)

6. Taking notes on a speech/lecture/telephonic conversations.

(1X6= 6 Marks)

7. Translation from Vernacular (Punjabi/ Hindi) to English (Isolated Sentences)

(1X6= 6 Marks)

Course Objectives:

I: To develop competence in oral and visual communication.

II: To inculcate innovative and critical thinking among the students.

III: To enable them to grasp the application of communication theories.

IV: To acquire the knowledge of latest technology related with communication skills.

V: To provide knowledge of multifarious opportunities in the field of this programme.

Course Contents:

1. Reading and Comprehension Skills:

Students will be required to read and comprehend the essays in Unit 3 and 4 of the book *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Third Edition.

2. Speaking and Conversational Skills: Components of a meaningful and easy conversation; understanding the cue and making appropriate responses; asking and providing information on general topics, situation based Conversation in English.

3. Grammar: Tenses, Conjunctions, and Subject-Verb Agreement.

Prescribed Books:

Making Connections by Kenneth J. Pakenham 3rd Edn. CUP

Recommended Books:
   1. *Oxford Guide to Effective Writing and Speaking* by John Seely.
   2. *The Written Word* by Vandana R Singh, Oxford University Press

Course Outcomes:

The completion of this course enables students to:

1. Identify common errors in language and rectify them.

2. Develop and expand writing skills through controlled and guided activities.

3. Develop coherence, cohesion and competence in oral discourse through intelligible pronunciation.

4. Develop the ability to handle the interview process confidently and learn the subtle nuances of an effective group discourse.

5. Communicate contextually in specific and professional situations with courtesy.

PRACTICAL (Marks: 15)

Course Contents:-

 1. Oral Presentation. (5 Marks)

2. Group Discussion. (5 Marks)

3. Mock Interview (5 Marks)

B.Sc. (HONS.) PHYSICS SEMESTER–II
BHPB-1201
Compulsory Course
ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ

Credit & Marks Distribution, Eligibility and Pre-Requisites of the Course

Course title & Code	Total Teaching Hours	Total Credits/ Hours per week	Credit distribution			Total Marks 100		Time Allowed in Exam
			L	T	P	Theory	IA	
ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ BHPB-1201	60	4	4	0	0	75	25	3 Hours

▪ **ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective**	▪ **ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)**
▪ ਵਿਦਿਆਰਥੀਆਂ ਵਿਚ ਸਾਹਿਤਕ ਰੁਚੀਆਂ ਪੈਦਾ ਕਰਨਾ। ▪ ਆਲੋਚਨਾਤਮਕ ਰੁਚੀਆਂ ਨੂੰ ਵਿਕਸਤ ਕਰਨਾ। ▪ ਵਿਦਿਆਰਥੀ ਨੂੰ ਦਫ਼ਤਰੀ ਅਤੇ ਘਰੇਲੂ ਚਿੱਠੀ ਪੱਤਰ ਤੋਂ ਜਾਣੂ ਕਰਵਾਉਣਾ। ▪ ਭਾਸ਼ਾਈ ਗਿਆਨ ਵਿਚ ਵਾਧਾ ਕਰਨਾ।	▪ ▪ ਉਸ ਅੰਦਰ ਸਾਹਿਤਕ ਰੁਚੀਆਂ ਪ੍ਰਫੁਲਿਤ ਹੋਣਗੀਆਂ। ▪ ਉਸ ਅੰਦਰ ਸਾਹਿਤ ਸਿਰਜਣਾ ਦੀ ਸੰਭਾਵਨਾ ਵਧੇਗੀ। ▪ ਵਿਦਿਆਰਥੀ ਚਿੱਠੀ-ਪੱਤਰ ਦੀ ਲਿਖਣ ਸ਼ੈਲੀ ਤੋਂ ਜਾਣੂ ਹੋਵੇਗਾ। ▪ ਉਹ ਭਾਸ਼ਾਈ ਬਣਤਰ ਤੋਂ ਜਾਣੂ ਹੋਵੇਗਾ।

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ। ਪਹਿਲੇ ਭਾਗ ਵਿਚ 1.5-1.5 (ਡੇਢ-ਡੇਢ) ਅੰਕ ਦੇ ਅਤਿ-ਸੰਖੇਪ (Objective Type) 10 ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜੋ ਕਿ ਸਾਰੇ ਸਿਲੇਬਸ ਵਿਚੋਂ ਹੋਣਗੇ ਅਤੇ ਸਾਰੇ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਲਾਜ਼ਮੀ ਹੋਣਗੇ। ਸਿਲੇਬਸ ਦੇ ਬਾਕੀ ਚਾਰ ਭਾਗਾਂ ਵਿਚ 02-02 ਲੇਖ ਨੁਮਾ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰੇਕ ਭਾਗ ਵਿਚੋਂ 01-01 ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੋਵੇਗਾ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 15 ਅੰਕ ਹੋਣਗੇ। ਪੇਪਰ ਸੈੱਟਰ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 25 ਅੰਕਾਂ ਦੀ ਹੈ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ 75+25=100 ਹਨ।

ਪਾਠ-ਕ੍ਰਮ
ਭਾਗ-ਪਹਿਲਾ

ਸਾਹਿਤ ਦੇ ਰੰਗ, ਡਾ. ਮਹਿਲ ਸਿੰਘ (ਸੰਪਾ.), ਰਵੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
ਭਾਗ ਦੂਜਾ – ਵਾਰਤਕ ਅਤੇ ਰੇਖਾ-ਚਿੱਤਰ, ਡਾ. ਪਰਮਿੰਦਰ ਸਿੰਘ, ਡਾ. ਭੁਪਿੰਦਰ ਸਿੰਘ ਅਤੇ ਡਾ.ਕੁਲਦੀਪ ਸਿੰਘ ਢਿੱਲੋਂ (ਸਹਿ ਸੰਪਾ.)
(ਵਾਰਤਕ ਭਾਗ ਵਿਚੋਂ ਸਾਰ/ਵਿਸ਼ਾ-ਵਸਤੂ। ਰੇਖਾ-ਚਿੱਤਰ **ਭਾਗ ਵਿਚੋਂ ਸਾਰ/ਨਾਇਕ ਬਿੰਬ)**

ਭਾਗ–ਦੂਜਾ

ਪੰਜਾਬ ਦੇ ਮਹਾਨ ਕਲਾਕਾਰ (ਸੰਪਾ. ਬਲਵੰਤ ਗਾਰਗੀ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।
(ਸਤੀਸ਼ ਗੁਜਰਾਲ ਤੋਂ ਸੁਰਿੰਦਰ ਕੌਰ ਤਕ)

(ਵਿਸ਼ਾ-ਵਸਤੂ/ਸਾਰ/ਨਾਇਕ ਬਿੰਬ)   ਭਾਗ-ਤੀਜਾ

(a) ਦਫ਼ਤਰੀ ਚਿੱਠੀ ਪੱਤਰ
(A) ਮੁਹਾਵਰੇ ਅਤੇ ਅਖਾਣ
                                              ਭਾਗ-ਚੌਥਾ

(a) ਸ਼ਬਦ-ਬਣਤਰ ਅਤੇ ਸ਼ਬਦ-ਰਚਨਾ – ਪਰਿਭਾਸ਼ਾ ਅਤੇ ਮੁਢਲੇ ਸੰਕਲਪ
(A) ਸ਼ਬਦ-ਸ਼੍ਰੇਣੀਆਂ

B.Sc. (HONS.) PHYSICS SEMESTER–II
BPBI-1202
Compulsory Course
muFll pMjwbl
(In Lieu of Compulsory Punjabi)

Credit & Marks Distribution, Eligibility and Pre-Requisites of the Course

Course title & Code	Total Teaching Hours	Total Credits/ Hours per week	Credit distribution			Total Marks 100		Time Allowed in Exam
			L	T	P	Theory	IA	
muFll pMjwbl BPBI-1202	60	4	4	0	0	75	25	3 Hours

▪ ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective	▪ ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)
▪ ਵਿਦਿਆਰਥੀ ਅੰਦਰ ਸ਼ਬਦ ਬਣਤਰ ਦੀ ਸਮਝ ਵਿਕਸਤ ਕਰਨਾ। ▪ ਵਿਦਿਆਰਥੀ ਨੂੰ ਸ਼ਬਦ ਪ੍ਰਕਾਰ ਬਾਰੇ ਜਾਣਕਾਰੀ ਪ੍ਰਦਾਨ ਕਰਨਾ। ▪ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੇ ਵਿਆਕਰਨਕ ਪ੍ਰਬੰਧ ਸੰਬੰਧੀ ਗਿਆਨ ਕਰਾਉਣਾ। ▪ ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ ਦੁਆਰਾ ਪੰਜਾਬੀ ਸ਼ਬਦ ਭੰਡਾਰ ਵਧਾਉਣਾ।	▪ ਉਹ ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ ਦੀ ਜਾਣਕਾਰੀ ਹਾਸਲ ਕਰਕੇ ਭਾਸ਼ਾਈ ਗਿਆਨ ਨੂੰ ਵਿਕਸਿਤ ਕਰਨਗੇ। ▪ ਪੰਜਾਬੀ ਸ਼ਬਦ-ਰਚਨਾ ਸੰਬੰਧੀ ਮੁਹਾਰਤ ਹਾਸਲ ਕਰਨਗੇ। ▪ ਵਿਦਿਆਰਥੀ ਸ਼ਬਦਾਂ ਦੀਆਂ ਭਿੰਨ-ਭਿੰਨ ਕਿਸਮਾਂ ਤੋਂ ਜਾਣੂ ਹੋਵੇਗਾ। ▪ ਵਿਦਿਆਰਥੀਆਂ 'ਚ ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ ਭੰਡਾਰ 'ਚ ਵਾਧਾ ਹੋਵੇਗਾ।

▪ **ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ**

▪ ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ। ਪਹਿਲੇ ਭਾਗ ਵਿਚ 01-01 ਅੰਕ ਦੇ ਅਤਿ-ਸੰਖੇਪ ਉੱਤਰ ਵਾਲੇ (ਬਜਾਇਚਟਵਿਇ ਠਪਐ) 11 ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜੋ ਕਿ ਸਾਰੇ ਸਿਲੇਬਸ ਵਿਚੋਂ ਹੋਣਗੇ ਅਤੇ ਸਾਰੇ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਲਾਜ਼ਮੀ ਹੋਣਗੇ। ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਦੂਸਰੇ ਭਾਗ ਵਿਚ, ਸਿਲੇਬਸ ਦੇ ਪਹਿਲੇ ਭਾਗ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿੰਨ੍ਹਾਂ ਵਿਚੋਂ ਕੋਈ ਦੋ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 8-8 ਅੰਕ ਹੋਣਗੇ। ਇਸੇ ਤਰ੍ਹਾਂ ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਤੀਸਰੇ ਭਾਗ ਵਿਚ ਤਿੰਨ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜਿੰਨ੍ਹਾਂ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 8-8 ਅੰਕ ਹੋਣਗੇ। ਭਾਗ ਚੌਥੇ ਵਿਚ ਪੰਜ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿੰਨ੍ਹਾਂ ਵਿਚੋਂ ਚਾਰ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 4-4 ਅੰਕ ਹੋਣਗੇ। ਭਾਗ ਪੰਜਵੇਂ ਵਿਚ ਤਿੰਨ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿੰਨ੍ਹਾਂ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਲਾਜ਼ਮੀ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 8-8 ਅੰਕ ਹੋਣਗੇ।

▪ ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 25 ਅੰਕਾਂ ਦੀ ਹੈ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ 75+25=100 ਹਨ।

ਪਾਠ-ਕ੍ਰਮ ਭਾਗ-ਪਹਿਲਾ

▪ ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ:
▪ ਧਾਤੂ, ਵਧੇਤਰ (ਅਗੇਤਰ, ਮਧੇਤਰ, ਪਿਛੇਤਰ), ਪੰਜਾਬੀ ਕੋਸ਼ਗਤ ਸ਼ਬਦ ਅਤੇ ਵਿਆਕਰਨਕ ਸ਼ਬਦ

ਭਾਗ-ਦੂਜਾ

▪ ਪੰਜਾਬੀ ਸ਼ਬਦ-ਪ੍ਰਕਾਰ:
▪ ਸੰਯੁਕਤ ਸ਼ਬਦ, ਸਮਾਸੀ ਸ਼ਬਦ, ਦੋਜਾਤੀ ਸ਼ਬਦ, ਦੋਹਰੇ/ਦੁਹਰੁਕਤੀ ਸ਼ਬਦ ਅਤੇ ਮਿਸ਼ਰਤ ਸ਼ਬਦ
▪ (ਅ) ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ

- ਭਾਗ-ਤੀਜਾ

- ਪੰਜਾਬੀ ਸ਼ਬਦ-ਰਚਨਾ:
- ਇਕ-ਵਚਨ/ਬਹੁ-ਵਚਨ, ਲਿੰਗ-ਪੁਲਿੰਗ, ਬਹੁਅਰਥਕ ਸ਼ਬਦ, ਸਮਾਨਅਰਥਕ ਸ਼ਬਦ, ਬਹੁਤੇ ਸ਼ਬਦਾਂ ਲਈ ਇਕ ਸ਼ਬਦ, ਸ਼ਬਦ ਜੁੱਟ, ਵਿਰੋਧਅਰਥਕ ਸ਼ਬਦ, ਸਮਨਾਮੀ ਸ਼ਬਦ

- ਭਾਗ-ਚੌਥਾ

- ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ
- ਖਾਣ-ਪੀਣ, ਸਾਕਾਦਾਰੀ, ਰੁੱਤਾਂ, ਮਹੀਨਿਆਂ, ਗਿਣਤੀ, ਮੌਸਮ, ਬਜ਼ਾਰ, ਵਪਾਰ, ਪੰਦਿਆਂ ਨਾਲ ਸੰਬੰਧਿਤ

B.Sc. (HONS.) PHYSICS SEMESTER–II
BPHC-1204
PUNJAB HISTORY & CULTURE (C 321 TO 1000 A.D.)
(Special Paper in lieu of Punjabi compulsory)
(For those students who are not domicile of Punjab)
B. A.; B.A. (SS); B. A. (Hons. – English); B. Com. (Hons., R, Ac. & Finance); B. Sc. Bio-Tech./Comp. Sc./Eco./FD/Food Sc./IT/Med./N.Med.; B.Sc. (Hons. –Botany, Chemistry, Mathematics, Physics, Zoology); B. of Mult.; B. in Int. & Mob. Tech.; BBA; BCA;BJMC; B. Voc. (Software Development, Theatre and Stage Craft, Food Processing, Textile Design & Apparel Technology)

SEMESTER–II

PUNJAB HISTORY & CULTURE (C 321 BC TO 1000 A.D.)
(Special Paper in lieu of Punjabi compulsory)
(For those students who are not domicile of Punjab)

Teaching Hours (per week): 4
Total Credits: 4
Credits:LTP:400
Total Hours: 60
Time: 3 Hours **Maximum Marks: 100**
(Theory Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

Instructions for the Paper Setters:
Question paper should consist of two sections—Section A and Section B. The paper setter must ensure that questions in Section–A do not cover more than one point, and questions in Section–B should cover at least 50 per cent of the theme.

Section–A: The examiner will set 15 objective type questions out of which the candidate shall attempt any 10 questions, each carrying 1½ marks. The total weightage of this section will be 15 marks. Answer to each question should be in approximately one to two sentences.

Section–B: The examiner will set 8 questions, two from each Unit. The candidate will attempt 4 questions selecting one from each Unit in about 1000 words. Each question will carry 15 marks. The total weightage of this section will be 60 marks.

Note: **The examiner is to set the question paper in two languages: English & Hindi.**
Course Objectives: The main objective of this course is to educate the students who are not domicile of the Punjab about the history and culture of the Ancient Punjab. It is to provide them knowledge about the social, economic, religious, cultural and political life of the peopleof the Punjab during the rule of various dynasties such as The Mauryans, The Khushans, The Guptas, The Vardhanas and other ancient ruling dynasties of the period under study.

Unit-I

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1. The Punjab under Chandragupta Maurya and Ashoka.

2. The Kushans and their Contribution to the Punjab.

Unit-II

3. The Punjab under the Gupta Emperors.

4. The Punjab under the Vardhana Emperors

Unit-III

5. Political Developments 7th Century to 1000 A.D.

6. Socio-cultural History of Punjab from 7th Century to 1000 A.D.

Unit-IV

7. Development of languages and Literature.

8. Development of art & Architecture.

Suggested Readings:-

L. Joshi (ed.*), History and Culture of the Punjab*, Part-I, Patiala, 1989 (3rdedition).

L.M. Joshi and Fauja Singh (ed), *History of Punjab*, Vol.I, Patiala 1977.
Budha Parkash, *Glimpses of Ancient Punjab*, Patiala, 1983.
B.N. Sharma*, Life in Northern India*, Delhi. 1966.

Course Outcomes:

On completing the course, the students will be able to:

CO-1   Understand the history and culture of the Punjab in Ancient Period.
CO-2   Analyse social, economic, religious, cultural and political life of Ancient Indian dynasties.
CO-3   Study about the political developments from 7th century to 1000AD.
CO-4   Understand socio-cultural history of the Punjab from 7th century to 1000 AD.
CO-5   Analyse language, literature, art and architecture of Ancient Punjab.

B.Sc. (HONS.) PHYSICS SEM-II
BHP-123
PHYSICS LAB-III

Teaching Hours (per week): 4
Total Credits: 2
Credits:LTP:002
Total Hours: 60

Time: 3 Hours
Maximum Marks: 50
(Theory Marks: 37+Internal Assessment: 13)
Pass Marks: 35%

General Guidelines for Practical Examination
I. The distribution of marks is as follows:
i) One experiment **15 Marks**
ii) Brief Theory **5 Marks**
iii) Viva–Voce **10Marks**
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.

Course Objectives: The purpose of the course is to understand the concept of resonance in series and parallel LCR circuits, study of induced e.m.f. as a function of velocity of a magnet, acceleration due to gravity by compound pendulum and by Kater's reversible pendulum. It includes measurement of logarithmic decrement, coefficient of damping, relaxation time and quality factor of a damped simple pendulum, laws of vibrating string by using Melde's apparatus and to show that $\lambda/2$ is constant.

LIST OF EXPERIMENTS

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 measure the charge sensitivity of a moving coil Ballistic galvanometer using a known capacitor.
6. To measure the self-inductance L of a given coil by Anderson Bridge method.
7. To find the value of B_H, 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.

Books Prescribed
1. Practical Physics Vol. I, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications.
2. Practical Physics, C.L. Arora, S. Chand & Co.

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the concept of resonance in series and parallel LCR circuits.
CO2	Study the induced e.m.f. as a function of velocity of a magnet.
CO3	Find out acceleration due to gravity by compound pendulum and by Kater's reversible pendulum.
CO4	Measure logarithmic decrement, coefficient of damping, relaxation time and quality factor of a damped simple pendulum.
CO5	Verify the laws of vibrating string by using Melde's apparatus and to show that $\lambda/2$ is constant.

B.Sc. (HONS.) PHYSICS SEM-II
BHP-124
PHYSICS LAB-IV

Teaching Hours (per week): 4
Total Credits: 2
Credits:LTP:002
Total Hours: 60
Time: 3 Hours   **Maximum Marks: 50**
(Theory Marks: 37+Internal Assessment: 13)
Pass Marks: 35%

General Guidelines for Practical Examination
I. The distribution of marks is as follows:
v) One experiment **15 Marks**
vi) Brief Theory **5 Marks**
vii) Viva–Voce **10Marks**
viii)   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.

Course Objectives: The purpose of the course is to understand the concept of resonance in series and parallel LCR circuits, study of induced e.m.f. as a function of velocity of a magnet, acceleration due to gravity by compound pendulum and by Kater's reversible pendulum. It includes measurement of logarithmic decrement, coefficient of damping, relaxation time and quality factor of a damped simple pendulum, laws of vibrating string by using Melde's apparatus and to show that $\lambda/2$ is constant.

LIST OF EXPERIMENTS
1. 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.
2. To determine the acceleration due to gravity by Kater's reversible pendulum.
3. To verify the laws of vibrating string by using Meldes apparatus and to show that $\lambda/2$ is constant.
4. To compare the mass of two vibrating strings by using Meldes apparatus.
5. To measure logarithmic decrement, coefficient of damping, relaxation time and quality factor of a damped simple pendulum.
6. Study of the electrical vibrator.
7. Study the formation of waves on the computer in excel spreadsheet.
8. Study the superposition of waves on the computer in excel spreadsheet.
Books Prescribed
3. Practical Physics Vol. I, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications.
4. Practical Physics, C.L. Arora, S. Chand & Co.

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the concept of resonance in series and parallel LCR circuits.
CO2	Study the induced e.m.f. as a function of velocity of a magnet.
CO3	Find out acceleration due to gravity by compound pendulum and by Kater's reversible pendulum.
CO4	Measure logarithmic decrement, coefficient of damping, relaxation time and quality factor of a damped simple pendulum.
CO5	Verify the laws of vibrating string by using Melde's apparatus and to show that $\lambda/2$ is constant.

B.Sc. (HONS.) PHYSICS SEMESTER-II
CHP 122
Inorganic Chemistry Lab-II

Teaching Hours (per week): 2
Total Credits: 1
Credits:LTP:001
Total Hours: 30
Time: 3 Hours   **Maximum Marks: 25**
(Theory Marks: 19+Internal Assessment: 06)
Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS AND CANDIDATES:

I. Examiner will give one organic salt to the students.

II. Each student will get different salt and analyse it for elements, functional group and prepare

its derivatives.

III. The question paper will be 19 marks with split as under:

(Write up = 6, Performance = 6, Viva-voce = 5, Practical note book = 2)

COURSE OBJECTIVE:

Students learn to identify and separate different cations in the inorganic mixtures through different methods. Students will be able to perform special tests for anions.
COURSE CONTENTS:

Section-A

Identification of cations and anions in a mixture which may contain combinations of acid ions.

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) Nitrate in the presence of chlorate.

(v) Chloride in the presence of bromide and iodide.

(vi) Chloride in the presence of iodide.

(vii) Bromide and iodide in the presence of each other and of chloride.

(viii) Phosphate, arsenate and arsenite in the presence of each other.

(ix) Sulphide, sulphite, thiosulphate and sulphate in the presence of each other.

(x) Borate in the presence of copper and barium salts.

(xi) Oxalate in the presence of fluoride.

Section-B

Identification of Cations in Mixtures

Identification of Group I, Group II (Group IIA and IIB), Group III,

Group IV, Group V and Group VI cations.

BOOKS PRESCRIBED:

Vogel's book on Inorganic Qualitative Analysis

COURSE OUTCOMES:

Sr. No.	On completing the course,
CO1	Students will be able to identify the anions present in the mixture.
CO2	Students will be able to identify the cations present in the mixture.
CO3	Gain hands-on practice of handling different Chemicals in the lab
CO4	Learn to prepare basic solution required to identify cations and anions in the mixture
CO5	learn about determination of boiling points of various compounds.

B.Sc. (HONS.) PHYSICS SEMESTER–II
Course Code: ZDA121
Course Title-DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION
DRUG ABUSE: MANAGEMENT AND PREVENTION
(Compulsory for all Under Graduate Classes)

Teaching Hours (per week): 2
Total Hours: 30
Time: 3 Hours   **Maximum Marks: 50**

Instructions for the Paper Setters:
1) There will be a total of 9 questions of which 5 are to be attempted.
2) Question 1 is compulsory and having 10 short answer type questions (1 mark each).
3) The remaining 8 questions (10 marks each) shall include 2 questions from each unit. Candidates shall be required to attempt 4 questions, one from each unit. Preferably, the question should not be split into more than two sub-parts.

Course Objectives:

The course aim is to

CO-1.	Describe the role of family in the prevention of drug abuse.
CO-2.	Describe the role of school and teachers in the prevention of drug abuse.
CO-3.	Emphasize the role of media and educational and awareness program.
CO-4.	Provide knowhow about various legislation and Acts against drug abuse.

UNIT-I

- **Prevention of Drug abuse**

    Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.

UNIT-II

- School: Counseling, Teacher as role-model.
- Parent-teacher-Health Professional Coordination, Random testing on students.

UNIT-III

- **Controlling Drug Abuse**
    Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program

UNIT-IV

- Legislation: NDPS act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

References:

1. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
2. Gandotra, R. and Randhawa, J.K. 2018. voZrI d[otos'A (BPky'oh) gqpzXB ns o'eEkw. Kasturi Lal & Sons, Educational Publishers, Amritsar- Jalandhar.
3. Inciardi, J.A. 1981. The Drug Crime Connection. Beverly Hills: Sage Publications.
4. Modi, Ishwar and Modi, Shalini (1997) Drugs: Addiction and Prevention, Jaipur: Rawat Publication.
5. Randhawa, J.K. and Randhawa, Samreet 2018. Drug Abuse-Management and Prevention. Kasturi Lal & Sons, Educational Publishers, Amritsar- Jalandhar.
6. Sain, Bhim 1991, Drug Addiction Alcoholism, Smoking obscenity New Delhi: Mittal Publications.
7. Sandhu, Ranvinder Singh, 2009, Drug Addiction in Punjab: A Sociological Study. Amritsar: Guru Nanak Dev University.
8. Singh, C. P. 2000. Alcohol and Dependence among Industrial Workers: Delhi: Shipra.
9. World Drug Report 2011, United Nations office of Drug and Crime.
10. World Drug Report 2010, United Nations office of Drug and Crime

Course Outcomes:

The students will be able to:

CO-1.	Understand the importance of family and its role in drug abuse prevention.
CO-2.	Understand the role of support system especially in schools and inter-relationships between students, parents and teachers.
CO-3.	Understand impact of media on substance abuse prevention.
CO-4.	Understand the role of awareness drives, campaigns etc. in drug abuse management.
CO-5	Learn about the Legislations and Acts governing drug trafficking and Abuse in India.

B.Sc. (HONS.) PHYSICS SEMESTER–III
BHP-231
MECHANICS-II

Time: 3 Hours

Teaching Hours (per week): 4
Total Credits: 4
Credits: LTP: 310
Total Hours: 60
Maximum Marks: 100
(Theory Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

Note for paper setter and students:
1. There will be five sections.
2. Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The candidate will have to attempt any 6 questions in this section.
3. Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections. Each question in these sections should not have more than two subparts.
4. Non-Programmable Scientific calculator is allowed.

Course Objectives: Objectives of this course are to understand the velocity of light, relative motion. To understand the importance of special theory of relativity. To understand the geometrical representation of relativity. To understand the concepts of frames of references, relativistic dynamics, structure of space time, principle of equivalence, fictitious forces etc. To realize the various phenomenon in terms of relativity and mechanics.

Course Contents:

UNIT–I
Frames of References; Inertial frame of reference; Galilean transformations; **Application of Galilean transformation to mechanics and electromagnetism**; **The Ether**; Michelson Morley Experiment; Explanation of the Null Result; Postulates of Special Theory of Relativity; Lorentz transformations; Length contraction; Time dilation; **Proper time interval**; Experimental evidence in support of time dilation; Twin paradox; Relativity of simultaneity; **Co-locality**; Relativistic formula for the composition of velocities-The velocity addition theorem.

UNIT–II
Variation of mass with velocity (Relativity of mass); mass energy **relationship**/equivalence; **Conservation of mass-energy**; Relation between momentum and energy, Transformation of momentum, energy **and force**; Relativistic Doppler effect (longitudinal and transverse) and its confirmation.

UNIT–III
Space-time continuum; Concept of Minkowski space; geometrical interpretation of Lorentz transformations of space, time **and** simultaneity; **intervals between events**: Space-like, time like and light-like intervals; concept of world lines; four vectors; **some important four-vectors-position four vector, velocity four-vector, momentum four-vector and four-force (Minkowski force)**.

UNIT–IV
Electric field and force in different frame of reference and their transformations; Principle of Equivalence; Gravitational and inertial mass; Gravitational mass of photons; Gravitational red shift; Fictitious forces; Effect of rotation of earth on 'g'; Effects of centrifugal and Coriolis forces produced as a result of earth's rotation. Foucault Pendulum.

Books Prescribed:
1. 1. A Primer of Special Theory of Relativity by P. L. Sardesai; New Age International Publisher.
2. Relativity and Electromagnetism, T.S. Bhatia, Vishal Publishing Co.

3. Mechanics : Berkeley Physics Course Vol-I, C. Kittel, W.D. Knight, M.A. Ruderman, C.A. Helmholtz and B.J. Moyer- Tata McGraw Hill Publishing Company Ltd., New Delhi.
4. The Special Theory of Relativity, S. Banerji & A. Banerji (Prentice Hall India).
5. Introduction of to Special Relativity: R. Resnick Wiley Eastern India Pvt. Ltd.
6. The Feymann Lectures Physics: R.P. Feymann, R.B. Leighton and M. Sands, Vol. I & II- Narosa Publishing House, New Delhi.
7. "Special Relativity" A.P. French, N.W. Norton and Company Inc. , New York.
8. Electricity & Magnetism-T.S. Bhatia and Gurpreet Singh, Vishal Publishing Co.

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the velocity of light, relative motion.
CO2	Understand the importance of general and special theory of relativity.
CO3	Understand the geometrical representation of relativity.
CO4	Understand the concepts of frames of references, relativistic dynamics, structure of space time, principle of equivalence, fictitious forces etc.
CO5	Realize the various phenomenon in terms of relativity and mechanics

B.Sc. (HONS.) PHYSICS–SEMESTER-III
BHP-232

STATISTICAL AND THERMAL PHYSICS

Time: 3 Hours

Teaching Hours (per week): 4
Total Credits: 4
Credits: LTP: 310
Total Hours: 60
Maximum Marks: 100
(Theory Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

Note for paper setter and students:
1. **There will be five sections.**
2. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The candidate will have to attempt any 6 questions in this section.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections. Each question in these sections should not have more than two subparts.**
4. **Non-Programmable Scientific calculator is allowed**

Course Objectives: The objective of this course is to employ fundamental physics concepts and theories to set up and formulate problems in thermodynamics and statistical mechanics, develop a working knowledge of the laws and methods of thermodynamics and elementary statistical mechanics and to use this knowledge to explore various applications. To know the existence and properties of the entropy, different thermodynamic potentials and their uses and treatment of ideal gases.

Course Contents:

UNIT–I

Basic ideas of Statistical Physics, Scope of Statistical Physics, Basic ideas about probability, **Examples of independent events, principle of equal a priori probability, Case of a box divided into equal sized compartments, Permutations and combinations,** Distribution of four distinguishable particles into compartments of equal size. Concept of macrostates and 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. **Division into cells.**

UNIT–II

Phase space and division into elementary cells. Three kinds of statistics. The basic approach in three statistics. Maxwell Boltzman (MB) statistics applied to an ideal gas in equilibrium. **Number of phase space cells, values of α and β, Maxwell Boltmann law of molecular energies.** Experimental verification of law of distribution of molecular speeds: **Zartmann and Ko Experiment, Graphical depiction of Maxwell Boltzmann speed distribution, most probable speed, average speed and root mean square speed of particles.** Need for Quantum Statistics – B.E. **Application of BE statistics to a photon gas**. Statement of Planck's law of Radiation,

Wien's Displacement and Stefan's law. Fermi Dirac (FD) statistics. Application of FD statistics to free electron gas inside conductor, Stability of white dwarfs, Comparison of M.B, B.E and F.D statistics.

UNIT- III

Statistical Basis of Entropy: Definition of entropy, change of entropy of a system, third law of thermodynamics. Additive nature of entropy, law of increase of entropy, reversible and irreversible processes and their examples, work done in a reversible process, Examples of increase of entropy in some natural processes: **Transfer of heat and second law of thermodynamics, Expansion of gas, diffusion of one gas into another**, entropy and disorder. Brief review of terms used in thermodynamics, Laws of Thermodynamics, Carnot's Heat Engine, Entropy changes in Carnot's cycle, Carnot's theorem, Thermodynamic temperature scale, Thermoelectric effect and its Applications, change of entropy along a reversible path in P-V diagram, entropy of a perfect gas, equation of state of an ideal gas, Heat death of Universe.

UNIT- IV

Maxwell's Thermodynamic Relations: Perfect differentials in Thermodynamics, Derivation of Maxwell Thermodynamic Relationships, **A device to remember Maxwell Thermodynamic Relationships,** Cooling produced by adiabatic expansion, adiabatic compression, adiabatic stretching of wires and thin films, change of internal energy with volume. Expression for Cp-Cv, variation of Cv with volume, **variation of Cp with pressure**, Clapeyron's equation. Joule-Thomson effect and its thermodynamic treatment, Joule-Thomson effect for a Vander Waal's gas, Production of very low temperatures by adiabatic demagnetization, Thermodynamic Potentials and Equilibrium of Thermodynamic Systems, Equation of state of an ideal gas, degrees of freedom, Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic, Mean free path (Zeroth Order).

TUTORIAL : Relevant problem on the topics covered in the course.

Books Prescribed:
1. Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill.
2. A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1969, Indian Press.
3. Thermodynamics, Enrico Fermi, 1956, Courier Dover Publications.
4. Heat and Thermodynamics, M.W.Zemasky and R. Dittman, 1981, McGraw Hill
5. Statistical Physics and Thermodynamics, V.S. Bhatia and T.S. Bhatia(Vishal Publishing Co.)

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Explain the fundamental differences between classical and quantum statistics and learn about quantum statistical distribution laws.

CO2	Analyze important examples of ideal Bose systems and Fermi systems.
CO3	Apply the concepts and principles of black body radiations.
CO4	Apply the concepts and laws of thermodynamics to solve problems in thermodynamic systems such as gases, heat engines etc.
CO5	Use the statistical physics methods, such as Boltzmann distribution, Fermi Dirac and Bose-Einstein distributions to solve problems in some physical systems.

B.Sc. (HONS.) PHYSICS SEMESTER–III
MAP-231
MATHEMATICS-III

Teaching Hours (per week): 4
Total Credits: 4
Credits: LTP: 310
Total Hours: 60
Maximum Marks: 100
(Theory Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS:
1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit) Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. The Section-A will consist of eight short answer type questions, each of 2.5 marks. Students are to attempt any six.
3. The Sections–B, C, D & E will consist of two questions each (each question should be subdivided into at most two parts). Students are to attempt any four questions in total by selecting one question from each section. Each question carries 15 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:
- To acquire the knowledge of testing of convergence of sequences and series of various types.
- To understand the coordinate systems.
- To perceive knowledge about vector differentiation and integration.

Course Content:

UNIT-I
Differential Equations: Ordinary differential equations. Formation of differential equation, solution of linear differential equation of the first order and the first degree. Solution of homogeneous and non homogeneous differential equations with constant coefficient. The chemical application of the first order differential equations. Series solution of the Legendre differential equations and Legendre Polynomials. Recurrence and orthogonality relation, Rodrigue's Formula.

UNIT-II
Partial differential Equations: Formation of Partial differential equations. Solution by Charpit's Method. Solution of homogeneous partial differential equations with constant coefficients.

UNIT-III
Complex Analysis: De-Moivre's Theorem and its simple applications, Analytic functions, Cauchy-Riemann Equations, Complex Integration, statements of Cauchy's theorem, Cauchy's Integral formula, Morera's theorem, Taylor's Theorem, Laurent's Theorem, Cauchy's residue Theorem and their simple applications.

UNIT-IV
Infinite Series: Series of positive terms, Alternate series, Behaviour of infinite series, Cauchy's convergence criterion, D'Alembert's ration test, Cauchy's Root test, Raabe's test, Gauss test, Cauchy's integral test, Absolute and conditional convergence (Tests without proof).

Reference Books:
1. Higher Engineering Mathematics by Dr. B.S. Grewal, 43rd Edition, Published by Khanna Publishers
2. Introduction to Electrodynamics (First chapter) by D. J. Griffiths, 3rd Edition, Published by Pearson Education
3. Mathematical Physics by H.K. Dass & Dr. Rama Verma, Published by S. Chand
4. Mathematical Physics by Satya Prakash, Published by Sultan Chand & Sons
5. Mathematical methods for Physicists – Arfken & Weber – 6 th Edition-Academic Press- N.Y.1990
6. Mathematical Methods of Physics – Mathews & Walker – 2 nd Edition- Pearson Edition 1968.
7. An introduction to Ordinary Differential Equations, E. A. Coddington, 2009, PHI learning
8. Differential Equations, George F. Simmons, 2007, McGraw Hill.

Course outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Study the behaviour of real numbers, sequences and series of real numbers
CO2	Analyse the application of coordinate system in different fields.
CO3	Apply the concept of vector differentiation and integration in solving various mathematical problems.

B.Sc. (HONS.) PHYSICS SEMESTER-III
CHX-231
Physical Chemistry-III

Teaching Hours (per week): 3
Total Credits: 3
Credits: LTP:300
Total Hours: 45

Time: 3 Hours   **Maximum Marks: 75**
(Theory Marks: 56+Internal Assessment: 19)
Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS AND CANDIDATES
(Scientific calculator is allowed)
   I.   Examiner will make five sections of paper namely Section-I, II, III, IV and V
   II.   Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
   III. Section-I will consist of 8 short questions carrying 2 Mark each and student have to attempt any six parts.
   IV.   Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 11 Marks.
   V.   The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

Course Objectives: The Physical Chemistry-III course enables the students to learn deeply about the states of matter and inculcate the theory for further practical approach. Students will learn about the gaseous, liquid states and the colloidal state. The mathematical derivations and formulas will provide knowledge of the various analytical properties of gases and liquids. The colligative properties and solutions topic is very crucial for exploring the day to day life phenomenon, and also from the perspective of research for solution preparations. Some important topics such as emulsions, gels and adsorption are very important for students in daily life.

Course Contents:
UNIT I
1. Solutions and Colligative Properties
Ideal and non–ideal solutions, methods of expressing concentrations of solutions, Dilute solution, colligative properties, Raoult's law, relative lowering ofvapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure, elevation of boiling point and depression of freezing point.

UNIT-II
2. Electrochemistry
Electrical transport-conduction in metals and in electrolyte solutions, specific conduction and equivalent conduction, variation of specific and equivalent conduction with dilution, Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte, dissociation, weak and strong electrolytes, Ostwald's dilution law.

UNIT-III
3. Chemical Kinetics
Rate of reaction, rate constant and rate laws, the order of reaction, first, second & third and zero order reactions, half-lives; determination of reaction order. Temperature dependence of reaction rates, reaction mechanism, rate-determining step approximation, steady-state approximation. Catalysis, homogeneous catalysis, autocatalysis, oscillation reactions. Enzyme catalysis, heterogeneous catalysis.

UNIT-IV
4. Liquid State
Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids,

liquids and gases. Liquid crystals: Difference between liquids crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell.

5. Colloidal State

Definition of colloids, classification of colloids. Solids in liquids (Sol): kinetic, optical and electrical, properties, stability of colloids, protective action, Hardy Schulze law, gold number. Liquids in liquids (emulsions): Types of emulsions, preparation. Emulsifiers. General applications of colloids.

Books Prescribed:
1. Physical Chemistry by P.W. Atkins, 8th Ed., Oxford University Press, 2006 (Indian Print).
2. Physical Chemistry by T. Engel & P. Reid, 1st ed., Pearson Education, 2006.
3. Physical Chemistry by Castellan, 3rd Ed., Addison Wisley/Narosa, 1985 (Indian Print)
4. Physical Chemistry by G. M. Barrow, 6th Ed., New York, McGraw Hill, 1996.
5. Physical Chemistry by R. J. Silbey, R. A. Albert &Moungi G. Bawendi, 4th Ed., New York: John Wiley, 2005.

Course Outcomes:

S. No.	On completing the course,
CO1	Learn about ideal and non–ideal solutions, methods of expressing concentrations of solutions, dilute solution, colligative properties and Raoult's law
CO2	Understand rate of reaction, rate constant and rate laws, the order of reaction, first, second & third and zero order reactions
CO3	Learn about homogeneous catalysis, autocatalysis, oscillation reactions.Enzyme catalysis and heterogeneous catalysis
CO4	Understand the structure of liquids Structural differences between solids, liquids and gases. Liquid crystals
CO5	Understand the classification of colloids. kinetic, optical and electrical, properties, stability of colloids,protective action, Hardy Schulze law, gold number, types of emulsions, Emulsifiers and applications of colloids.

B.Sc. (HONS.) PHYSICS SEMESTER–III
Course code: ESL–221
Course Title: ENVIRONMENTAL STUDIES–I (COMPULSORY)
B.A./B.Sc. (Biotech., Food Sci., Comp. Sci., Eco., FD., IT., Med., Non Med.)/B.Sc. (Hons.-Physics, Chemistry, Maths)/B.B.A./B.C.A./B.Com./B.Com. (Hons.)/BJMC/BA Social Sciences/BA (Hons.) Punjabi, BA (Hons.) English, B.Voc (Food Processing, Theatre and Stage Craft, Software Development, Textile Design & Apparel Tech)

Teaching Hours (per week): 2
Total Credits: 2
Credits:LTP:200
Total Hours: 30

Time: 3 Hours   **Maximum Marks: 50**
                                                                                Pass Marks: 35%

Instructions for Paper Setters: The question paper will consist of three sections. Candidate will be required to attempt all the sections. Each unit of the syllabus should be given equal weightage of marks. Paper to be set in English, Punjabi and Hindi.

Section–A: (16 Marks): It will consist of five short answer type questions. Candidates will be required to attempt four questions, each question carrying four marks. Answer to any of the questions should not exceed two pages.

Section–B: (24 Marks): It will consist of five questions. Candidates will be required to attempt four questions, each question carrying six marks. Answer to any of the questions should not exceed four pages.

Section–C: (10 Marks): It will consist of two questions. Candidate will be required to attempt one question (carrying ten marks) only. Answer to the question should not exceed 5 pages.

Course Objectives

1   The main goal of Environmental studies is to create the environmental awareness to create a safe, green and sustainable environment.
2   To make students aware about the importance of ecosystem, types of ecosystem, energy flow in an ecosystem, ecological succession, food chain and food web.
3   To make students aware of water conservation, global warming, consumerism and waste products. and, also about the environmental protection acts.
4   Role of National Service Scheme (NSS). Health and hygiene.

Unit-I

The Multidisciplinary Nature of Environmental Studies: Definition, components, scope and importance of environment/environmental studies, Need for public awareness.

Natural Resources: Definition, types, use, overexploitation, benefits, case studies (if any) and associated problems of following natural resources: Forest Resources, Water Resources, Mineral Resources, Food Resources, Energy Resources, Land Recourses *etc.*

Roleof an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit-II

Ecosystem:

General introduction, types (Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems *viz.* ponds, streams, lakes, rivers, oceans, estuaries),Structure and functions of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids.

Unit-III

Social Issues and Environment: Sustainable development,Urban problems related to energy, Water conservation, rain water harvesting.Resettlement and rehabilitation of people; its problems and concerns. Case studies.Environmental ethics: Issues and possible solutions.Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents andholocause. Case studies.Wasteland reclamation.

Environmental Protection Act: Air (prevention and Control of Pollution) Act.Water (prevention and Control of Pollution) Act.Wildlife Protection Act.Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

Unit-IV

National Service Scheme

Introduction and Basic Concepts of NSS: History, philosophy, aims & objectives ofNSS; Emblem, flag, motto, song, badge *etc.;* Organizational structure, roles and responsibilities of various NSS functionaries.

Health, Hygiene & Sanitation: Definition, needs and scope of health education; Food and Nutrition; Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan); National Health Programme; Reproductive health.

Suggested Books:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.

2. Bharucha, E. 2013 . Textbook of Environmental Studies, Universities Press, Hyderabad.

3. Basu, M., Xavier, S. 2016. Fundamentals of Environmental Studies, Cambridge University Press, India

3. Down to Earth, Centre for Science and Environment, New Delhi.

4. Jadhav, H. and Bhosale, V. M. 1995. Environmental Protection and Laws. Himalaya Pub.

5. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, Pearson
    Education (Singapore) Pte. Ltd., Delhi.

6. Kaushik, A. and Kaushik, C. P. 2004. Perspective in Environmental Studies, New Age
    International (P) Ltd, New Delhi.

7. Mahapatra, R., Jeevan, S.S. and Das, S. 2017. Environment Reader for Universities, Centre for Science and
    Environment, New Delhi.

8. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.

9. Raven, P.H., Hassenzahl, D.M. and Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.

10. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.

11. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex,
    Amritsar

12. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.

13. Saroj A., Kaur R., Walia H., Kaur T, 2021. Environmental Studies - A Holistic Approach, KLS Publishers.

Suggested Websites:

1. https://nss.gov.in
2. https://moef.gov.in
3. http://punenvis.nic.in
4. https://www.unep.org

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO-1	learn about the sustainable environment.
CO-2	gain the knowledge ecosystem and its functioning.
CO-3	know about the water conservation programs like rain water harvesting and water shedding and to gain knowledge of environmental (air, water and pollution) protections acts.
CO-4	know about the role and importance of NSS– a volunteer organization, in making up a better environment and to maintain better health and hygiene.

B.Sc. (HONS.) PHYSICS SEMESTER–III
Psychology
IDPSY-2331
INTERDISCIPLINARY COURSE ID-I

Teaching Hours (per week): 3
Total Credits: 3
Credits: LTP: 300
Total Hours: 45
Maximum Marks: 75
(Theory Marks: 56+ Internal Assessment: 19)
Pass Marks: 35%

Time: 3 Hours
INSTRUCTIONS FOR PAPER SETTERS:
Section A: - Eight questions will be set in Section A from the whole syllabus. Students are required to attempt all the questions in about 50 words. Each question carries 2 marks.
8x2=16 Marks
Section B: - Eight questions will be set, 2 from each unit (Unit I- Unit-IV). Students are required to attempt five questions in about 300 words by selecting 1 question from each unit. Fifth question may be attempted from any unit. Each question carries 8 marks.
5x8=40 Marks

The medium of this paper will be English only.

COURSE OBJECTIVES:
1. To provide basic knowledge of different psychological and cognitive processes.
2. To bring awareness in students regarding their mental processes, behaviors and emotional reactions.
3. To teach various coping strategies to deal with stress effectively.
4. To enhance communication skills of students.

UNIT-I
Personality
a. Brief introduction of theories of Personality (Eysenck, Freud, Erikson and Big Five).
b. Description of Personality tests: EPQ, NEO-PIR, W.A.T.
Stress
a. Definition and Techniques of Stress management.
b. Role of Hardiness in Stress.

UNIT-II
Attitudes
a. Definition and components of Attitude.
b. Formation of Attitude and ways to change Attitude.
Motivation
a. Theories of Motivation (Maslow and Herzberg)
b. Types of Motivation and ways to enhance Motivation

UNIT-III
Goal Setting
a. Understanding Goal Setting (Locke's theory)
b. Goal-Setting Principles
Problem Solving
a. Concept and Stages of Problem Solving.
b. Role of Analytical intelligence in Problem Solving.
Communication

a. Definition and Types of Communication.
b. Developing effective Communication skills.

UNIT- IV

Confidence
a. Defining Confidence (Vealey)
b. Defining and developing optimistic mind-set
c. Role of self-efficacy in Confidence (Bandura).

Concentration
a. Understanding Concentration
b. Components, Strategies of Concentration

BOOKS PRESCRIBED:

1. Crano, W.D., & Prislin, W. (2008). *Attitudes and Attitude Change.* Psychology Press.
2. Feist, J., Feist, G.J., & Ann. T. (2017). Theories of Personality. New Delhi: McGraw Hill.
3. Jain, S. (2001). *Introduction to Psychology.* New Delhi: Kalyani Publishers.
4. McClelland, D.C. (1988). *Human motivation.* Cambridge University Press.
5. Morgan, G.T., King, P.A., Weisz, T.R., &Schopler, J. (1999). *Introduction to Psychology.* New York: Mcgraw Hill Book Co.
6. Waitley, D. (1993). *Psychology of Motivation.* Nightingale-Conant.

COURSE OUTCOMES (COs)

Sr. no.	On completing the course, students will be able to
CO1	Understand their thoughts, feelings and behaviors appropriately.
CO2	Cope with stressful situations in an effective manner.
CO3	Verbally and non- verbally expressing themselves productively in interviews.

B.Sc. (HONS.) PHYSICS SEMESTER–III
Basics of Computer: Excel Spreadsheet
SEC- HP-231

Teaching Hours (per week):5
Total Credits:3
LTP:102

Time: 1.5 Hours for Theory
Time: 3 Hours for Practical

Total Hours: 45
Total Marks: 75
(Theory Marks: 19+6=25 &
Practical Marks :37+13=50)
Pass Marks: 35%

INSTRUCTIONS:

1. There will be three sections.
2. Section A is compulsory and will be of 5 marks consisting of 7 short answer type questions carrying 1 mark each covering the whole syllabus. The answer should not exceed 20 words. The candidate will have to attempt any 5 questions in this section.
3. Sections B and C will be set from units I & II respectively and will consist of two questions of 7 marks each from the respective unit. The candidates are required to attempt one question from each of these sections. Each question in these sections should not have more than two subparts.

Course Objectives:

The main objective of this course is to make students familiar with the Microsoft excel and its applications in different areas. It further aims to make them able to plot different types of graphs or charts with the help of excel.

Course Content:

UNIT-I

Introduction to Microsoft Excel- Worksheet overview, History of excel, versions, importance, features and organization of worksheet. Application areas of spreadsheet, row, column and cell. Adding, resizing, copying and pasting of cells. Active cell, cell pointer and address, drag and drop, freeze panes, basic shortcut keys, undo and redo.

UNIT-II

Data analysis- Entering data, formulas, statistical functions, mathematical functions, converting formulas to values, create a chart or graph, different types of chart, Display a 3-D column chart, Chart toolbar, printing the graph, Enhancing the charts, gridlines, formatting text and numbers, color and patterns, modifying and deleting , sheet reference, beginning of data analysis project for simulation a given problem, assigning the fixed and variables in cells, data generation, data analysis using graphs, adding the best fit to the analysis result.

Books Prescribed:

1. Windows based computer courses: G. Singh and R. Singh - Kalyani publishers.
2. Introduction to computers: Peter Norton- Tata Mcgraw Hill.
3. Computer Fundamentals: P.K. Sinha and Priti Sinha- BPB publications.
4. Modelling Physics with Microsoft Excel Bernard V Liengme, Morgan & Claypool Publishers (2014)
5. Excel for Scientists and Engineers Numerical Methods E. Joseph Billo A John Wiley & Sons, Inc., Publication (2011)

Course Outcomes

Sr. No.	On completing the course, the students will be able to:
CO1	Know about the history and importance Microsoft excel.
CO2	Understand about the basics involved in spreadsheet.
CO3	Solve mathematical and statistical problems with excel.
CO4	Plot graphs and charts with the help of Microsoft excel.
CO5	Enhance the charts with toolbar and shortcut keys.

B.Sc. (HONS.) PHYSICS SEMESTER–III
BHP-233
PHYSICS LAB-V
General Guidelines for Practical Examination

Teaching Hours (per week): 4

Total Credits: 2

Credits: LTP: 002

Total Hours: 60

Time: 3 Hours   **Maximum Marks: 50**

(Theory Marks: 37+Internal Assessment: 13)

Pass Marks: 35%

General Guidelines for Practical Examination
   The distribution of marks is as follows:
i) One experiment **15 Marks**
ii) Brief Theory **5 Marks**
iii) Viva–Voce **10Marks**
iv) Record (Practical file) **7 Marks**

V. 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.

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

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

Course Objectives: Objectives of this course are to understand the applications of sextant in different situations. To understand the basics of adiabatic expansion and probability. To understand the concept of thermal conductivity. To study stefan's law. To study concept of the heating efficiency of electric kettle.

Course Content:
LIST OF EXPERIMENTS
1. To measure an accessible Horizontal height using sextant.
2. To measure an accessible vertical distance between two points using sextant.
3. To measure an accessible area of window/door using sextant.
4. To measure inaccessible height by using sextant.
5. Verify laws of probability distribution by throwing 1/2 similar coins.
6. To write the macro state, microstate & thermodynamically frequency of five identical coins.
7. To study adiabatic expansion of gas and hence to calculate value of γ.
8. To determine the heating efficiency of an electric kettle with varying voltage.
9. To determine the heating efficiency of an electric kettle with fixed voltage but different volume of liquid.

Books Prescribed:
1. Practical Physics Vol.II, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications

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

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:

CO1	Understand the applications of sextant in different situations.
CO2	Understand the basics of adiabatic expansion and probability.
CO3	Understand thermal conductivity.
CO4	Study Stefan's law.
CO5	Study how to find the heating efficiency of electric kettle

B.Sc. (HONS.) PHYSICS SEMESTER–III
BHP-234
PHYSICS LAB-VI
General Guidelines for Practical Examination

Teaching Hours (per week): 4
Total Credits: 2
Credits: LTP: 002
Total Hours: 60

Time: 3 Hours   **Maximum Marks: 50**
(Theory Marks: 37+Internal Assessment: 13)
Pass Marks: 35%

General Guidelines for Practical Examination
   The distribution of marks is as follows:
i) One experiment **15 Marks**
ii) Brief Theory **5 Marks**
iii) Viva–Voce **10Marks**
iv) Record (Practical file) **7 Marks**

VIII.   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.

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

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

Course Objectives: Objectives of this course are to understand the applications of sextant in different situations. To understand the basics of adiabatic expansion and probability. To understand the concept of thermal conductivity. To study stefan's law. To study concept of the heating efficiency of electric kettle.

Course Content:
LIST OF EXPERIMENTS
   1. To determine Stefan's constant using Boltzmann's Law.
   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) using a potentiometer.
   4. To measure thermal expansion of crystal using interference fringes.
   5. To measure the thermo e.m.f. as a function of temperature of the hot junction.
   6. To determine the value of Boltzmann constant.
   7. To find the angle of prism by rotating the telescope method using spectrometer.
   8. To find the angle of prism by rotating the table method using spectrometer.
   9. To study the working of Household energy meter & determine the power consumed in some electrical appliances.

   Books Prescribed:
   1. Practical Physics Vol.II, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications

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

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:

CO1	Understand the applications of sextant in different situations.
CO2	Understand the basics of adiabatic expansion and probability.
CO3	Understand thermal conductivity.
CO4	Study Stefan's law.
CO5	Study how to find the heating efficiency of electric kettle

B.Sc. (HONS.) PHYSICS SEMESTER-III
CHX-232
Physical Chemistry Lab-III

Teaching Hours (per week): 2
Total Credits: 1
Credits:LTP:001
Total Hours: 30
Time: 3 Hours **Maximum Marks: 25**
(Theory Marks: 19+Internal Assessment: 06)
Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS AND CANDIDATES:
I. **Examiner will give one organic salt to the students.**
II. **Each student will get different salt and analyse it for elements, functional group and prepare its derivatives.**
III. **The question paper will be 19 marks with split as under:**
(Write up = 6, Performance = 6, Viva-voce = 5, Practical note book = 2)Course Objectives: This practical course enables the students to understand the physical properties of liquids such as surface tension, density and viscosity. Students are able to understand the measurement techniques of some of the physical properties. Students will learn to handle apparatus like stalagmometer, Ostwald's viscometer and calorimeter. Students will be able to understand the acid-base titrations in the laboratory.

Course Contents:

Section-A Crystalisation:
Concept of indication of crystalisation. Phthalic acid from hot water (using fluted filter paper & stem less funnel)
Acetanilide from boiling water.
Naphthalene from Ethanol
Benzoic acid from water

Section-B Physical Chemistry
1. To determine the specific reaction rate of hydrolysis of ethyl acetate catalyzed by Hydrogen ions at room temperature.
2. To study the effect of acid strength on hydrolysis of an ester.

Viscosity, Surface Tension (Pure Liquids)
3. To study the viscosity and surface tension of glycerine solution in water.
4. To determine the solubility of benzoic acid at different temperatures and to determine enthalpy H of the dissolution process.
5. To determine the enthalpy of neutralization of a weak acid/weak base versus strong
base/strong acid and determine the enthalpy of ionization of the weak acid/weak base.
6. To determine the enthalpy of dissolution of solid calcium chloride and calculate the lattice
energy of calcium chloride from its enthalpy data using Born Haber cycle.

Books Prescribed:
1. Findlay's Practical Physical Chemistry, 9th Edition, Revised by B.P. Levitt
2. Experimental Physical Chemistry by RC DAS and B. Behera 9th Edition,
3. Advance Practical Chemistry, J. B. Yadav

Course Outcomes:

Sr. No.	On completing the course,
CO1	Measure important physical properties like surface tension, viscosity, density, enthalpy, heat of neutralization etc.
CO2	Learn to examine various physical parameters by different methods.
CO3	Learn to handle important apparatus like stalagmometer, Ostwalds viscometer and calorimeter.
CO4	Learn to examine the rate of reactions (hydrolysis of ester)
CO5	Learn to perform acid-base titrations.

B.Sc. (HONS.) PHYSICS SEMESTER–IV
BHP-241
OPTICS

Time: 3 Hours

Teaching Hours (per week): 4
Total Credits: 4
Credits: LTP: 400
Total Hours: 60
Maximum Marks: 100
(Theory Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

Note for paper setter and students:
1. There will be five sections.
2. Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The candidate will have to attempt any 6 questions in this section.
3. Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections. Each question in these sections should not have more than two subparts.
4. Non-Programmable Scientific calculator is allowed.

Course Objectives: Objectives of this course are to understand the concept of polarization, interference and diffraction. To understand the light propagation through lenses, mirrors, prisms, and other optical systems. To understand different branches of optics with associated experiments. To differentiate Fraunhofer and Fresnel diffraction. To understand the science and applications of laser technology. To understand the applications and importance of optics in daily life.

UNIT–I
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; Interference pattern by division of wave front; Fresnel Biprism; Displacement of fringes; Fresnel double mirror; Llyod's single mirror.

UNIT–II
Interference by Division of Amplitude; Change of phase on reflection; Interference in thin films (reflected and transmitted regions); Need for extended source and Fringes of equal inclination & equal thickness; Non-reflecting films/Anti reflection coatings; Newton's Rings and their application; Fabry Perot interferometer and etalon; Huygen's Principle, Diffraction of Light, Huygen's-fresnel Diffraction theory; Fresnel's half-period zones; Zone plate; Diffraction at a straight edge; Diffraction by a circular **and rectangular apertures**; Distinction between fresnel and fraunhoffer diffraction; Fraunhoffer diffraction at a single slit, at double slit, and for N slits/transmission grating; Rayleigh Criterion for resolution; Resolving power of telescope and grating.

UNIT–III
Polarization: Transverse nature of light; Polarization by reflection and refraction; Brewster's Law; Malus Law; Double refraction; Nicol Prism; Elliptically and circularly polarized light; Quarter wave and half-wave plates; Production and detection of polarized light; Optical activity; Specific rotation; Half shade polarimeter.

UNIT–IV
Derivation of Einstein relations; Concept of stimulated emission and population inversion; Broadening of spectral lines (Qualitative); Three level and four level laser schemes; Elementary theory of optical cavity; Longitudinal and transverse modes; Components of laser devices; Condition for laser action; Types of lasers, Ruby, Nd:YAG lasers, He-Ne and CO_2 lasers; Mode of creating population inversion and output characteristics; Application of lasers.

TUTORIAL: Relevant problem on the topics covered in the course.

Books Prescribed:

1. Text book of Optics: N. Subramanayam, B. Lal and M. N. Avadhamulu
2. Fundamentals of Optics: Jenkins and White
3. Optics: Ajoy Ghatak
4. Laser Fundamentals, W.T. Silfvast (Foundation Books), New Delhi, 1996
5. Laser and Non-Liner Optics, B.B. Laud (New Age Pub.) 2002
6. Optics, Born and Wolf, (Pergamon Press) 3rd edition, 1965
7. Laser, Svelto, (Plenum Pres) 3rd edition, New York

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand polarization, interference and diffraction.
CO2	Understand the light propagation through lenses, mirrors, prisms, and other optical systems.
CO3	Understand different branches of optics with associated experiments.
CO4	Differentiate between Fraunhofer and Fresnel diffraction.
CO5	Understand the applications and importance of optics in daily life.

B.Sc. (HONS.) PHYSICS SEMESTER–IV
BHP-242
MODERN PHYSICS

Time: 3 Hours
Teaching Hours (per week): 4
Total Credits: 4
Credits: LTP: 400
Total Hours: 60
Maximum Marks: 100
(Theory Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

Note for paper setter and students:
1. There will be five sections.
2. Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The candidate will have to attempt any 6 questions in this section.
3. Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections. Each question in these sections should not have more than two subparts.
4. Scientific calculator is allowed.

Course Objectives: The Objective of this course is to make the students gain knowledge about cathode rays, positive rays and their properties, atomic models of Thomson, Rutherford and Bohr, quantum methods in the solution of problems involving atomic spectra, blackbody radiation, the photoelectric effect, structure of the atom, wave nature of matter and uncertainty principle.

Unit – I

Cathode Rays and Positive Rays
Electrical conduction through gases, ionization of gas, ionization current, phenomena of discharge through gases at low pressure, properties of cathode rays, determination of specific charge (e/m) of electron, Millikan's oil drop method, balanced drop method, **Importance of knowledge of Electric Charge, Energy of moving electron in electron-volt,** Positive rays and particles, **Properties of positive rays,** Thomson's experiment, positive ray parabolas, isotopes of hydrogen. **Atomic weight and atomic number.**

Unit – II

Atomic Structure of the Matter
Thomson's atom model, Rutherford's nuclear atom model**, Impact parameter, Distance of closest approach, drawbacks of Rutherford model,** Bohr's theory of hydrogen atom, spectral series of hydrogen atom, atomic energy levels, Bohr's correspondence principle, successes and failures of Bohr's theory, **Ritz Combination Rule, Correction in Bohr's Theory for finite mass of the nucleus, Evidences in favour of Bohr's Theory.**

Unit – III

Foundation of Quantum Mechanics
Black body radiations, Wien's theory, Rayleigh Jeans law, Planck's law of radiation, Failure of classical theory to explain black body radiations, Photoelectric effect, **Laws of photoelectric emission, Classical explanation of photoelectric effect. Work function,** Einstein's photoelectric equation, Compton scattering, Theory of Compton effect and its limitations, **Kinetic energy of recoil electron.**

Unit – IV

Wave Nature of Matter and Uncertainty Principle
The wave particle duality, de Broglie concept of matter waves, phase and group velocities, de Broglie relation for a photon and wavelength of material particles, characteristics of de Broglie waves, Davisson and Germer's experiment, The uncertainty principle for position and momentum (x and p_x), Energy and time (E and t) and angular position-angular momentum, illustrations of uncertainty principle, Gamma ray microscope. Diffraction by a single slit, applications of uncertainty principle- nonexistence of free electrons and existence of n, p and α particles in nucleus, zero point energy and size of hydrogen atom.

Books Prescribed:

1. Quantum Physics of Atoms Molecules Solids, Nuclei & Particles: R. Eisberg and R. Resnick,
2. Elementary Modern Physics: Atam P. Arya.
3. Concepts of modern physics: A. Beiser.

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the properties of cathode rays and positive rays.
CO2	Explain the Photoelectric effect, Compton effect and the quantum theory of light
CO3	Understand the wave properties of particles and particle diffraction (Davisson Germer Experiment)
CO4	Understand the uncertainty principle, the Atomic structure and its development, Thomson and Rutherford atomic model.
CO5	Have information about the Bohr atom model.

B.Sc. (HONS.) PHYSICS SEMESTER–IV
MAP-241
MATHEMATICS-IV

Teaching Hours (per week): 4
Total Credits: 4
Credits: LTP: 310
Total Hours: 60
Maximum Marks: 100
(Theory Marks: 75+Internal Assessment: 25)
Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS:
1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit) Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. The Section-A will consist of eight short answer type questions, each of 2.5 marks. Students are to attempt any six.
3. The Sections–B, C, D & E will consist of two questions each (each question should be subdivided into at most two parts). Students are to attempt any four questions in total by selecting one question from each section. Each question carries 15 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:
 • To understand the concept of vector spaces and inner product.
 • To get familiar with the concepts of differential equations and its various applications.
 • To perceive knowledge about groups and various algebraic properties.

Course Content:

UNIT-I
Probability theory and distributions: Axiomatic theory of probability, probability density function, conditional probability, mathematical expectation, moments, moment generating function

UNIT-II
Conditional and marginal distribution, special frequency distributions, Binomial, Possion, Normal, Uniform, Gamma, Beta and Exponential distribution.

UNIT-III
Fourier series: Periodic functions, Dirichlet Conditions, Fourier Series and Fourier Coefficient, functions having arbitrary period, Sine and Cosine Series, half range expansions, Fourier integral(definitions), Harmonic Analysis.

UNIT-IV
Vector calculus: Vector differentiation and integration of vectors, Vectors operators, Gradient, Divergence and curl.Gauss, Stoke and Green's theorem (statements only) and their applications.

Reference Books:
1. B.S. Grewal, Higher Engineering Mathematics: Khanna Publishers, Delhi (1995).
2. Mohan Singh, Topics in Maths, Lakshmi Publication, New Delhi (1997)
3. N. S. Gopalakrishnan.: University Algebra, New Age International Publishers (2007)
4. Introduction to Electrodynamics (First chapter) by D. J. Griffiths, 3rd Edition, Published by Pearson   Education
5. Mathematical Physics by H.K. Dass & Dr. Rama Verma, Published by S. Chand
6. Mathematical Physics by Satya Prakash, Published by Sultan Chand & Sons
7. Mathematical methods for Physicists – Arfken& Weber – 6 th Edition-Academic Press- N.Y.1990
8. Mathematical Methods of Physics – Mathews & Walker – 2 nd Edition- Pearson Edition 1968.
9. An introduction to Ordinary Differential Equations, E. A. Coddington, 2009, PHI learning
10. Differential Equations, George F. Simmons, 2007, McGraw Hill.

Course outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Relate matrices with linear spaces.
CO2	Apply the concept of differentiation in solving differential equations in various fields.
CO3	analyse various physical phenomena using group theory.

B.SC. (HONS.) PHYSICS SEMESTER-IV
CHX-241
MOLECULAR SPECTROSCOPY-IV

Teaching Hours (per week): 3
Total Credits: 3
Credits: LTP:300
Total Hours: 45
Time: 3 Hours **Maximum Marks: 75**
(Theory Marks: 56+Internal Assessment: 19)
Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS AND CANDIDATES
(Scientific calculator is allowed)
Examiner will make five sections of paper namely Section-I, II, III, IV and V
Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
Section-I will consist of 8 short questions carrying 2 Mark each and student have to attempt any six parts.
Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 11 Marks.
The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

Course Objectives: Students will acquire the knowledge of energy and electromagnetic spectrum, ultraviolet and visible spectroscopy, Infrared spectroscopy. They will know about the applications of Wood-Fischer rule and IR Spectroscopy selection rules, factor affecting wave number. This course will help the students to know the instrumentation and basic concepts of NMR and Mass spectroscopy. They will be able to solve problems related to UV, IR, NMR and mass spectroscopy.

COURSE CONTENTS:
UNIT – I
Energy and Electromagnetic Spectrum
Introduction, the Electromagnetic Spectrum, Characteristics of Electromagnetic Radiations, Regions of the spectrum, Units of Frequency, Wavelength and Wave number, Interaction of radiation with matter, Absorption and emission spectroscopy, spectroscopic transition between two stationary states, energy levels, Transition probability and Selection Rules, spin-orbit coupling, singlet and triplet states, Fluorescence and Phosphorescence, Statement of Born-Oppenheimer approximation, Degree of freedom, Frank Condon Principle, Basic features of different spectrometers.
UNIT – II

Ultraviolet and Visible Spectroscopy
Introduction, Theory (Origin) of UV-Visible Spectroscopy, the energy of electronic excitation, instrumentation, Sample handling, Measurement techniques, Sample and reference cells, Solvents and solutions, Laws of light absorption-Beer's and Lambert's laws, Molar extinction coefficient, Electronic Transitions, Different types of transition noticed in UV spectrum of organic functional groups and their relative energies. Transition Probability: Allowed and Forbidden Transitions, Formation of Absorption Bands, Designation of Absorption Bands, Conjugated Systems and Transition Energies Chromophore, Auxochromes, Absorption and intensity shifts, Factors affecting λmax , Stereochemical Factors in Electronic Spectroscopy, Biphenyls and binaphthyls, Solvent effects, Applications of Electronic Spectroscopy-Conjugated Dienes and a,ß-Unsaturated Carbonyl Compounds.
Applications of UV-visible spectroscopy

Applications of UV spectroscopy, Woodward Fieser rules for calculating λ_{max} of conjugated polyenes and α,ß -unsaturated carbonyl compounds..

UNIT – III

Infrared Spectroscopy

Molecular Vibrations, Vibrational energy levels, Selection rules, Modes of vibration, Calculation of vibrational frequencies- degree of freedom, Force constant, Fundamental vibration frequencies, existence of overtones, Factors influencing Vibrational Frequencies (Vibrational Coupling, Hydrogen Bonding, Electronic effect, Bond Angles, Field Effect) of different functional groups. Instrumentation, sampling techniques-solids, liquids.

Applications IR Spectroscopy

Applications of IR spectroscopy, Absorption of Common functional Groups, Interpretation of simple IR spectra, Finger print regions. Simple numerical problems based on UV and IR spectroscopy.

UNIT – IV

Nuclear Magnetic Resonance

The Nuclear spin, Larmor frequency, the NMR isotopes, Population of nuclear spin level, Spin and Spin lattice relaxation. Measurement techniques (CW & FT method), Solvent used. Chemical shift, Reference compounds, Shielding constant, Range of typical chemical Shifts, Simple application of chemical shifts, Anisotropic effect. Spin spin splitting, Coupling constant.

Applications of NMR spectroscopy

NMR spectra with various examples such as ethyl bromide, ethanol, acetaldehyde, 1,1,2- tribromoethane, ethyl acetate, toluene, o-, m-, p- anisidine, o-, m-, p- nitrophenols, acetophenone. Simple numerical of structure elucidation of NMR spectroscopic data.

BOOKS PRESCRIBED:

1. Organic Spectroscopy By W. Kemp; Publisher- Palgrave, New York
2. D.H. Williams and I. Fleming. Spectroscopic Methods in Organic Chemistry.
3. Spectrometric Identification of Organic Compounds - R.M. Silverstein & F. X. Webster; Publisher: John Willey and Sons,Inc.
4. Introductory Problems in Spectroscopy- By R.C. Banks, E.R. Matjeha and G. Mercer; Publisher : The Benzamine / Cummings Publishing Company Inc.
5. Introduction to Spectroscopy – D. L. Pavia, G. M .Lampman, and G. S. Kriz Publisher: Brooks / Cole, a part of cengage learning

COURSE OUTCOMES:

Sr. No.	On completing the course, the student will be able to
CO1	Understand the spectrums, their types and characteristics.
CO2	Understand the various aspects of UV-Visible spectroscopy and behaviour of UV-peaks and its shifting under different conditions.
CO3	Ssolve the absorption wavelength of conjugated polyenes and α,ß -unsaturated carbonyl compounds.
CO4	Interpret the IR spectrum and relate the spectral peaks with the various types of bonds present in the molecules.
CO5	Interpret the actual NMR spectrum and calculate the chemical shift, coupling constant and correlate the NMR peaks with structure and proton counting.

B.Sc. (HONS.) PHYSICS SEMESTER–IV
Course Code: ESL–222
Course Title: ENVIRONMENTAL STUDIES–II (COMPULSORY)
B.A./B.Sc. (Biotech., Food Sci., Comp. Sci., Eco., FD., IT., Med., Non Med.)/B.Sc. (Hons.-Physics, Chemistry, Maths)/B.B.A./B.C.A./B.Com./B.Com. (Hons.)/BJMC/BA Social Sciences/BA (Hons.) Punjabi, BA (Hons.) English, B.Voc (Food Processing, Theatre and Stage Craft, Software Development, Textile Design & Apparel Tech)

Teaching Hours (per week): 2
Total Credits: 2
Credits:LTP:200
Total Hours: 30
Time: 3 Hours   **Maximum Marks: 50**
Pass Marks: 35%

Instructions for Paper Setters: The question paper will consist of three sections. Candidate will be required to attempt all the sections. Each unit of the syllabus should be given equal weightage of marks. Paper to be set in English, Punjabi and Hindi.
Section–A: (16 Marks): It will consist of five short answer type questions. Candidates will be required to attempt four questions, each question carrying four marks. Answer to any of the questions should not exceed two pages.
Section–B: (24 Marks): It will consist of five questions. Candidates will be required to attempt four questions, each question carrying six marks. Answer to any of the questions should not exceed four pages.
Section–C: (10 Marks): It will consist of two questions. Candidate will be required to attempt one question (carrying ten marks) only. Answer to the question should not exceed 5 pages.
Course Objectives:

1   To study the concept of Biodiversity – role, importance, values and its conservation. Hot spots and threats to biodiversity.
2   To create awareness regarding environmental pollution, its causes and effects and preventive measure to control the different types of pollution.
3   To make students aware of growing human population – causes and concern. Family welfare programs. Road safety (Traffic) rules.
4   To know about entrepreneurship development and civil/self defense.

Unit-I

Biodiversity and its Conservation:
- Definition: Genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of Biodiversity: Consumptive use; productive use, social, ethical, aesthetic and optionvalues.
- Biodiversity of global, National and local levels.
- India as mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to Biodiversity: Habitat loss, poaching of wild life, man wildlife conflicts. Threatened and endemic species of India.
- Endangered species, vulnerable species, and rare species.
- Conservation of Biodiversity: In situ and Ex-situ conservation of biodiversity. National Parks, Wild life sanctuaries, Biosphere reserve, Project Tiger, Project Elephant.

Unit-II

Environmental Pollution:
Environmental Pollution: Concepts and Types
- Definition, causes, effects and control measures of:
    a) Air Pollution

b) Water Pollution

c) Soil Pollution

d) Marine Pollution

e) Noise Pollution

f) Thermal Pollution

g) Nuclear Hazards

h) Electronic Waste

➢ Concepts of hazards waste & human health risks.

➢ Solid Waste Management: Causes, effects and control measures of municipal, biomedical and e-waste

➢ Role of an individual in prevention of pollution.

➢ Pollution case studies.

➢ Disaster Management: Floods, Earthquake, Cyclone and Landslides.

Unit-III

Human Population and the Environment

➢ Human population growth: impacts on environment.

➢ Population explosion-Family welfare programme.

➢ Environment and human health: Concept of health and disease, common communicable and non communicable diseases, public awareness

➢ Human rights.

➢ Value education.

➢ Women and child welfare.

➢ Role of information technology in environment and human health.

➢ Environment movments in India: Chipko movement, Silent valley movement and other case studies.

➢ Road Safety Rules & Regulations**:** Use of Safety Devices while Driving, Do's and Don'tswhile Driving, Role of Citizens or Public Participation, Responsibilities of Public underMotor Vehicle Act, 1988, General Traffic Signs.

➢ Accident & First Aid**:** First Aid to Road Accident Victims, Calling Patrolling Police &Ambulance.

Unit-IV

National Service Scheme:

● **Entrepreneurship Development:** Definition & Meaning; Qualities of good entrepreneur; Steps/ ways in opening an enterprise; Role of financial and support service Institutions.

● **Civil/Self Defense:** Civil defense services, aims and objectives of civil defense; Needs for self-defense training.

Field Visits:

● Visit to a local area to document environmental assets–river/forest/ grassland/hill/mountain.

● Visit to a local polluted site–Urban/Rural/Industrial/Agricultural.

● Study of common plants, insects, birds.

● Study of simple ecosystems–pond, river, hill slopes etc.

● Contribution of the student to NSS/any other social cause for service of society.

● Visit to Museum/Science City

● Municipal solid waste management and handling.

Note: In this section the students will be required to visit and write on the environment of an area/ ecosystem/vi1lage industry/disaster/mine/dam/agriculture field/waste management/hospital etc. with its salient features, limitations, their implications and suggestion for improvement.

References/Books:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.
2. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
3. Down to Earth, Centre for Science and Environment, New Delhi.
4. Jadhav, H. & Bhosale, V. M. 1995. Environmental Protection and Laws. Himalaya Pub.
5. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, PearsonEducation (Singapore) Pte. Ltd., Delhi.
6. Kaushik, A. & Kaushik, C. P. 2004. Perspective in Environmental Studies,New Age International (P) Ltd, New Delhi.
7. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.
8. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.

9. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex,Amritsar
10. Asthana, D.K. 2006. Text Book of Environmental Studies, S. Chand Publishing.
11. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.
12. Basu, M., Xavier, S. 2016. Fundamentals of Environmental Studies, Cambridge University Press, India.
13. Mahapatra, R., Jeevan, SS, Das S. 2017. Environment Reader for Universities, Centre for Science and Environment, New Delhi.

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO-1	Know about the meaning of Biodiversity and its role in environment.
CO-2	Learn about the causes of different forms of pollution and their control measures.
CO-3	Understand the causes and challenges of growing human population, women and child welfare programs.
CO-4	Know the development of entrepreneurship and techniques of civil/self-defense.

B.Sc. (HONS.) PHYSICS SEMESTER–IV
Geography
BGEO-2432
INTERDICIPLINARY COURSE ID-II
Syllabus for B.Sc. Hons. (Mathematics, Physics, Chemistry)

Time: 3 hours

Credit hours (per week): 04
Total Credits: 3
LTP: 201
Total hours: 60
Total Marks: 75
Theory: 37 Marks
Internal Assessment: 19 Marks
Practical: 19 Marks (Written: 5 marks, Record (File): 7 marks, Viva Voce: 7 Marks)
Pass Marks: 35%

Instructions for the Paper Setter:
The Medium of Instruction is English.
Section A: -It will consist of 12 questions from the part A & B. All questions are compulsory. Each question will carry one mark, the total weightage being 12 marks.
(12×1=12 marks)
Section B: - It will consist of 8 questions from part A & B upto 100 words in length. The students will be required to attempt any 5 questions. Each question will carry 5 marks the total weightage being 25 marks.

(5x5=25 Marks)
Course Objectives: To develop in them an understanding of basic concepts, principals and theories relating to geographical phenomena. Students will gain factual knowledge about atmospheric phenomena, global climate system and global oceans.

Part A: Physical Geography

1. **Exploring the Earth:** The shape of the Earth, The Earth's movements, Day and Night, The Earth's Revolution, Dawn and Twilight, Latitude and Longitude, Longitude and Time, Standard Time and Time Zones, The International Date line.
2. **The Earth's Crust:** The Structure of the Earth, Classification of Rocks, (Igneous, Sedimentary and Metamorphic), Types of Mountains, Types of Plateaus, Types of Plains.
3. **The Oceans:** Ocean currents of Indian, Pacific Atlantic Ocean.

Part B: Weather, Climate and Vegetation

1. **Weather:** The Difference between Climate and Weather, The Elements of Weather and Climate: Rainfall, Pressure, Temperature and Humidity, Winds, Sunshine.
2. **Climate:** Composition and Structure of Atmosphere, Factors affecting Insulation, Factors affecting temperature, Precipitation, Rainfall, Monsoon
3. **Vegetation:** Climatic types and natural vegetation, World climatic types

Part-C: Practical work

Maps: Physical (India and World), Types of soil (India), Monsoon

Maps: Vegetation (India), Rainfall (India and World), Natural calamities (last six months) earthquake, flood, cyclone, tsunami and landslides

Prescribed Text:

1. Certificate Physical & Human Geography by G.C. Leong
2. Oxford India Atlas (Latest Edition)
3. Spectrum- Geography & India

Course Outcomes	
CO-1	It enables the students to acquire basic knowledge of geography as a spatial science and to secure employment in the sectors of geospatial analysis development and planning mapping.
CO-2	Understand effects of rotation, revolution and interior structure of the earth.
CO-3	Analyze the interaction between Earth's atmosphere and Earth's surface and how atmospheric moisture works.
CO-4	Learn the behavior and characteristics of global oceans

B.Sc. (HONS.) PHYSICS SEMESTER–IV
PC Based Physics Experiments
SEC- HP-241

Teaching Hours (per week):5
Total Credits:3
LTP:102

Time: 1.5 Hours for Theory   **Total Hours: 45**
Time: 3 Hours for Practical   **Total Marks: 75**
(Theory Marks: 19+6=25 &
Practical Marks :37+13=50)
Pass Marks: 35%

INSTRUCTIONS:

1.   **There will be three sections.**
2.   **Section A is compulsory and will be of 5 marks consisting of 7 short answer type questions carrying 1 mark each covering the whole syllabus. The answer should not exceed 20 words. The candidate will have to attempt any 5 questions in this section.**
3.   **Sections B and C will be set from units I & II respectively and will consist of two questions of 7 marks each from the respective unit. The candidates are required to attempt one question from each of these sections. Each question in these sections should not have more than two subparts.**

Course Objectives:
The main objective of this course is to make students familiar with the Programming in Fortran 77 and its applications in different areas of physical sciences.

Course Content:

UNIT-I
Introduction to Fortran 77 basic steps in solving any problem, input data processing of data, operator's arithmetic, relational & logical operators. Variable & Constants, function.

UNIT-II
Basic format of Program, comment line, declaration of variable, assignment statement, loop statement, displaying of results, stop & end of Program, types of error,

List of Practical-

1. To compute sum sine series.

2. To compute the sum of cosine series.

3. To fit a straight line to a given set of data points.

4. To study the charging & discharging of capacitor.

5. To study RC & Rl circuit.

Books Prescribed:
1. Ram Kumar-Programming with Fortran-77 (Tata McGraw Hill), 1995.
2. R.S. Dhaliwal - Programming with Fortran-77 (Wiley-Eastern Ltd)
3. RC Verma, Computational Physics New Age International.
4. N. Singh Computational Methods for physics & Mathematics Narosa.

Course Outcomes

Sr. No.	On completing the course, the students will be able to:
CO1	Know about to write programs in FORTRAN 77 programming language.
CO2	Learn the basic terms like constants, variables, structures, arrays etc. used in Fortran programming language

CO3   Apply Fortran programming to study the charging discharging of capacitor.
CO4   Apply Fortran programming to evaluate the sum of sine & cosine series.
CO5   Understand the uses of operators & function in Fortran.

B.Sc. (HONS.) PHYSICS SEMESTER–IV
BHP-243
PHYSICS LAB-VII

Teaching Hours (per week): 4
Total Credits: 2
Credits:LTP:002
Total Hours: 60

Time: 3 Hours
Maximum Marks: 50
(Practical Marks: 37+Internal Assessment: 13)
Pass Marks: 35%

General Guidelines for Practical Examination

The distribution of marks is as follows:
i)   One experiment **15 Marks**
ii)   Brief Theory **5 Marks**
iii)   Viva–Voce **10Marks**
iv)   Record (Practical file) **7 Marks**

v)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.
vi)   Number of candidates in a group for practical examination should not exceed 12.
vii)   In a single group no experiment be allotted to more than three examinee in any group.

Course Objectives: Objectives of this course are to understand spectrometer, telescope, microscope, plane diffraction grating, least count etc. To understand different sources of light and associated experiments. To understand how light propagates through lenses, mirrors, prisms, and other optical systems. To understand, design and conduct experiments, analyse and interpret data using optical systems. To understand the concept of polarization through experiment.

LIST OF EXPERIMENTS

1. To determine refractive index of glass using spectrometer.
2. **To determine refractive index of liquid using spectrometer.**
3. To determine the Cauchy's constants.
4. To study the refractive index of a doubly refracting prism.
5. To set up Newton's rings to determine wavelength of sodium light.
6. To determine the wavelength by using plane diffraction grating (Use Hg source)
7. To determine dispersive power of plane diffraction grating.
8. To determine resolving power of a telescope.
9. To determine resolving power of a grating.
10. To study the absorption spectra of iodine vapours.
11. To study the rotation of plane of polarization by using polarimeter.
12. To determine the specific rotation of sugar using Laurent's half shade polarimeter

Books Prescribed:
1   Practical Physics Volume-II, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications
2   Practical Physics, C.L. Arora, S. Chand & Co.

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand spectrometer, telescope, microscope, plane diffraction grating, least count etc.
CO2	Understand different sources of light and associated experiments.
CO3	Understand the light propagation through lenses, mirrors, prisms, and other optical systems.
CO4	Understand design , conduct experiments, analyse and interpret data using optical systems.
CO5	Understand polarization with experiment.

B.Sc. (HONS.) PHYSICS SEMESTER–IV
BHP-244
PHYSICS LAB-VIII

Teaching Hours (per week): 4
Total Credits: 2
Credits:LTP:002
Total Hours: 60

Time: 3 Hours
Maximum Marks: 50
(Practical Marks: 37+Internal Assessment: 13)
Pass Marks: 35%

General Guidelines for Practical Examination
The distribution of marks is as follows:
viii) One experiment **15 Marks**
ix) Brief Theory **5 Marks**
x) Viva–Voce **10Marks**
xi) Record (Practical file) **7 Marks**
xii) 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.
xiii) Number of candidates in a group for practical examination should not exceed 12.
xiv) In a single group no experiment be allotted to more than three examinee in any group.

Course Objectives: Objectives of this course are to understand spectrometer, telescope, microscope, plane diffraction grating, least count etc. To understand different sources of light and associated experiments. To understand how light propagates through lenses, mirrors, prisms, and other optical systems. To understand, design and conduct experiments, analyse and interpret data using optical systems. To understand the concept of polarization through experiment.

LIST OF EXPERIMENTS
1. To study the inverse square law of radiation photo voltaic cell.
2. To study the spectral characteristics of photo voltaic cell.
3. To study the Planck's constant using photo cell.
4. To use a multimeter for measuring voltage (AC, DC).
5. To use a multimeter for measuring current (AC, DC).
6. To use a multimeter for measuring resistance.
7. To determine the wavelength of laser using single slit diffraction pattern.
8. To determine the wavelength of laser using diffraction grating.
9.

Books Prescribed:

1 Practical Physics Volume-II, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications
2 Practical Physics, C.L. Arora, S. Chand & Co.

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand spectrometer, telescope, microscope, plane diffraction grating, least count etc.
CO2	Understand different sources of light and associated experiments.

CO3	Understand the light propagation through lenses, mirrors, prisms, and other optical systems.
CO4	Understand design , conduct experiments, analyse and interpret data using optical systems.
CO5	Understand polarization with experiment.

B.SC. (HONS) PHYSICS (SEMESTER–IV)
CHX-242
PHYSICAL CHEMISTRY LAB-IV

Teaching Hours (per week): 2
Total Credits: 1
Credits:LTP:001
Total Hours: 30
Time: 3 Hours   **Maximum Marks: 25**
(Theory Marks: 19+Internal Assessment: 06)
Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS AND CANDIDATES:
I.   Examiner will give one organic salt to the students.
II.   Each student will get different salt and analyse it for elements, functional group and prepare its derivatives.
III.   The question paper will be 19 marks with split as under:
(Write up = 6, Performance = 6, Viva-voce = 5, Practical note book = 2)Course Objectives: This practical course enables the students to understand the physical properties of liquids such as surface tension, density and viscosity. Students are able to understand the measurement techniques of some of the physical properties. Students will learn to handle apparatus like stalagmometer, Ostwald's viscometer and calorimeter. Students will be able to understand the acid-base titrations in the laboratory.

COURSE OBJECTIVE: Students will be able to find strength, normality of unknown solution through conductometric titration, adsorption isotherms, polarimetry, refractometric, use of calorimeter to find enthalpy of neutralization of strong acid and base.

COURSE CONTENTS:
Note. The question paper will be set by the examiner based on the syllabus.

1.   **Refractometry**: Determine refractive index of a given liquid as a criterion for its purity. (Benzene i.e. commercial) benzene + A.R. acetone).

2.   **Polarimetry**: Determine the %age composition of an optically active solution.

3.   Calorimetry:
a) Determination of Heat of neutralization
        (i) Strong acid-strong base
         (ii) Weak acid-strong base.
 b) Determination of Heat of solution of KCl, NH_4Cl, KNO_3

4.   Conductometry:
a) Determination of cell constant.
b) Determination of specific and equivalent conductance of electrolyte (NaClandHCl).
c) Precipitation titration of Na_2SO_4 vs. $BaCl_2$.
d) Neutralization titrations NaOH vs. HCl and NaOH vs. CH_3COOH.

5.   Determination of adsorption isotherm of oxalic acid on charcoal.

Books Prescribed:
1. Advance Practical Chemistry, J. B. Yadav

Course Outcomes:

S. No.	On completing the course,
CO1	Students will learn to measure refractive index of various solvents using refractometer.
CO2	Students will learn to measure angle of rotation with the help of polarimeter and then calculate the optical activity of various solutions.
CO3	Students will learn to calculate the heat of neutrilization, heat of solution of acids, bases and salts with the help of a calorimeter..
CO4	By doing the experiments on conductometer, students will learn measure the cell constant, equivalent conductance, specific conductations and will also perform conductometric titrations.
CO5	By performing the experiment of adsorption ,they will learn about the adsorption isotherm.