

B.Sc. (Hons.) Physics

Course Structure and Syllabus (Based on Choice Based Credit System) 2019 onwards

Bachelor of Sciences (Hons) Physics Program

Duration: 3 Years (Semester System)

Eligibility: The prospective student must have 10+2 or equivalent with minimum 50% marks or equivalent in aggregate with Physics as one of the main subjects. A relaxation for the minimum marks will be as per Punjab government regulations.

PROGRAM EDUCATIONAL OBJECTIVES: At the end of the program, the student will be able to:

PEO1	Apply principles of basic science concepts in understanding, analysis and prediction of physical systems.
PEO2	Develop human resource with knowledge, abilities and insight in Physics and related fields required for career in academia and industry.
PEO3	Engage in lifelong learning and adapt to changing professional and societal needs.

PROGRAM OUTCOMES: At the end of the program, the student will be able to:

PO1	Apply the knowledge gained to solve the scientific problems.
PO2	Identify, formulate, and analyze scientific problems reaching substantiated conclusions using first principles of mathematical, physical, and chemical sciences.
PO3	Design solutions for physics problems that meet the specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal consideration.
PO4	Use research-based knowledge and methods including design of experiments, analysis, interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Create, select, and apply appropriate techniques, resources, and modern scientific tools to physics problems with an understanding of the limitations.
PO6	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues, and the consequent responsibilities relevant to the professional scientific practice.
PO7	Understand the impact of the scientific solutions in societal and environmental

	contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Apply ethical principles and commit to the norms of scientific practice.
PO9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communicate effectively on scientific activities with the Scientific/Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Demonstrate knowledge and understanding of the scientific principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of scientific and technological change.

PROGRAM SPECIFIC OUTCOMES: At the end of the program, the student will be able to:

PSO1	Understand the concepts of different branches of physics.
PSO2	Demonstrate expertise to conduct wide range of scientific experiments.
PSO3	Apply the concepts of physics in areas of mechanics, electromagnetism, solid state, nuclear, etc., in industry, academia, and day-to-day life.

SEMESTER FIRST

Course Code	Course Title	Type of course	Load Allocation			Marks Distribution		Total Marks	Cr
			L	T	P	Internal	External		
UC-BSHP-111-19	Optics	Core Course Theory and Practical	4	-	-	40	60	100	4
UC-BSHP-112-19	Electricity and Magnetism		4	-	-	40	60	100	4
UC-BSHP-113-19	Physics Lab-I		-	-	4	30	20	50	2
UC-BSHM 104-19	Calculus-I	General Elective and Practical	4	1	-	40	60	100	4
UC-BHCL-I-101-19	Inorganic Chemistry		4	1	-	40	60	100	4
UC-BHCP-I-102-19	Chemistry Lab-I		-	-	4	30	20	50	2
UC-BSHL-105-19	Communicative English -I	Ability Enhancement Compulsory Course	2	-	-	20	30	50	2
UC-BSHL-106A/106B-19	Punjabi Compulsory-I or Mudhli Punjabi-I		2	-	-	20	30	50	2
TOTAL			16	4	8	260	340	600	24

L: Lectures T: Tutorial P: Practical Cr: Credits

SEMESTER SECOND

Course Code	Course Title	Type of course	Load Allocation			Marks Distribution		Total Marks	Cr
			L	T	P	Internal	External		
UC-BSHP-121-19	Waves and Vibrations	Core Course Theory and Practical	4	-	-	40	60	100	4
UC-BSHP-122-19	Mechanics		4	-	-	40	60	100	4
UC-BSHP-123-19	Physics Lab-II		-	-	4	30	20	50	2
UC-BSHM-XXX-19	Mathematics	General Elective and Practical	4	1	-	40	60	100	4
UC-BSHC-XXX-19	Organic Chemistry		4	1	-	40	60	100	4
UC-BSHC-XXX-19	Chemistry Lab-II		-	-	4	30	20	50	2
UC-BSHX-XXX-19	Communicative English -II	Ability Enhancement Compulsory Course	2	-	-	20	30	50	2
UC-BSHX-XXX-19	Punjabi Compulsory -II or Mudhli Punjabi-II		2	-	-	20	30	50	2
TOTAL			16	4	8	260	340	600	24

L: Lectures T: Tutorial P: Practical Cr: Credits

Examination and Evaluation

Theory			
S. No.	Evaluation criteria	Weightage in Marks	Remarks
1	Mid term/sessional Tests	24	Internal evaluation (40 Marks) MSTs, Quizzes, assignments, attendance, etc., constitute internal evaluation. Average of two mid semester test will be considered for evaluation.
2	Attendance	6	
3	Assignments	10	
4	End semester examination	60	External evaluation
5	Total	100	Marks may be rounded off to nearest integer.
Practical			
1	Evaluation of practical record/ Viva Voice/Attendance/Seminar/ Presentation	30	Internal evaluation
2	Final Practical Performance + Viva-Voce	20	External evaluation
3	Total	50	Marks may be rounded off to nearest integer.

Instructions for Paper-Setter in B. Sc (Hons.) Physics

A. Scope

1. The question papers should be prepared strictly in accordance with the prescribed syllabus and pattern of question paper of the University.
2. The question paper should cover the entire syllabus with proper distribution and Weightage of marks for each question.
3. The language of questions should be simple, direct, and documented clearly and unequivocally so that the candidates may have no difficulty in appreciating the scope and purpose of the questions. The length of the expected answer should be specified as far as possible in the question itself.
4. The distribution of marks to each question/answer should be indicated in the question paper properly.

B. Type and difficulty level of question papers

1. Questions should be framed in such a way as to test the students intelligent grasp of broad principles and understanding of the applied aspects of the subject. The Weightage of the marks as per the difficulty level of the question paper shall be as follows:
 - i) Easy question 30%
 - ii) Average questions 50%
 - iii) Difficult questions 20%
2. The numerical content of the question paper should be upto 25%.

C. Format of question paper

1. Paper code and Paper-ID should be mentioned properly.
2. The question paper will consist of three sections: Sections-A, B and C.
3. Section-A is **COMPULSORY** consisting of **TEN SHORT** questions carrying two marks each (total 20 marks) covering the entire syllabus.
4. The Section-B consists of **FOUR** questions of eight marks each covering the entire **PART-A** of syllabus (Taking two questions from every unit).
5. The Section-C consists of **FOUR** questions of eight marks each covering the entire **PART-B** of syllabus (Taking two questions from every unit).
6. Attempt any five questions from Section-B and Section-C, selecting at least two questions from each of the two sections.

Question paper pattern for MST:

Roll No:	No of pages:
IK Gujral Punjab Technical University- Jalandhar	
Department of Physical Sciences	
Academic Session:	
Mid-Semester Test: I/II/III (Regular/reappear)	Date:
Programme: B.Sc. (Hons.) Physics	Semester:
Course Code:	Course:
Maximum Marks: 24	Time: 1 hour 30 minutes

❖ Note: Section A is compulsory; Attempt any two questions from Section-B and one question from Section-C.

Section: A		Marks	COs
1		2	
2		2	
3		2	
4		2	
Section: B			
5		4	
6		4	
7		4	
Section: C			
8		8	
9		8	

Details of Course Objectives

CO1	
CO2	
CO3	
CO4	
CO5	

SEMESTER-I

UC-BSHP-111-19	Optics	L-3, T-1, P-0	4 Credits									
Pre-requisite: Understanding of senior secondary level Physics and Mathematics												
Course Objectives: The objective of the course is to develop basic understanding of Interference, Diffraction and Polarization among students. The Students also learn about the LASER and its applications. Students will be equipped with knowledge to measure wavelength, refractive index and other related parameters, which will act as a strong background if he/she chooses to pursue physics as a career.												
Course Outcomes: At the end of the course, the student will be able to												
CO1	Identify and illustrate physical concepts and terminology used in optics and other related wave phenomena											
CO2	Analyze and understand coherence and phenomenon of interference and their applications											
CO3	Acquainted with Fresnel's and Fraunhofer's diffraction and their applications.											
CO4	Get thorough knowledge of the polarization of light and its changes upon reflection and transmission, and will learn to analyze the polarization in optical systems.											
CO5	Describe the different types of lasers, its principle, properties of laser beam.											
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	-	1	2	1	2	3	2	2
CO2	2	2	1	2	1	1	1	1	1	3	1	1
CO3	3	2	2	2	1	1	2	1	1	3	1	1
CO4	2	2	2	2	1	1	2	1	1	3	1	1
CO5	2	2	2	2	1	1	2	1	1	3	1	1

Detailed Syllabus:

PART-A

UNIT I

Interference: Definition and properties of wave front, Temporal and Spatial Coherence, Young's double slit experiment, Lloyd's single mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films, Fringes of equal inclination (Haidinger Fringes), Newton's Rings: Measurement of wavelength and refractive index, Interferometer: Michelson Interferometer-(1) Idea of form of fringes (No theory required), (2) Determination of Wavelength, (3) Wavelength Difference, (4) Refractive Index, Fabry-Perot interferometer. (11 Lectures)

UNIT-II

Diffraction: Huygens Principle, Huygens-Fresnel Diffraction theory, Fraunhofer diffraction: Single slit. Circular aperture, Rayleigh criterion of resolution, Resolving Power of a telescope, Double slit, Multiple slits, Diffraction grating, Resolving power of grating. Fresnel Diffraction: Fresnel's Assumptions, Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Propagation of Light, Theory of a Zone Plate: Multiple Foci of a Zone Plate, Fresnel diffraction pattern of a straight edge and circular aperture. (11 Lectures)

PART-B

UNIT-III

Polarization: Plane polarized light, Representation of Unpolarized and Polarized light, Polarization by Reflection, Brewster's law, Malus Law, Polarization by Selective absorption by Crystals, Polarization by Scattering, Polarization by Double Refraction, Nicol Prism, Huygen's theory of Double Refraction, Polaroid, Elliptically and Circularly polarized lights, Quarter and Half wave plates. (11 Lectures)

UNIT-IV

Laser and Application: Lasers, Spontaneous emission, Stimulated absorption, Stimulated emission, Einstein coefficients, Einstein relations, Conditions for Laser actions, Population inversion, Different types of Laser Pumping mechanism: Optical Pumping, Electric Discharge and Electrical pumping, Resonators, Two, Three and Four level laser systems, Ruby laser, He-Ne gas Laser, Semiconductor laser, CO₂ laser, applications of laser: Holography, Principle of Holography. (11 Lectures)

Text and Reference Books:

1. Optics: A.K. Ghatak (Tata-McGraw Hill), 1992.
2. Fundamentals of Optics: F.A. Jenkins and H.E. White (McGraw Hill), 1981.
3. A Text Book of Optics: N. Subrahmaniyam et al. (S. Chand Publishing) (2006).
4. O. Svelto, "Principles of Lasers", Springer Science & Business Media, 2010.

UC-BSHP-112-19	Electricity and Magnetism					L-3, T-1, P-0	4 Credits					
Pre-requisite: Basic knowledge of Electricity and Magnetism at high school level.												
Course Objectives: The objective of the course is to expose the students to the formal structure of electricity and magnetism so that they can use these as per their requirement.												
Course Outcomes: At the end of the course, the student will be able to												
CO1	Understand and describe the different concepts of electromagnetism											
CO2	To obtain the electric and magnetic fields for simple configurations under static conditions.											
CO3	To analyse time varying electric and magnetic fields.											
CO4	To understand Maxwell's equation in different forms and different media.											
CO5	have a solid foundation in fundamentals required to solve problems and also to pursue higher studies.											
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	2	1	2	1	2	3	2	2
CO2	3	2	1	-	2	2	1	1	1	3	1	1
CO3	3	2	3	-	2	1	2	1	1	3	1	1
CO4	3	2	3	2	-	2	2	1	1	3	1	1
CO5	2	2	3	2	-	2	2	1	1	3	1	1

Detailed Syllabus:

PART-A

UNIT I

Review of Vector Analysis: Vector algebra, scalar and vector product; Concept of Fields; scalar and vector field; gradient, divergence and curl and their physical significance; Conservative field, Line, surface and volume integral of a vector field, Gauss-divergence theorem and Stoke's theorem.
(10 Lectures)

UNIT II

Electrostatics: Electrostatic field; electric flux; Gauss's law in integral and differential form; Applications of Gauss law-Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charge sheet; Electric potential as line integral of electric field, potential due to point charge and electric dipole; calculation of electric field from potential; Poisson's equation and Laplace's equation(Cartesian coordinate); Capacitance; capacitance of a spherical conductor and cylindrical capacitor, Energy per unit volume in electrostatic field, Dielectric medium, dielectric polarization and its types, Displacement vector, Boundary conditions.
(12 Lectures)

PART-B

UNIT-III

Magnetostatics: Magnetic flux; magnetic flux density; Faraday's law; magnetomotive force; Biot-Savart's law and its applications-straight conductor, circular coil, divergence and curl of magnetic field; Ampere's Circuital law in integral and differential form; Magnetic vector potential; ampere's force law; magnetic vector potential; Energy stored in a magnetic field, boundary conditions on magnetic fields.
(10 Lectures)

UNIT-IV

Maxwell's Equations and Electromagnetic Waves: Equation of continuity for time varying fields; Inconsistency of Ampere's law; concept of sinusoidal time variations (Phasor notation); Maxwell's equations in differential and integral form, physical significance; Maxwell equations in free space, static field and in Phasor notation; Difference between displacement current and conduction current; Wave equation in free space and in homogenous medium, Concept of Poynting vector; Poynting Theorem.
(11 Lectures)

Reference Books:

1. David Griffiths, Introduction to Electrodynamics, Pearson Education India Learning Private Limited; 4th edition.
2. Edward C Jordan and Keith G Balmain, Electromagnetic waves and radiating systems, Prentice Hall.
3. Kraus John D, Electromagnetics, McGraw-Hill Publisher.
4. W. Saslow, Electricity, Magnetism and Light, Academic Press.
5. A Textbook of Electricity and Magnetism, S.K. Sharma and S. Sharma, Publisher: S Dinesh & Co.
6. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.

UC-BSHP-113-19	Physics Lab-I	L-0, T-0, P-4	2 Credits									
Pre-requisite (If any): High-school education												
Course Objectives: The aim and objective of the lab course is to introduce the students to the formal structure of electromagnetism and phenomenon of wave optics so that they can use these as per their requirement.												
Course Outcomes: At the end of the course, the student will be able to												
CO1	Able to verify the theoretical concepts/laws learnt in theory courses.											
CO2	Trained in carrying out precise measurements and handling sensitive equipment.											
CO3	Understand the methods used for estimating and dealing with experimental uncertainties and systematic “errors”.											
CO4	Learn to draw conclusions from data and develop skills in experimental design.											
CO5	Document a technical report which communicates scientific information in a clear and concise manner.											
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	2	1	2	3	2	3
CO2	3	3	1	-	2	2	1	1	1	3	2	3
CO3	3	3	2	-	2	1	2	1	1	3	2	3
CO4	3	2	2	2	-	2	2	1	1	3	2	3
CO5	2	2	2	2	-	2	2	1	1	3	2	3

Note: Students are expected to perform about 8-10 experiments from the following list, selecting minimum of 6-7 from the Physical Lab and 2-3 from the Virtual lab.

List of experiments:

1. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses.
2. To study the laser beam characteristics like; wave length, aperture, spot size, etc. using diffraction grating.
3. To study the diffraction using laser beam and thus to determine the grating element.
4. To study wavelength and laser interference using Michelson's Interferometer.
5. To find the refractive index of a material/glass using spectrometer.
6. To find the refractive index of a liquid using spectrometer.
7. To determine the resolving power of a prism.
8. To study the magnetic field of a circular coil carrying current using a Steward and Gees Tangent Galvanometer.
9. Determine the radius of circular coil using the Circular coil.
10. To study B-H curve using CRO.
11. To find out polarizability of a dielectric substance.
12. To find out the horizontal component of earth's magnetic field (B_h).

Text and Reference Books:

1. A Text -book of Practical Physics, I. Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal.
2. Engineering Practical Physics, S. Panigrahi & B. Mallick, 2015, Cengage Learning India Pvt. Ltd.
3. Practical Physics, G.L. Squires, 2015, 4th Edition, Cambridge University Press.
4. Practical Physics, C L Arora. S. Chand & Company Ltd.
5. <http://www.vlab.co.in>

UC-BSHM-104-19	CALCULUS-I	L-4, T-1, P-0	4 Credits									
Pre-requisite: Understanding of senior secondary level Mathematics												
Course Objectives: The objectives of this course are to make the students understand the following: <ol style="list-style-type: none"> 1. The fundamental concepts of differential and integral calculus. 2. The geometrical meaning of functions, limits, continuity, derivatives, mean value theorems. 3. Applications of derivatives and integrals. 4. Limit, Continuity, partial derivatives and their applications in finding extreme values. 5. The utility of double and triple integrals in finding area and volume bounded by surfaces. 												
Course Outcomes: At the end of the course, the student will be able to												
CO1	Understand the fundamental concepts of differential and integral calculus.											
CO2	Apply the knowledge of derivatives in finding extreme values of the function and definite integrals to find area under the curve.											
CO3	The geometrical meaning of functions, limits, continuity, derivatives, mean value theorems.											
CO4	Limit, Continuity, partial derivatives and their applications in finding extreme values.											
CO5	The utility of double and triple integrals in finding area and volume bounded by surfaces.											
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	2	1	2	3	2	3
CO2	3	3	1	-	2	2	1	1	1	3	2	3
CO3	3	3	2	-	2	1	2	1	1	3	2	3
CO4	3	2	2	2	-	2	2	1	1	3	2	3
CO5	2	2	2	2	-	2	2	1	1	3	2	3
Detailed Syllabus:												
Section-A												

UNIT-I

Functions of single variable, Simple examples of limit, continuity, differentiability, Derivative of elementary functions (t-ratios, logarithmic functions, exponential functions), Higher order derivatives, Statement of Mean value theorems and simple applications, Applications of derivative: increasing decreasing functions, extreme values of functions. **(Ref. 1)**

UNIT-II

Integration as an inverse process of differentiation, Finding integrals by partial fractions, by parts, Statement of fundamental theorem of calculus, Finding definite integrals by method of substitution, Applications of definite integral in finding length of an arc, area under simple curves, area enclosed between two curves. **(Ref. 1)**

Section-B

UNIT-III

Introduction of Limit, continuity of functions of two variables with simple examples, partial derivatives, Total derivatives, Homogeneous functions, Statement of Euler's theorem, Simple examples of maxima-minima of functions of several variables, Lagrange's method of multipliers.

UNIT-IV

Double integrals, Change of order of integration, Jacobian, Double integral in polar coordinates, Triple integrals, Simple applications in finding area and volumes.

TEXT AND REFERECNCE BOOK

- Mathematics, A Text book for Class XII (Parts I & II), New Delhi: NCERT, 2003. **(Unit I & II)**
- R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Pub., 4th Edition, 2015.
- James Stewart, Calculus, 5th Edition, Brooks/Cole (Thomson), 2003.



UC-BSHC-XXX-19	INORGANIC CHEMISTRY						L-3, T-1, P-0	4 Credits				
Pre-requisite: Understanding of senior secondary level Physics and Mathematics												
Course Objectives: which will act as a strong background if he/she chooses to pursue physics as a career.												
Course Outcomes: At the end of the course, the student will be able to												
CO1												
CO2												
CO3												
CO4												
CO5												
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
Detailed Syllabus:												
PART-A												
UNIT-I												
Atomic Structure:												
Bohr's theory, its limitations and atomic spectrum of hydrogen atom. Wave mechanics: deBroglie equation, Heisenberg's Uncertainty Principle and its significance, Schrödinger's wave equation, significance of ψ and ψ^2 . Quantum numbers and their significance. Normalized and orthogonal wave functions. Sign of wave functions. Radial and angular wave functions for hydrogen atom. Radial and angular distribution curves. Shapes of <i>s</i> , <i>p</i> , <i>d</i> and <i>f</i> orbitals. Contour boundary and probability diagrams. Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations, Variation of orbital energy with atomic number												
UNIT-II												
Chemical Bonding-I:												
Ionic bond: General characteristics, types of ions, size effects, radius ratio rule and its limitations. Packing of ions in crystals. Born-Landé equation with derivation and importance of Kapustinskii expression for lattice energy. Madelung constant, Born-Haber cycle and its application, Solvation												

energy.

Metallic Bond: Qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in solids.

Weak Chemical Forces: van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces, Hydrogen bonding (theories of hydrogen bonding, valence bond treatment) Effects of chemical force, melting and boiling points, solubility energetics of dissolution process.

UNIT-III

Chemical Bonding-II:

Covalent bond: Lewis structure, Valence Bond theory (Heitler-London approach). Energetics of hybridization, equivalent and non-equivalent hybrid orbitals. Bent's rule, Resonance and resonance energy, Molecular orbital theory. Molecular orbital diagrams of diatomic and simple polyatomic molecules N_2 , O_2 , C_2 , B_2 , F_2 , CO , NO , and their ions; HCl , BeF_2 , CO_2 , (idea of s-p mixing and orbital interaction to be given). Formal charge, Valence shell electron pair repulsion theory (VSEPR), shapes of simple molecules and ions containing lone pairs and bond pairs of electrons, multiple bonding (σ and π bond approach) and bond lengths. Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules and consequences of polarization. Ionic character in covalent compounds: Bond moment and dipole moment. Percentage ionic character from dipole moment and electronegativity difference.

UNIT-IV

Chemistry of s and p Block Elements:

Inert pair effect, Relative stability of different oxidation states, diagonal relationship and anomalous behaviour of first member of each group. Allotropy and catenation. Complex formation tendency of s and p block elements. Hydrides and their classification ionic, covalent and interstitial. Basic beryllium acetate and nitrate. Study of the following compounds with emphasis on structure, bonding, preparation, properties and uses. Boric acid and borates, boron nitrides, borohydrides (diborane) carboranes and graphitic compounds, silanes, Oxides and oxoacids of nitrogen, Phosphorus and chlorine. Peroxo acids of sulphur, interhalogen compounds, polyhalide ions, pseudohalogens and basic properties of halogens.

Reference Books :-

1. Lee, J.D. *Concise Inorganic Chemistry*, ELBS, 1991.
2. Douglas, B.E; Mc Daniel, D.H. & Alexander, J.J. *Concepts & Models of Inorganic Chemistry 3rd Ed.*, John Wiley Sons, N.Y. 1994.
3. Greenwood, N.N. & Earnshaw. *Chemistry of the Elements*, Butterworth-Heinemann. 1997.
4. Cotton, F.A. & Wilkinson, G. *Advanced Inorganic Chemistry*, Wiley, VCH, 1999.
5. Miessler, G. L. & Donald, A. Tarr. *Inorganic Chemistry 4th Ed.*, Pearson, 2010.
6. Shriver & Atkins, *Inorganic Chemistry 5th Ed.*

UC-BSHC-XXX-19	CHEMISTRY LAB-I	L-0, T-0, P-4	2 Credits									
Pre-requisite: Understanding of senior secondary level Chemistry												
Course Objectives: which will act as a strong background if he/she chooses to pursue physics as a career.												
Course Outcomes: At the end of the course, the student will be able to												
CO1												
CO2												
CO3												
CO4												
CO5												
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
List of Experiments:												
(A) Titrimetric Analysis												
(i) Calibration and use of apparatus												
(ii) Preparation of solutions of different Molarity/Normality of titrants												
(B) Acid-Base Titrations												
(i) Estimation of carbonate and hydroxide present together in mixture.												
(ii) Estimation of carbonate and bicarbonate present together in a mixture.												
(iii) Estimation of free alkali present in different soaps/detergents												
(C) Oxidation-Reduction Titrimetry												
(i) Estimation of Fe(II) and oxalic acid using standardized KMnO ₄ solution.												

(ii) Estimation of oxalic acid and sodium oxalate in a given mixture.

(iii) Estimation of Fe(II) with $K_2Cr_2O_7$ using internal (diphenylamine, anthranilic acid) and external indicator.

Reference text:

1. Vogel, A.I. *A Textbook of Quantitative Inorganic Analysis*, ELBS.

UC-BSHX-XXX-19	Communicative English -I	L-2, T-0, P-0	2 Credits									
Pre-requisite: Basic proficiency in Communication Skills												
Course Objectives: The main objective of this course is: <ul style="list-style-type: none"> To help the students become proficient in LSRW-Listening, Speaking, Reading & Writing skills To help the students become the independent users of English language To develop in them vital communication skills, integral to their personal, social and professional interactions To teach them the appropriate language of professional communication To prepare them for job market 												
Course Outcomes: At the end of the course, the student will												
CO1	acquire basic proficiency in reading & listening, writing and speaking skills											
CO2	be able to understand spoken and written English language, particularly the language of their chosen technical field.											
CO3	be able to converse fluently.											
CO4	be able to produce on their own clear and coherent texts.											
CO1	become proficient in professional communication, such as, interviews, group discussions, office environments, important reading skills as well as writing skills and thereby will have better job prospects.											
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	1	1	2	2	3	2	3	2	2
CO2	1	-	-	1	1	2	2	3	2	3	2	2
CO3	1	-	-	1	1	2	2	3	2	3	2	2
CO4	1	-	-	1	1	2	2	3	2	3	2	2
CO5	2	-	-	1	1	2	2	3	2	3	2	2

Detailed Syllabus:

Part –A

UNIT I-(Literature)

(A) *The Poetic Palette (Orient Black Swan, Second Edition, 2016)*

The following poems from this anthology are prescribed:

1. Pippa's Song: Robert Browning
2. Apparently With No Surprise: Emily Dickinson
3. Fool and Flea: Jeet Thayil

(B) *Prose Parables (Orient Black Swan, 2013)*

The following stories from the above volume are prescribed:

- a. The Kabuliwallah : Rabindranath Tagore
- b. The Eyes Are Not Here: Ruskin Bond
- c. Grief: Anton Chekov

UNIT-II

Vocabulary: Word Formation Processes; Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives; Synonyms, antonyms

Grammar: Subject-verb agreement; Noun-pronoun agreement; Misplaced modifiers; Articles Determiners; Modals; Prepositions;

PART-B

UNIT-III

Reading and Understanding: Close Reading; Comprehension;

UNIT-IV

Mechanics of Writing & Speaking Skills

Essay Writing (Descriptive/Narrative/Argumentative); Business letters; Précis Writing; Self Introductions; Group Discussion

TEXT AND REFERENCE BOOK

1. John Eastwood, Oxford Practice Grammar, Oxford University Press, 2014
2. Michael Swan, Practical English Usage, OUP. 1995.
3. F.T. Wood, Remedial English Grammar, Macmillan. 2007.
4. William Zinsser, On Writing Well, Harper Resource Book 2001.
5. Sanjay Kumar and Pushp Lata, Oxford University Press. 2011.
6. Communication Skills, Oxford University Press. 2011.
7. Liz Hamp-Lyons and Ben Heasley, Study Writing, Cambridge University Press. 2006.

UC-BSHX-XXX-19	ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ (Punjabi Compulsory)-I	L-2, T-0, P-0	2 Credits									
Pre-requisite: Understanding of senior secondary level Punjabi												
Course Objectives: The objective of the course is: 1.To enhance the language ability of students. 2.To enhance the ability of Learning science and developing science literacy through local language teaching with science subjects.												
Course Outcomes: At the end of the course, the student will be able to												
CO1	Translate and transfer/broadcast the western scientific knowledge in the local language.											
CO2	Translate and transfer the indigenous/traditional scientific knowledge available in local knowledge into English and other global languages.											
CO3	Understand the society through Punjabi language, literature and culture											
CO4	Learning science and in developing science literacy.											
CO5	Improve the internal communication.											
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
Detailed Syllabus:												
PART-A												
UNIT I : ਕਵਿਤਾ ਭਾਗ:												
ਭਾਈ ਵੀਰ ਸਿੰਘ:												
ਸਮਾਂ, ਚਸ਼ਮਾ												
ਪ੍ਰੋ. ਪੁਰਨ ਸਿੰਘ :												
ਪੰਜਾਬ ਨੂੰ ਕੁਕਾਂ ਮੈਂ, ਹੱਲ ਵਾਹੁਣ ਵਾਲੇ												
ਪ੍ਰੋ.ਮੋਹਨ ਸਿੰਘ :												

Course Objectives: The objective of the course is to: 1. enhance the language ability of students. 2. enhance the ability of Learning science and developing science literacy through local language teaching with science subjects.												
Course Outcomes: At the end of the course, the student will be able to												
CO1	Translate and transfer/broadcast the western scientific knowledge in the local language.											
CO2	Translate and transfer the indigenous/traditional scientific knowledge available in local knowledge into English and other global languages.											
CO3	Understand the society through Punjabi language, literature and culture.											
CO4	Learning science and in developing science literacy.											
CO5	Improve the internal communication.											
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
Detailed Syllabus:												
PART-A												
UNIT I												
ਪੈਂਤੀ ਅੱਖਰੀ (ਵਰਣਮਾਲਾ), ਅੱਖਰ ਕ੍ਰਮ ਮਾਤਰਾਵਾਂ : ਮੁਢਲੀ ਜਾਣ-ਪਛਾਣ ਲਗਾਖਰ :ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ												
UNIT-II												
ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ: ਮੁਢਲੀ ਜਾਣ-ਪਛਾਣ ਮੂਲ ਸ਼ਬਦ , ਅਗੇਤਰ, ਪਿਛੇਤਰ ਸਮਾਨਾਰਥਕ ਸ਼ਬਦ, ਵਿਰੋਧਾਰਥਕ ਸ਼ਬਦ ਸ਼ੁੱਧ- ਅਸ਼ੁੱਧ: ਦਿੱਤੇ ਪੈਰੇ ਵਿੱਚੋਂ ਅਸ਼ੁੱਧ ਸ਼ਬਦ ਨੂੰ ਸ਼ੁੱਧ ਕਰਨਾ (11 Lectures)												

PART-B

UNIT-III

ਹਫਤੇ ਦੇ ਸੱਤ ਦਿਨਾਂ ਦੇ ਨਾਂ

ਬਾਰਾਂ ਮਹੀਨਿਆਂ ਦੇ ਨਾਂ

ਰੁੱਤਾਂ ਦੇ ਨਾਂ

ਇਕ ਸੌ ਤੱਕ ਗਿਣਤੀ ਸ਼ਬਦਾਂ ਵਿਚ

UNIT-IV

ਸਧਾਰਣ ਸ਼ਬਦਾਂ ਦਾ ਅੰਗਰੇਜ਼ੀ ਤੋਂ ਪੰਜਾਬੀ ਅਨੁਵਾਦ

ਸਧਾਰਣ ਸ਼ਬਦਾਂ ਦਾ ਪੰਜਾਬੀ ਤੋਂ ਅੰਗਰੇਜ਼ੀ ਅਨੁਵਾਦ

TEXT AND REFERENCE BOOK

1. □□□.□□.□□□□ □□□□, □□□□□ □□ □□□, □□□ □□□□□ □□□□□□□□,
□□□□□□□□□□, 2016.

SEMESTER -II

UC-BSPH-121-19	Waves and Vibrations					L-3, T-1, P-0	4 Credits					
Pre-requisite: Understanding of senior secondary level physics and Mathematics												
Course Objectives: The objective of the course provides an exposure about simple harmonic motions, damped harmonic motions and forced oscillations. Students learn about the different waves, propagation of waves in various mediums and reflection/transmission of waves at the interface of mediums.												
Course Outcomes: At the end of the course, the student will be able to												
CO1	Understand the simple and damped harmonic motion of an oscillator.											
CO2	Understand Forced Vibrations and phenomenon of Resonance											
CO3	Apply the Coupled oscillator to the real life problems.											
CO4	Understand the transmission of signals and Electromagnetic Waves											
CO5	Apply the knowledge obtained in this course to day-to-day problems.											
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	1	-	1	2	-	2	3	2	3
CO2	2	2	1	2	1	1	1	-	1	3	2	3
CO3	3	2	-	2	1	1	2	-	1	3	2	3
CO4	2	2	-	2	1	1	2	1	1	3	3	1
CO5	2	2	-	2	1	1	2	1	1	3	3	3

Detailed Syllabus:

PART-A

UNIT-I

Simple and Damped Harmonic Motion: Simple harmonic motion, energy of a SHO, Compound pendulum, Torsional pendulum, Electrical Oscillations, Lattice Vibrations, Transverse Vibrations of a mass on a string, Anharmonic Oscillations. Damped simple harmonic motion, Decay of free Vibrations due to damping, types of damping, Determination of damping coefficients – Logarithmic decrement, relaxation time and Q-factor. Electromagnetic damping. (12 Lectures)

UNIT-II

Forced Vibrations and Resonance: Forced mechanical and electrical oscillator, Transient and Steady State Oscillations, Displacement and velocity variation with driving force frequency, Variation of phase with frequency resonance, Power supplied to forced oscillator by the driving force. Q-factor and band width of a forced oscillator, Electrical and nuclear magnetic resonances. (12 lectures)

PART-B

UNIT-III

Coupled Oscillations: Stiffness coupled oscillators, Normal coordinates and modes of vibrations. Inductance coupling of electrical oscillators, Normal frequencies, Forced vibrations and resonance for coupled oscillators, Masses on string-coupled oscillators.

Waves in Physical Media: Types of waves, wave equation (transverse) and its solution characteristics impedance of a string, Impedance matching, Reflection and Transmission of waves at boundary, Energy of vibrating string, wave and group velocity. (12 Lectures)

UNIT-IV

Transmission of signals and Electromagnetic Waves: Transmission of a non-monochromatic wave, Frequency range and Signal duration, Bandwidth theorem, Group and phase velocities, Electromagnetic theory of dispersion, Doppler effect, Electromagnetic (EM) waves: Maxwell Equations, Wave equation, EM waves in a medium of finite ϵ , μ and σ . Energy flow due to a plane EM wave, EM waves in a conducting medium, Skin depth. (12 Lectures)

Text and Reference Books:

1. Text Book of Vibrations and Waves: S.P. Puri (Macmillan India), 2004.
2. The Physics of Vibrations and Waves: H.J. Pain (Wiley and ELBS), 2013.
3. N.K. Bajaj, The Physics of Waves and Oscillations, Tata McGraw Hill, 1998.

UC-BSHP-122-19	Mechanics					L-3, T-1, P-0	4 Credits					
Pre-requisite: Understanding of senior secondary level Physics and Mathematics												
Course Objectives: The aim and objective of the course on Mechanics is to introduce the students to the formal structure of vector mechanics, harmonic oscillators, and mechanics of solids so that they can use these in Engineering as per their requirement. This will act as a strong background if he/she chooses to pursue higher studies in physics.												
Course Outcomes: At the end of the course, the student will be able to												
CO1	Understand the fundamentals of vector mechanics for a classical system.											
CO2	Identify various types of forces in nature, frames of references, and conservation laws.											
CO3	Know the inertial and non-inertial system.											
CO4	Understand the Gravitation force as a Central Force Motion											
CO5	Apply the knowledge obtained in this course to day-to-day problems.											
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	1	2	1	2	1	2	3	2	2
CO2	2	3	1	2	2	1	1	1	1	3	1	1
CO3	3	3	2	2	2	1	2	1	1	3	1	1
CO4	2	2	2	-	2	1	2	1	1	3	1	1
CO5	2	2	-	2	2	1	2	1	1	3	1	1

Detailed Syllabus:

UNIT I:

Fundamentals of Dynamics: Reference frames. Inertial frames; Review of Newton's Laws of Motion. Galilean transformations; Galilean invariance. Dynamics of a system of particles. Centre of Mass. Principle of conservation of momentum. Impulse. Momentum of variable-mass system: motion of rocket. (12 Lectures)

UNIT II:

Work and Energy: Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Potential Energy. Energy diagram. Stable and unstable equilibrium. Force as gradient of potential energy. Work done by non-conservative forces. Law of conservation of Energy.

Collisions: Elastic and inelastic collisions between particles. Centre of Mass and Laboratory frame of references. (12 Lectures)

UNIT-III

Non-Inertial Systems: Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications. Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems. (12 Lectures)

UNIT-IV

Gravitation and Central Force Motion: Law of gravitation. Gravitational potential energy. Inertial and gravitational mass. Potential and fields due to spherical shell and solid sphere. Motion of a particle under a central force field. Two-body problem and its reduction to one-body problem and its solution. The energy equation and energy diagram. Kepler's Laws. Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS). (12 Lectures)

Text and Reference Books:

1. Mechanics, Berkeley Physics, Vol.1, C. Kittel, W. Knight, et.al. 2007, Tata McGraw-Hill.
2. Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
3. Feynman Lectures, Vol. I, R.P. Feynman, R.B. Leighton, M. Sands, 2008, Pearson Education
4. Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons
5. University Physics. F.W. Sears, M.W. Zemansky, H.D. Young 13/e, 1986, Addison Wesley
6. Physics for scientists and Engineers with Modern Phys., J.W. Jewett, R.A. Serway, 2010, Cengage Learning
7. Theoretical Mechanics, M.R. Spiegel, 2006, Tata McGraw Hill.

UC-BSHP-123-19	Physics Lab-II	L-0, T-0, P-4	2 Credits									
Pre-requisites (if any): High-school education with Physics lab as one of the subject.												
Course Objectives: The aim and objective of the Physics Lab course is to introduce the students of B. Sc. (Hons.) Physics to the formal structure of wave and vibrations and mechanics so that they can use these as per their requirement.												
Course Outcomes: At the end of the course, the student will be												
CO1	Able to understand the theoretical concepts learned in the theory course.											
CO2	Trained in carrying out precise measurements and handling equipment.											
CO3	Learn to draw conclusions from data and develop skills in experimental design.											
CO4	Able to understand the principles of error analysis and develop skills in experimental design.											
CO5	Able to document a technical report which communicates scientific information in a clear and concise manner.											
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	2	1	2	3	2	3
CO2	3	3	1	-	2	2	1	1	1	3	2	3
CO3	3	3	2	-	2	1	2	1	1	3	2	3
CO4	3	2	2	2	-	2	2	1	1	3	2	3
CO5	2	2	2	2	-	2	2	1	1	3	2	3

Note: Students are expected to perform about 8-10 experiments from the following list, selecting minimum of 6-7 from the Physical Lab and 2-3 from the Virtual lab.

List of experiments:

1. Measurements of length (or diameter) using vernier caliper and screw gauge.
2. Measurement of volume using travelling microscope. Use of Plumb line and Spirit level.
3. To determine the frequency of an electrically maintained tuning fork in a) Transverse mode of vibration b) Longitudinal mode of vibration.
4. To verify the law of vibrating string Using Melde's experiment.
5. To compare mass per unit length of two strings by Melde's experiment.
6. To find out the frequency of AC mains using electric-vibrator/sonometer.
7. To determine the horizontal and vertical distance between two points using a Sextant.
8. To determine the height of an inaccessible object using a Sextant.
9. To determine the angular diameter of the sun using the sextant.
10. To determine the angular acceleration α , torque τ , and Moment of Inertia of flywheel.
11. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g and (c) Modulus of rigidity.
12. To determine the time period of a simple pendulum for different length and acceleration due to gravity.
13. To study the variation of time period with distance between centre of suspension and centre of gravity for a compound pendulum and to determine: (i) Radius of gyration of the bar about an axis through its C.G. and perpendicular to its length. (ii) The value of g in the laboratory.
14. To find the moment of inertia of an irregular body about an axis through its C.G with the torsional pendulum.

Reference book and suggested readings:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
3. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal.
4. Engineering Practical Physics, S. Panigrahi & B. Mallick, 2015, Cengage Learning India Pvt. Ltd.
5. Practical Physics, G.L. Squires, 2015, 4th Edition, Cambridge University Press.
6. Practical Physics, C L Arora. S. Chand & Company Ltd.
7. <http://www.vlab.co.in>

UC-BSHM-XXX-19	MATHEMATICS						L-3, T-1, P-0	4 Credits				
Pre-requisite: Understanding of senior secondary level Mathematics												
Course Objectives: which will act as a strong background if he/she chooses to pursue physics as a career.												
Course Outcomes: At the end of the course, the student will be able to												
CO1												
CO2												
CO3												
CO4												
CO5												
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

Detailed Syllabus:

PART-A

UNIT I

UNIT-II

PART-B

UNIT-III

UNIT-IV

TEXT AND REFERENCE BOOK

UC-BSHC- XXX-19	ORGANIC CHEMISTRY						L-3, T-1, P-0	4 Credits				
Pre-requisite: Understanding of senior secondary level Physics and Mathematics												
Course Objectives: which will act as a strong background if he/she chooses to pursue physics as a career.												
Course Outcomes: At the end of the course, the student will be able to												
CO1												
CO2												
CO3												
CO4												
CO5												
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

Detailed Syllabus:

PART-A

Unit-I

Basics of Organic Chemistry

Organic Compounds: Classification, and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties. *Electronic Displacements:* Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strength. Homolytic and Heterolytic fission with suitable examples. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophilicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes. Introduction to types of organic reactions and their mechanism: Addition, Elimination and Substitution reactions.

Unit-II

Stereochemistry:

Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions; Geometrical isomerism: cis–trans and, syn-anti isomerism E/Z notations with C.I.P rules.

Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centres, Distereoisomers, meso structures, Racemic mixture and resolution. Relative and absolute configuration: D/L and R/S designations.

A. Carbon-Carbon sigma bonds formation:-

Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz-Fittig Reactions, Free radical substitutions: Halogenation -relative reactivity and selectivity.

PART-B

Unit-III

Carbon-Carbon pi bonds:

Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations.

Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/ AntiMarkownikoff addition), mechanism of oxymercuration-demercuration, hydroboration oxidation, ozonolysis, reduction (catalytic and chemical), syn and anti-hydroxylation(oxidation). 1,2-and 1,4-addition reactions in conjugated dienes and, Diels-Alder reaction; Allylic and benzylic bromination and mechanism, e.g. propene, 1-butene, toluene, ethyl benzene. *Reactions of alkynes:* Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.

Unit-IV

Cycloalkanes and Conformational Analysis

Types of cycloalkanes and their relative stability, Baeyer strain theory, Conformation analysis of alkanes: Relative stability: Energy diagrams of cyclohexane: Chair, Boat and Twist boat forms; Relative stability with energy diagrams.

Aromatic Hydrocarbons

Aromaticity: Hückel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directing effects of the groups.

Text and Reference Books:

1. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds; Wiley: London, 1994.
5. Kalsi, P. S. Stereochemistry Conformation and Mechanism; New Age International, 2005.

UC-BSHC- XXX-19	CHEMISTRY LAB-II					L-0, T-0, P-2			2 Credits			
Pre-requisite: Understanding of senior secondary level Chemistry												
Course Objectives: which will act as a strong background if he/she chooses to pursue physics as a career.												
Course Outcomes: At the end of the course, the student will be able to												
CO1												
CO2												
CO3												
CO4												
CO5												
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
List of Experiments:												
<ol style="list-style-type: none"> 1. Checking the calibration of the thermometer 2. Purification of organic compounds by crystallization using the following solvents: a) Water b) Alcohol, and c) Alcohol-Water. 3. Determination of the melting points of above compounds and unknown organic compounds (Kjeldahl method and electrically heated melting point apparatus) 4. Effect of impurities on the melting point – mixed melting point of two unknown organic compounds 5. Determination of boiling point of liquid compounds. (boiling point lower than and more than 100°C by distillation and capillary method) 6. Chromatography a) Separation of a mixture of two amino acids by ascending and horizontal paper chromatography b) Separation of a mixture of two sugars by ascending paper chromatography, c) Separation of a mixture of o-and p-nitrophenol or o-and p-aminophenol by thin layer chromatography (TLC) 												

Reference Books

1. Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry*, Pearson Education (2009).
2. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. *Practical Organic Chemistry, 5th Ed.*, Pearson (2012).

UC-BSHX-XXX-19	Communicative English-II	L-2, T-0, P-0	2 Credits									
Pre-requisite: Basic proficiency in communicative English												
Course Objectives: This course is designed to <ul style="list-style-type: none"> • help the students become proficient in LSRW-Listening, Speaking, Reading & Writing skills • help the students become the independent users of English language • develop in them vital communication skills, integral to their personal, social and professional interactions • teach them the appropriate language of professional communication • prepare them for job market 												
Course Outcomes: At the end of the course, the student will be able to												
CO1	Students will acquire basic proficiency in reading & listening, writing and speaking skills.											
CO2	Students will be able to understand spoken and written English language, particularly the language of their chosen technical field.											
CO3	They will be able to converse fluently.											
CO4	They will be able to produce on their own clear and coherent texts.											
CO5	Students will become proficient in professional communication such as interviews, group discussions, office environments, important reading skills as well as writing skills and thereby will have better job prospects.											
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	1	1	2	2	3	2	3	2	2
CO2	1	-	-	1	1	2	2	3	2	3	2	2
CO3	1	-	-	1	1	2	2	3	2	3	2	2
CO4	1	-	-	1	1	2	2	3	2	3	2	2
CO5	2	-	-	1	1	2	2	3	2	3	2	2

Detailed Syllabus:

Part –A

UNIT I-(Literature)

(A) *The Poetic Palette* (Orient Black Swan, Second Edition, 2016)

The following poems from this anthology are prescribed:

1. The Soul's Prayer: Sarojini Naidu
2. I Sit and Look Out: Walt Whitman
3. Women's Rights: Annie Louise Walker

(B) *Prose Parables* (Orient Black Swan, 2013)

The following stories from the above volume are prescribed:

1. The Doctor's Word: R.K. Narayan
2. The Doll's House: Katherine Mansfield
3. Dusk: H.H. Munroe (Saki)

UNIT-II

Vocabulary: Standard abbreviations; One word substitution; Word Pairs (Homophones/ Homonyms)

Grammar: Sentence Structures; Use of phrases and clauses in sentences; Transformation of Sentences; Importance of proper punctuation

PART-B

UNIT-III

Reading and Understanding: Summary Paraphrasing; Analysis and Interpretation; Translation (from Hindi/Punjabi to English and vice-versa)

UNIT-IV

Mechanics of Writing & Speaking Skills: Report writing; Career Documents- Job applications, Resume/CV writing, Common Everyday Situations: Conversations & Dialogues, Formal Presentations

TEXT AND REFERENCE BOOK

1. John Eastwood, Oxford Practice Grammar, Oxford University Press, 2014
2. Michael Swan, Practical English Usage, OUP. 1995.
3. F.T. Wood, Remedial English Grammar, Macmillan. 2007.
4. William Zinsser, On Writing Well, Harper Resource Book 2001.
5. Sanjay Kumar and Pushp Lata, Oxford University Press. 2011.
6. Communication Skills, Oxford University Press. 2011.
7. Liz Hamp-Lyons and Ben Heasley, Study Writing, Cambridge University Press. 2006.

UC-BSHP- XXX-19	ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ (Punjabi Compulsory)- II	L-2, T-0, P-0	2 Credits									
Pre-requisite: Understanding of senior secondary level Punjabi												
Course Objectives: The objective of the course is to enhance the ability of via Learning science and developing science literacy through local language teaching with science subjects.												
Course Outcomes: At the end of the course, the student will be able to												
CO1	Translate and transfer/broadcast the western scientific knowledge in the local language.											
CO2	Translate and transfer the indigenous/traditional scientific knowledge available in local knowledge into English and other global languages.											
CO3	Understand the society through Punjabi language, literature and culture											
CO4	Learning science and in developing science literacy.											
CO5	Improve the internal communication.											
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

Detailed Syllabus:

PART-A

UNIT I :

ਡਾ.ਹਰਿਭਜਨ ਸਿੰਘ:

ਅਪ੍ਰਮਾਣਿਕ, ਤੇਰੇ ਹਜ਼ੂਰ ਮੇਰੀ ਹਾਜ਼ਰੀ ਦੀ ਦਾਸਤਾਨ

ਸ਼ਿਵ ਕੁਮਾਰ ਬਟਾਲਵੀ:

ਕੰਡਿਆਲੀ ਥੇਰੂ, ਧਰਮੀ ਬਾਬਲ ਪਾਪ ਕਮਾਇਆ, ਰੁੱਖ

ਪਾਸ਼:

ਇਨਕਾਰ, ਸਭ ਤੋਂ ਖਤਰਨਾਕ, ਦਹਿਕਦੇ ਅੰਗਿਆਰਾਂ 'ਤੇ

ਸੁਰਜੀਤ ਪਾਤਰ:

ਹੁਣ ਘਰਾਂ ਨੂੰ ਪਰਤਣਾ, ਕੁਝ ਕਿਹਾ ਤਾਂ..., ਪੁਲ

(Lecture 12)

UNIT-II

ਕਹਾਣੀ ਭਾਗ:

ਸੰਤੋਖ ਸਿੰਘ ਧੀਰ:

ਕੋਈ ਇਕ ਸਵਾਰ

ਪ੍ਰੇਮ ਪ੍ਰਕਾਸ਼:

ਲੱਛਮੀ

ਮੋਹਨ ਭੰਡਾਰੀ :

ਘੋਟਣਾ

ਵਰਿਆਮ ਸਿੰਘ ਸੰਧੂ :

ਆਪਣਾ ਆਪਣਾ ਹਿੱਸਾ

(Lecture 11)

PART-B

UNIT-III

ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀਆਂ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ

ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਉਪਰ ਪਏ ਪ੍ਰਭਾਵ

(Lecture 12)

UNIT-IV

ਰਿਪੋਰਟਿੰਗ, ਸਮਾਚਾਰ ਲਿਖਣ ਦੀ ਵਿਧੀ ਤੇ ਤੱਤ
ਪੰਜਾਬੀ ਪੈਰੋ ਦਾ ਸਰਲ ਅੰਗਰੇਜ਼ੀ ਅਨੁਵਾਦ
ਦਫਤਰੀ ਚਿੱਠੀ ਪੱਤਰ

TEXT AND REFERENCE BOOK:

1. □□□.□□.□□□□ □□□□, □□□□□ □□ □□□, □□□ □□□□□ □□□□□□□□, □□□□□□□□□□, 2016.

UC-BSHX-XXX-19	ਮੁਢਲੀ ਪੰਜਾਬੀ (Mudhli Punjabi)-II	L-2, T-0, P-0	2 Credits									
Pre-requisite: Understanding of senior secondary level Physics and Mathematics												
Course Objectives: The objective of the course is: 1.To enhance the language ability of students. 2.To enhance the ability of Learning science and developing science literacy through local language teaching with science subjects.												
Course Outcomes: At the end of the course, the student will be able to												
CO1	Translate and transfer/broadcast the western scientific knowledge in the local language.											
CO2	Translate and transfer the indigenous/traditional scientific knowledge available in local knowledge into English and other global languages.											
CO3	Understand the society through Punjabi language, literature and culture.											
CO4	Learning science and in developing science literacy.											
CO5	Improve the internal communication.											
Mapping of course outcomes with the program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

Detailed Syllabus:

PART-A

UNIT I

ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ : ਪਛਾਣ ਤੇ ਵਰਤੋਂ-

ਨਾਂਵ

ਪੜਨਾਂਵ

ਵਿਸ਼ੇਸ਼ਣ

ਕਿਰਿਆ

ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ

(12 Lectures)

UNIT-II

ਰੋਜ਼ਾਨਾ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ:

ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਰਿਸ਼ਤੇ-ਨਾਤੇ ਤੇ ਕਿੱਤਿਆਂ ਸਬੰਧੀ।

(12 Lectures)

PART-B

UNIT-III

ਪੰਜਾਬੀ ਵਾਕ ਬਣਤਰ :

ਸਧਾਰਣ ਵਾਕ

ਸੰਯੁਕਤ ਵਾਕ

ਮਿਸ਼ਰਤ ਵਾਕ

(12 Lectures)

UNIT-IV

ਸਧਾਰਣ ਵਾਕਾਂ ਦਾ ਅੰਗਰੇਜ਼ੀ ਤੋਂ ਪੰਜਾਬੀ ਅਨੁਵਾਦ

ਸਧਾਰਣ ਵਾਕਾਂ ਦਾ ਪੰਜਾਬੀ ਤੋਂ ਅੰਗਰੇਜ਼ੀ ਅਨੁਵਾਦ

(11 Lectures)

TEXT AND REFERENCE BOOK:

1. □□□.□□.□□□□ □□□□, □□□□□ □□ □□□, □□□ □□□□□ □□□□□□□□, □□□□□□□□□□, 2016.