

Faculty of Sciences
Syllabus for
Bachelor of Science (Honours) Physics
(Under Continuous Evaluation System)

(SEMESTER: I-VI)

Session – (2022-23)



Kanya Maha Vidyalaya, Jalandhar
(Autonomous)
The Heritage Institution

BASIC PUNJABI

In lieu of Punjabi(Compulsory)

COURSE CODE -/BOPL-1031

Course outcomes

CO1:ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਨੂੰ ਸਿਖਾਉਣ ਦੀ ਪ੍ਰਕਿਰਿਆ ਵਿਚ ਪਾ ਕੇ ਇਕ ਹੋਰ ਭਾਸ਼ਾ ਸਿੱਖਣ ਦਾ ਮੌਕਾ ਪ੍ਰਦਾਨ ਕਰਨਾ ਹੈ ।

CO2:ਇਸ ਵਿਚ ਵਿਦਿਆਰਥੀ ਨੂੰ ਬਾਰੀਕਬੀਨੀ ਨਾਲ ਭਾਸ਼ਾ ਦਾ ਅਧਿਐਨ ਕਰਵਾਇਆ ਜਾਵੇਗਾ ।

CO3:ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੰਜਾਬੀ ਸ਼ਬਦ ਰਚਨਾ ਤੋਂ ਜਾਣੂ ਕਰਵਾਇਆ ਜਾਵੇਗਾ ।

CO4:ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ ਬਾਰੇ ਦੱਸਣਾ ਹੈ ।

CO5:ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਦਾ ਸ਼ਬਦ ਘੇਰਾ ਵਿਸ਼ਾਲ ਕਰਨਾ ਹੈ ।

CO6:ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੰਜਾਬੀ ਵਿਚ ਹਫ਼ਤੇ ਦੇ ਸੱਤ ਦਿਨਾਂ ਦੇ ਨਾਂ, ਬਾਰਾਂ ਮਹੀਨਿਆਂ ਦੇ ਨਾਂ, ਰੁੱਤਾਂ ਦੇ ਨਾਂ, ਇਕ ਤੋਂ ਸੌ ਤੱਕ ਗਿਣਤੀ ਸ਼ਬਦਾਂ ਵਿਚ ਸਿਖਾਉਣਾ ਹੈ ।

(Semester-I)

Session 2022-23

**Course Title: Punjab History and Culture (From Earliest Times to C 320) (Special paper in lieu of Punjabi Compulsory)
(For those students who are not domicile of Punjab)**

Course Code: BOPL-1431

COURSE OUTCOMES

After completing Semester I and course on Punjab History and Culture students of History will be able to identify and have a complete grasp on the sources & writings of Ancient Indian History of Punjab.

CO1: Identify and describe the emergence of earliest civilizations in: Indus Valley Civilization and Aryan Societies.

CO2: Identify and analyses the Buddhist, Jain and Hindu faith in the Punjab

CO3: Analyses the emergence of Early Aryans and Later Vedic Period, their Society, Culture, Polity and Economy

CO4: To make students understand the concepts of two faiths Jainism and Buddhism, its principles and their application and relevance in present times

BACHELOR OF SCIENCE (HONOURS) PHYSICS

**(Semester I)
Session 2022-23**

COMMUNICATION SKILLS IN ENGLISH

(Theory)

Course Code:

**BOPL -1102
COURSE OUTCOMES**

At the end of this course, the students will develop the following Skills:

CO 1: Reading skills that will facilitate them to become an efficient reader

CO 2: Through reading skills, the students will have an ability to have a comprehensive understanding of the ideas in the text and enhance their critical thinking

CO 3: Writing skills of students which will make them proficient enough to express ideas in clear and grammatically correct English

CO 4: The skill to use an appropriate style and format in writing letters (formal and informal) and resume, memo, notices, agenda, minutes

BACHELOR OF SCIENCE (HONOURS) PHYSICS
SEMESTER-I
SESSION 2022-23
MECHANICS-I

Course Code: BOPL-1393

Course Outcomes: Mechanics -I

After passing this course, students will be able to:

CO1: Understand the various coordinate systems and its applications. Students will be able to understand the conservative and non-conservative forces and calculation of work for various kinds of forces.

CO2: Learn various conservation laws. They will understand the elastic collision in different systems, cross section of elastic scattering as well as Rutherford scattering and know the motion of rigid body.

CO3: Learn about central forces and their properties. They will be able to solve motion of particle under central force and to determine the turning points of orbit.

CO4: understand the rotational motion of a rigid body in general. They will be able to solve equations of rotational motion by using Euler's equations and moment of inertia tensor for a rigid body. Further they will understand the motion of elementary gyroscope and spinning top.

**BACHELOR OF SCIENCE (HONOURS) PHYSICS
SEMESTER-I**

**SESSION 2022-23
ELECTRICITY and MAGNETISM-I**

Course No. BOPL-1394

Course Outcomes: Electricity and Magnetism-I

After passing this course the students will be able to:

- CO1: understand the vector calculus and vector algebra and its applications in electricity and magnetism. The students will be able to solve the electrostatic problems with the help of Gauss law and Coulomb's law.
- CO2: understand the applications of scalar potential for the calculation of electric field and electric potential due to an arbitrary charge distribution.
- CO3: solve the problems with the help of method of images and understand the conduction of electric current and fundamental laws of electricity and relate the electric and magnetic fields in two inertial frames of reference.
- CO4: able to understand electric field, potential and polarization of different media and related quantities.

Bachelor of Science (Honours) Physics
Semester-I
Session: 2022-23
Course Title: Mathematics-I
Course Code: BOPL-1335
Course outcomes

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

CO 1: Understand the concept of limits, continuity and derivative of a function, maxima and minima of a function of a single variable

CO 2: Explain the significance of Rolle's theorem, Mean Value theorem, Taylor's and Maclaurin's theorem and to find the expansions of functions.

CO 3: Demonstrate the geometrical meaning of integral calculus as an area and their uses in the determination of C.G & moments of inertia.

CO 4: Understand how to solve linear differential equations with constant coefficients and linear homogeneous and inhomogeneous differential equations of second order.

**Bachelor of Science (Honours) Physics
(Semester-I)
Session: 2022-25
Course Title: Chemistry-I
Course Code: BOPL-1086**

Course outcomes:

Students will be able to

CO1: differentiate between chiral and achiral compounds, configuration and conformation and understand the concept of isomerism

CO2: understand the resolution of enantiomers and differentiate between dextrorotatory and laevorotatory compounds, do conformational analysis of ethane, butane, cyclohexane, monosubstituted and disubstituted cyclohexane and explain the various methods of formation and chemical reactions of alkanes, alkenes and alkynes.

CO3: understand functional group transformation by nucleophilic substitution

CO4: describe the mechanism and stereochemistry of nucleophilic substitution reactions and understand the principles of nucleophilic addition to carbonyl groups.

**Bachelor of Science (Honours) Physics Semester-I
Session – (2022-23)**

Course Outcomes: Physics Lab-I Sem I

Course No. BOPP-1397

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

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

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

**Bachelor of Science (Honours) Physics
(Semester-I)
Session: 2022-25
Course Title: Chemistry Lab-I
Course Code: BOPP-1088**

Course outcomes

Students will be able to

CO1: develop skills required for the qualitative analysis of organic compounds and to detect elements (N, S and halogens).

CO2: detect functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro) in simple organic compounds

CO3: determine the physical constants of organic compounds

CO4: prepare the derivatives of organic compounds

Bachelor of Science (Honours) Physics Semester-I

SEMESTER – I

DRUG ABUSE

Course Code: AECD-1161

(Theory)

Course Outcomes:

- CO 1. This information can include factual data about what substance abuse is; warning signs of addiction; information about how alcohol and specific drugs affect the mind and body;
- CO 2. How to be supportive during the detoxification and rehabilitation process.
- CO 3. Main focus of substance abuse education is teaching individuals about drug and alcohol abuse and how to avoid, stop, or get help for substance use disorders.
- CO 4. Substance abuse education is important for students alike; there are many misconceptions about commonly used legal and illegal substances, such as alcohol and marijuana.

Session 2022-23

BACHELOR OF SCIENCE (HONOURS) PHYSICS

SEMESTER-II

BASIC PUNJABI

In lieu of Punjabi (Compulsory)

COURSE CODE - BOPL-2031

Course outcomes

CO1: ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਨੂੰ ਸਿਖਾਉਣ ਦੀ ਪ੍ਰਕਿਰਿਆ ਵਿਚ ਪਾ ਕੇ ਇਕ ਹੋਰ ਭਾਸ਼ਾ ਸਿੱਖਣ ਦੇ ਮੌਕੇ ਪ੍ਰਦਾਨ ਕਰਨਾ ਹੈ ।

CO2: ਇਸ ਵਿਚ ਵਿਦਿਆਰਥੀ ਨੂੰ ਬਾਰੀਕਬੀਨੀ ਨਾਲ ਭਾਸ਼ਾ ਦਾ ਅਧਿਐਨ ਕਰਵਾਇਆ ਜਾਵੇਗਾ ।

CO3: ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੰਜਾਬੀ ਸ਼ਬਦ ਰਚਨਾ ਤੋਂ ਜਾਣੂ ਕਰਵਾਇਆ ਜਾਵੇਗਾ ।

CO4: ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ ਨੂੰ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀ ਅਮੀਰੀ ਦਾ ਅਤੇ ਬਾਰੀਕੀਆਂ ਨੂੰ ਸਮਝਣ ਲਈ ਵੱਖਰੇ-ਵੱਖਰੇ ਸਿਧਾਂਤਾਂ ਦਾ ਵਿਕਾਸ ਕਰਨਾ ਹੈ ।

CO5: ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਦਾ ਸ਼ਬਦ ਘੇਰਾ ਵਿਸ਼ਾਲ ਕਰਨਾ ਹੈ ।

CO6: ਵਿਦਿਆਰਥੀ ਵਾਕ ਦੀ ਪਰਿਭਾਸ਼ਾ ਅਤੇ ਇਸਦੀ ਬਣਤਰ ਤੋਂ ਜਾਣੂ ਹੋਣਗੇ ਅਤੇ ਭਾਸ਼ਾ ਤੇ ਪਕੜ ਮਜ਼ਬੂਤ ਹੋਵੇਗੀ ।

CO7: ਪੈਰ੍ਹਾ ਰਚਨਾ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਬੁੱਧੀ ਨੂੰ ਤੀਖਣ ਕਰਦਿਆਂ ਉਨਾਂ ਦੀ ਲਿਖਣ ਪ੍ਰਤਿਭਾ ਨੂੰ ਉਜਾਗਰ ਕਰਨਾ ਹੈ ।

CO8: ਘਰੇਲੂ ਅਤੇ ਦਫ਼ਤਰੀ ਚਿੱਠੀ ਪੱਤਰ ਲਿਖਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਇਸ ਕਲਾ ਵਿਚ ਨਿਪੁੰਨ ਕਰਨਾ ਹੈ ।

CO9: ਮੁਹਾਵਰਿਆਂ ਦੀ ਵਰਤੋਂ ਨਾਲ ਗੱਲਬਾਤ ਵਿਚ ਪਰਪੱਕਤਾ ਆਉਂਦੀ ਹੈ । ਇਹ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਗੱਲਬਾਤ ਵਿਚ ਨਿਖਾਰ ਲਿਆਉਣ ਦਾ ਕੰਮ ਕਰਨਗੇ ।

(Semester-II)
Session 2022-23
Course Title: Punjab History and Culture (C. 320 to 1000 B.C.)
(Special paper in lieu of Punjabi Compulsory)
(For those students who are not domicile of Punjab)

Course Code: BOPL-2431

COURSE OUTCOMES

After completing Semester II and course on Ancient History of Punjab, students of History will be able to identify and have a complete grasp on the sources & writings of Ancient History of Punjab

CO 1: Analyse the emergence of Mauryan, Gupta empires during the classical age in India

CO 2: To understand the various factors leading to rise and fall of empires and emergence of new dynasties and their Culture, society, administration, polity and religion specifically of Kushans and Vardhanas in the Punjab

CO 3: Students will be adept in constructing original historical argument based on primary source material research

CO 4: To have an insight on the existing Literature of this period and understand the past developments in the light of present scenario.

CO 5: To enable students to have thorough insight into the various forms/styles of Architecture and synthesis of Indo - Muslim Art and Architecture in Punjab

Session 2022-23

COMMUNICATION SKILLS IN ENGLISH

Course Code:

BOPM -2102

COURSE OUTCOMES

At the end of this course, the students will develop the following skills:

CO 1: Enhancement of listening skills with the help of listening exercises based on conversation, news and TV reports

CO 2: The ability of Note-Taking to be able to distinguish the main points from the supporting details and the irrelevant information from the relevant one using Listening Skills

CO 3: Acquisition of knowledge of phonetics which will help them in learning about correct pronunciation as well as effective speaking

CO 4: Speaking skills of the students enabling them to take active part in group discussion and present their own ideas

BACHELOR OF SCIENCE (HONOURS) PHYSICS (SESSION 2022-23)

Semester II

Course Outcome of ELECTRICITY and MAGNETISM-II

Course No. BOPL-2393

After passing this course, students will be able to:

- CO1: understand source of magnetic field and application of Biot Savart's Law and Ampere's circuital law in different situations.
- CO2: understand different type of magnetic materials and their characteristics.
- CO3: understand the Faraday's Law of electromagnetic induction and LCR circuits.
- CO4: derive Maxwell equations and their applications in propagation of e.m. waves in conductors and insulators.

BACHELOR OF SCIENCE (HONOURS) PHYSICS (SESSION 2022-23)
Semester II

Course Outcomes: Vibrations and Waves

Course No. BOPL-2394

After passing this course the student will be able to:

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

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

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

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

Bachelor of Science (Honours) Physics

Semester-II

Session: 2022-23

Course Title: Mathematics-II

Course code: BOPL-2335

Course outcomes

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

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

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

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

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

Bachelor of Science (Honours) Physics
(Semester II)
Session: 2022-25
COURSE CODE: BOPL-2086
COURSE TITLE: Chemistry-II

Course outcomes:

Students will be able to

CO1: understand the key features of coordination compounds viz. variety of structures, oxidation numbers and electronic configurations, coordination numbers and explain the bonding and stability of complexes. Describe the shapes and structures of coordination complexes with coordination numbers ranging from 4 to 12. Describe the stability of metal complexes by the use of formation constants.

CO2: Understand the splitting of d-orbitals in octahedral, tetrahedral, cubic and square planar fields of ligands. Calculate C.F.S.E. of high spin and low spin octahedral and high spin tetrahedral complexes. Explain thermodynamic effects of crystal field splitting and determine microstate and ground state terms.

CO3: Draw MOEL diagram for octahedral and tetrahedral complexes. Explain bonding in polynuclear metal carbonyls and counting of electrons in carbonyl clusters

CO4: Describe the effect of macrocyclic ligands on anion and cation complex structure.

PHYSICS LAB-II

Course No. BOPP-2397

COURSE OUTCOMES

- CO1: Students will be able to study resonance in series & parallel LCR circuit.
- CO2: At the end of this course, students will be able to find the value of capacitor, coefficient of self-inductance, permeability & permittivity of air.
- CO3: Students will be able to study the variation of magnetic field on the axis of coil & can find the value of horizontal component of magnetic field.
- CO4: Students will be able to verify various concepts related to oscillations of various pendulums and laws of vibrations of strings.

Bachelor of Science (Honours) Physics
(Semester II)
Session: 2022-25
COURSE CODE: BOPP-2088
COURSE TITLE: Chemistry Lab-II (Practical)

Course outcomes:

Students will be able to

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

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

CO3: understand the principle of inorganic qualitative analysis.

CO4: separate, identify and confirm the various cations present in the mixture.

BACHELOR OF SCIENCE (HONOURS) PHYSICS (SESSION 2022-23)
SEMESTER-III
OPTICS

Course Code: BOPL-3391

Course Outcome of Optics

After passing this programme the students will be able to:

- CO1:** understand the concept of interference of waves by division of wave front and its different methods and concept of coherence.
- CO2:** understand the interference of waves by division of Amplitude and its methods and will have knowledge of interferometers
- CO3:** understand the Huygen's Fresnel theory and diffraction, Fraunhofer diffraction due to single slit, double slit and n slits, the concept of resolving power.
- CO4:** understand the concept the polarization of light and types of polarisers.

BACHELOR OF SCIENCE (HONOURS) PHYSICS (SESSION 2022-23)
SEMESTER-III

STATISTICAL AND THERMAL PHYSICS

Course No. BOPL-3392

Course Outcomes: STATISTICAL AND THERMAL PHYSICS

After passing this programme the students will be able to:

- CO1: Understand the basic ideas and scope of probability as well as distribution of n particles in different compartments.
- CO2: Concept of different types of Statistics and the need for Quantum Statistics.
- CO3: Understand the concept of entropy, Laws of Thermodynamics and applications to thermoelectric effect.
- CO4: Understand the Maxwell Thermodynamics relations, Change of state and Claypron equation. Thermodynamic Potentials and Equilibrium of Thermodynamic Systems

Bachelor of Science (Honours) Physics
Semester–III
Session 2022-23
Course Title: Mathematics-III
Course Code: BOPL-3333

Course outcomes

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

CO 1: Understand the concept of complex numbers and De Moivre's theorem

CO 2: Understand the basic concept of lines, parabola, hyperbola and ellipse.

CO 3: Understand and demonstrate the concept of cone, cylinder and sphere and understand of tangent plane and normal plane to the surfaces the concept

CO 4: Understand and demonstrate the concept of double and triple integrals.

**Bachelor of Science (Honours) Physics
(Semester-III)
Session: 2022-25
Course Title: Chemistry- III
(Physical Chemistry)
Course Code: BOPL-3084**

Course outcomes

Students will be able to

CO1: acquire the knowledge of structure and intermolecular forces present between solids, liquids and gases.

CO2: Understand the concept of surface tension and interfacial tension

CO3: Understand the concept of reaction rates and determine the rate law from initial rate data

CO4: demonstrate an understanding of basic principles of colligative properties and understand the basic concepts of colloidal state of matter and applications of colloids.

INTERDISCIPLINARY COURSE ID-I

Bachelor of Science (Honours) Physics

Semester–III

Session- 2022-23

Course Title: Python Programming

Course Code: BOPM-3135

Course Outcome

After passing the course the students will be able to:

CO1: Comprehend the use of various programming constructs like data types, operators, string processing and control structures.

CO2: Identify the flow of control in various control statement.

CO3: Implement various built-in and user defined function, packages and modules to solve basic problems in Physics.

CO4: Comprehend file manipulation using various built-in functions.

CO5: Comprehend visualization of data and result through graphics.

Course Outcomes: Physics Lab-III

Semester III

(SESSION 2022-23)

Course No. BOPP-3396

CO1: After the completion of this course students will be able to use spectrometer along with prism, doubly refractive prism, diffraction grating to find various optical parameters.

CO2: Students will be able to find resolving power of grating and telescope

CO3: At the end of this course students will be able to use polarimeter and hence will be able to measure specific rotation by using polarimeter.

CO4. Students will be able to demonstrate the verification of laws of probability distribution, conversion of electrical energy to heat and concept of thermal conductivity.

BACHELOR OF SCIENCE (HONOURS) PHYSICS

(SEMESTER-III)

SESSION: 2022-25

COURSE CODE: BOPP-3086

COURSE TITLE: CHEMISTRY LAB-III

Course outcomes

Students will be able to

CO1: understand the technique of crystallisation

CO2: compare the viscosity and surface tension of different liquids and solutions

CO3: determine the rate of the reactions

CO4: efficiently use of calorimeter in various experiments

BACHELOR OF SCIENCE (HONOURS) PHYSICS (SESSION 2022-23)

SEMESTER-IV

COURSE CODE: BOPL-4391

Course Outcomes: Mechanics -II

After passing this course, students will be able to:

After passing this course, students will be able to:

CO1: understand the relative motion in inertial and non-inertial frames of reference. They will learn Galilean transformations and invariance of physical quantities. They will know about various fictitious forces which arise due to translational and rotational motion of frames.

CO2: understand the development of special theory of relativity by studying Michelson Morley Experiment and Lorentz Transformations. They will understand the consequences of relativity when objects move at a very high speed which is comparable to speed of light.

CO 3: to solve various problems related to relativistic dynamics. They will learn about relativistic mass, energy, momentum and force.

CO 4: to understand the concept of space-time intervals and Minkowski space. They will understand the time dilation, length contraction via geometrical interpretation of Lorentz transformations. They will learn the effects of gravity on light and space-time curvature.

BACHELOR OF SCIENCE (HONOURS) PHYSICS (SESSION 2022-23)
SEMESTER-IV

Course Outcomes: Atomic Spectroscopy
Course No. BOPL-4392

After passing this programme the students will be able to:

- CO1: understand fine and hyperfine spectrum of hydrogen atom and the concept of spin and magnetic moment of an electron
- CO2: understand spectra of alkali atoms and Zeeman effect
- CO3: demonstrate understanding of exchange symmetry of wave function, different coupling schemes and spectra of atoms with more than one electron.
- CO4: Students will understand concept of X rays spectra including origin, production and characterization

Bachelor of Science (Honours) Physics
Semester-IV
Session 2022-23
Course Title: Mathematics-IV
Course Code: BOPL-4333

Course outcomes

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

CO 1: Understand the concept of matrices, determinants and State and prove Cayley Hamilton theorem. Solve system of linear equations and obtain Eigen values, Eigen vectors and Characteristic polynomial.

CO 2: Understand the concept of system of linear equations and condition for consistency.

CO 3: Understand the concept of Vector Spaces, Linear Independence and Dependence, Basis and Dimension and linear transformation and its matrix representation.

CO4: Demonstrate the concept of infinite series with various tests.

B.Sc. (Hons.) Physics (Semester-IV)

**COURSE CODE: BOPL-4084
CHEMISTRY-IV**

Session 2022-23

(Molecular Spectroscopy)

Students will be able to

CO1: learn about the Principle and applications of ultraviolet and Woodward Fisher Rule

CO2: understand the infra-red spectroscopy in organic structure determination

CO3: explain common terms in NMR spectroscopy such as chemical shift, coupling constant, and anisotropic effect, spin spin splitting, shielding constant and their affect on the spectra of the compound.

CO4: study the various measurement techniques in NMR spectroscopy.

CO5: understand the various cleavages and rearrangements in Mass spectroscopy.

CO6: factors affecting cleavage patterns in Mass spectroscopy.

CO7: interpret the spectrum of unknown compounds on the basis of NMR and Mass spectroscopy.

CO8: understand the various applications of NMR and Mass spectroscopy.

CO9: use NMR and Mass spectroscopy data in elucidating the chemical structure of a compound.

CO10: solve the numerical problems based on use NMR and Mass spectroscopy.

Bachelor of Science (Honours) Physics
Semester-IV
Session- 2022-23
Course Title: Numerical Methods and Error Analysis
Course Code:BOPL-4335

Course Outcomes:

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

CO 1. Understand various kinds of errors and uncertainties experimental measurements and results. They will learn to estimate the errors in mathematical calculations

CO 2: Solve polynomial and transcendental equations numerically with the iterative methods. They will also learn to solve set of linear simultaneous equations by direct and iterative methods

CO 3: Interpolate the data from a set of experimental observations with equal and unequal intervals. They will also learn to fit the given set of data points with an appropriate function

CO 4: Solve integration and differentiation numerically by using various methods. They will learn to solve linear differential equations by iterative methods

BACHELOR OF SCIENCE (HONOURS) PHYSICS (SESSION 2022-23)
SEMESTER-IV
PHYSICS LAB-IV

Course No. BOPP-4396

COURSE OUTCOMES: After completion of this course student will be able

CO1: to measure an accessible (Horizontal and vertical) and inaccessible height using sextant.

CO2: to demonstrate adiabatic expansion, thermo emf, Stefan's constant and thermal expansion measurements.

CO3: to find e/m of an electron, ionisation potential, and characteristics of solar cell.

CO4: understand spectrum of Iodine and Hydrogen.

BACHELOR OF SCIENCE (HONOURS) PHYSICS

(SEMESTER-IV)

SESSION: 2022-25

COURSE CODE: BOPP-4087

COURSE TITLE: CHEMISTRY LAB-IV

Students will be able to

CO1: know the principle and mechanism of Conductometric titrations and polarimetric experiments

CO2: determine the heat of neutralization and Heat of solution Calorimetrically .

CO3: know the principle and working of Abbe's Refractometer

CO4: determine the composition of unknown mixture of two liquids by refractive index measurements.

BACHELOR OF SCIENCE (HONOURS) PHYSICS

SEMESTER-V

SESSION 2022-23

CONDENSED MATTER PHYSICS – I

Course No. BOPL- 5391

Course Outcomes: CONDENSED MATTER PHYSICS – I

After passing this course, students will be able to:

- CO 1. Understand basics about crystal structures in solids, various types of crystal structure, unit cells and symmetry operations.
- CO 2. Student will also understand the experimental methods to determine crystal structures, reciprocal lattice, Brillouin zones and form factor.
- CO 3. Student will understand the concept of free electron model and its applications in explaining concepts of electric conductance.
- CO 4.** Build concept about Kronig Penny model and its application to band theory to differentiate insulators, semiconductors and conductors, Hall effect

**BACHELOR OF SCIENCE (HONOURS) PHYSICS
SEMESTER– VI
SESSION 2022-23**

QUANTUM MECHANICS

Course No. BOPL- 5392

Course Outcomes: Quantum Mechanics

Course Outcomes- After completing this course a student will be able to

CO1: understand about wavefunction and time dependent and time independent Schrodinger's wave equations.

CO2: understand various quantum operators, eigen functions, eigen values, expectation values and Gaussian wave functions.

CO3: apply Schrodinger's wave equation for step potential, rectangular potential, potential well and oscillating potential.

CO4: apply Schrodinger's wave equation in spherical coordinates to three dimensional problems like hydrogen atom and harmonic oscillator.

BACHELOR OF SCIENCE (HONOURS) PHYSICS

SEMESTER-V

SESSION 2022-23

NUCLEAR PHYSICS

Course No. BOPL- 5393

Course Outcomes: NUCLEAR PHYSICS

After passing this course, students will be able to:

- CO 1. Understand basic properties of nucleus and nuclear forces and various hypothesis of nucleus constituents
- CO 2. Understand about radioactivity, theories of alpha, beta and gamma decay, neutrino hypothesis.
- CO 3. Understand concepts and types about nuclear reactions, reactions cross section, fission and fusion
- CO 4. Understand nuclear models (Liquid drop, Fermi gas model and Shell model) and their failures and successes.

**BACHELOR OF SCIENCE (HONOURS) PHYSICS
SEMESTER- V
SESSION 2022-23
ELECTRONICS**

Course No. BOPL- 5394

Course Outcomes: Electronics

Course Outcomes- After completing this course a student will be able to

CO1: understand, concept of voltage and current sources, working of a p-n junction diode, Zener diode, and their use in basic gates, photonic devices, rectification and voltage regulation.

CO2: understand the characteristics, biasing and working of BJT and FETs.

CO3: able to understand h-parameters, amplifiers using BJT & FETs and types of feedbacks and practical example of negative feedback (emitter follower). understand LC and RC oscillators and their comparison.

CO4: able to understand basics of digital electronics.

BACHELOR OF SCIENCE (HONOURS) PHYSICS (SESSION 2022-23)
SEMESTER-V
COURSE CODE: BOPP-5397
PHYSICS LAB-V

Course Outcomes : Physics Lab Sem V

- CO 1. Students will be able to characterize p-n junction, zener diode, and their use as rectifier, filters, clipping element and to find energy gap.
- CO 2. Student will be able to use CRO for AC voltage and frequency.
- CO 3. Students will be able to characterize Common base and common emitter transistors and their use as amplifier.
- CO 4. Students will be able to use diodes as basic gates.

SEMESTER VI

**BACHELOR OF SCIENCE (HONOURS) PHYSICS
SEMESTER– VI
SESSION 2022-23**

RADIATION AND PARTICLE PHYSICS

Course No. BOPL- 6391

Course Outcomes: Particle Physics

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

CO1: understand about elementary particles, different types of interactions and quark model.

CO2: understand interaction of radiation and charged particles with matter.

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

CO4: understand theory and working of various types of nuclear detectors like gas filled, semiconductor, solid state track detectors and nucleus emulsions.

**BACHELOR OF SCIENCE (HONOURS) PHYSICS
SEMESTER– VI
SESSION 2022-23**

CONDENSED MATTER PHYSICS – II

Course No. BOPL- 6392

Course Outcomes: Condensed Matter Physics – II

After completing this course student will be able to

CO1: understand the concept of phonons, and role of lattice vibrations in specific heat of solids.

CO2: understand the basic concepts related to super conductivity.

CO3: understand the concept of dielectric polarisation types and frequency dependence.

CO4: understand the basics about nanomaterials and some characterisation techniques.

BACHELOR OF SCIENCE (HONOURS) PHYSICS
SEMESTER-VI
SESSION 2022-23

MOLECULAR SPECTROSCOPY AND LASER

Course No. BOPL- 6393

Course Outcomes: MOLECULAR SPECTROSCOPY AND LASER

After passing this course, students will be able to:

- CO 1: understand the basics of microwave and infrared spectroscopy and their applications.
- CO 2: understand the Raman and electronic spectroscopy, applications and comparison.
- CO3: understand the basics of principle and theory of working of LASERs.
- CO 4: understand different types of LASER and basics of Q Switching and holography.

BACHELOR OF SCIENCE (HONOURS) PHYSICS
SEMESTER-VI
(Session-2022-23)
DIGITAL ELECTRONICS AND APPLICATIONS
Course No. BOPL- 6394

Course Outcomes: DIGITAL ELECTRONICS AND APPLICATIONS

After passing this course, students will be able to:

- CO 1: understand the basics of ICs, binary to digital and digital to binary conversions, different number systems, addition and subtraction in binary system.
- CO 2: understand different gates, Boolean laws, K maps.
- CO3: understand the basics of gates as adders, subtractor, comparator, multiplexer, demultiplexer, encoder, decoder and flip-flops.
- CO 4: understand IC 555: multivibrators, registers, Counters, Semiconductor Memories.

BACHELOR OF SCIENCE (HONOURS) PHYSICS (SESSION 2022-23)
SEMESTER-VI
PHYSICS LAB-VI

Course No. BOPP-6395

COURSE OUTCOMES

After completing this lab student will be able to:

CO1: use GM counter as detector

CO2: Characterise Thermistor, diode, LDR and to find magnetic parameters using CRO.

CO3: understand Hall effect and Boltzmann's coefficient, photo electric effect

CO4: To use OP-Amps as inverting and non inverting amplifiers and its application in zero cross detector and comparator.

BACHELOR OF SCIENCE (HONOURS) PHYSICS (SESSION 2022-23)
SEMESTER-VI

PHYSICS LAB-VII

Course No. BOPP-6396

COURSE OUTCOMES

After completing this lab student will be able to

CO1: understand logic gates and their truth tables

CO2: understand 2-bit comparator, adders, subtractors, parity generator and checker.

CO3: understand shift register, flip flops

CO4: understand A/D, D/A converters and counters.