**Asian Educational Institute, Patiala (PB)**

**(An Autonomous College)**

**School of Science & Mathematics**

**Programme Structure: B. Sc./ B. Sc. (Honours) Physical Sciences**

**Semester-1**

**Session: 2025-2026 (NEP 2020 Implementation)**

| S. No | Course Type NEP 2020 | Subject Code | Course Title | Credits | Hours per week | Marks |
|---|---|---|---|---|---|---|
| 1. | Major-Physics | BPHY101T | Mechanics | 03 | 4 | 100 |
| 2. | Major -Physics Lab | BPHY101L | Physics Laboratory | 01 | 2 | 50 |
| 3.. | Major-Mathematics | BMATH101T | Algebra and Trigonometry | 04 | 4 | 100 |
| 4. | Major-Chemistry | BCHEM101T | Organic Chemistry-I | 03 | 4 | 100 |
| 5. | Major-Chemistry Lab | BCHEM101L | Chemistry Laboratory | 01 | 2 | 50 |
| 6. | Minor-Computer Science | BCOMP101 | Fundamental of Computers | 04 ( T+L) | 4 | 100 |
| 7. | IDC/MDC | BIDCI101 | Evolving Universe | 03 | 3 | 100 |
| 8. | AEC (language) | BENG101 | English-I | 02 | 2 | 50 |
| 9. | SEC | BSEC101 | Electronics Workshop-1 | 03 (T+L) | 3 | 100 |
| 10. | VAC | BEVS101 | Environment and Road Safety | 02 | 2 | 50 |
| 11. | PBI | BPBI101 | Punjabi (Compulsory) | 04 | 4 | 100 |
| | | | Total | 30 | | |

# Asian Educational Institute, Patiala (PB)

## (An Autonomous College)

## School of Science & Mathematics

### Programme Structure: B. Sc. / B. Sc. (Honours) Physical Sciences

### Semester II

### Session: 2025-2026 (NEP 2020 Implementation )

| S. No | Course Type NEP 2020 | Subject Code | Course Title | Credits | Teaching Hours per week | Marks |
|---|---|---|---|---|---|---|
| 1. | Major- Physics | BPHY102T | Electricity and Magnetism | 03 | 4 | 100 |
| 2. | Major -Physics Lab | BPHY102L | Physics Laboratory | 01 | 2 | 50 |
| 3. | Major- Mathematics | BMATH102T | Calculus-I | 04 | 4 | 100 |
| 4. | Major- Chemistry | BCHEM102T | Inorganic Chemistry-I | 03 | 4 | 100 |
| 5. | Major- Chemistry Lab | BCHEM102L | Chemistry Laboratory | 01 | 2 | 50 |
| 6. | Minor - Computer Science | BCOMP102 | Office Automation Tools | 04 ( T+L) | 4 | 100 |
| 7. | IDC/MDC | BIDC102 | Evolution of Science | 03 | 3 | 100 |
| 8. | AEC (language) | BENG102 | English-II | 02 | 2 | 50 |
| 9. | SEC | BSEC102 | Electronics Workshop-II | 03(T+L) | 3 | 100 |
| 10. | VAC | BDRUG102 | Drug Abuse- Problem Management and Prevention | 02 | 2 | 50 |
| 11. | PBI | BPBI102 | Punjabi Compulsory | 04 | 4 | 100 |
| | | | Total | 30 | | |

# ASIAN EDUCATIONAL INSTITUTE, PATIALA (PB)

## UG PROGRAMME (Bachelor of Science) MULTIDISCIPLIANARY

## B.Sc. / B.Sc. (HONOURS)

## SESSION: 2025-2026

### Subject- Physics

| Code | Title of Paper | Hours (Per Week) | Max. Marks | | | Credits | Examination Time(Hours) |
|---|---|---|---|---|---|---|---|
| **SEMESTR-I** | | | **Total** | **Ext.** | **Int.** | | |
| BPHY101T | **MAJ:** Mechanics | 03 | 100 | 70 | 30 | 03 | 03 |
| BPHY101L | **MAJ:** Physics Laboratory | 02 | 50 | 35 | 15 | 01 | 03 |
| BPHY101T | **MIN:** Mechanics | 03 | 100 | 70 | 30 | 03 | 03 |
| BPHY101L | **MIN:** Physics Laboratory | 02 | 50 | 35 | 15 | 01 | 03 |
| BEUN101 | **IDC/MDC:** Evolving Universe | 03 | 100 | 70 | 30 | 03 | 03 |
| BSEC101 | **SEC:** Electronics Workshop-I, (2T+1L) | 04 | 100 | 70 | 30 | 03 | 03 |
| | | | | | | | |
| **SEMESTR-II** | | | | | | | |
| BPHY102T | **MAJ:** Electricity and Magnetism | 03 | 100 | 70 | 30 | 03 | 03 |
| BPHY102L | **MAJ:** Physics Laboratory | 02 | 50 | 35 | 15 | 01 | 03 |
| BPHY102T | **MIN:** Electricity and Magnetism | 03 | 100 | 70 | 30 | 03 | 03 |
| BPHY102L | **MIN:** Physics Laboratory | 02 | 50 | 35 | 15 | 01 | 03 |
| BESC102T | **IDC/MDC:** Evolution of Sciences / Applied Physics-I | 03 | 100 | 70 | 30 | 03 | 03 |
| BSEC102 | **SEC:** Electronics Workshop-2, ( 2T +1L) | 04 | 100 | 70 | 30 | 03 | 03 |

- **MAJ:** Discipline Specific Core Course: **MIN**: Minor Core Course; **IDC/MDC:** Inter Disciplinary Course/Multi-Disciplinary Course, **AEC:** Ability Enhancement Course, **VAC:** Value Added Course, **SEC:** Skill Enhancement Course.

**Semester-I**

**MECHANICS**

**Subject Code: BPHY101T**

**(Major Theory)**

**Max. Marks:** 100 **Credits:** 03

**End-Semester Exam:** 70 **Teaching Hours:** 40 Hours

**Internal Evaluation:** 30 **Pass Marks:** 35%

| **Course Outcomes:** On successful completion of this course students will: | |
|---|---|
| **CO1** | Understand the various co-ordinate systems and its applications. |
| **CO2** | Student will able to know the fundamental forces of nature, concept of centre of mass, central forces and motion under central force, |
| **CO3** | Know the conservation laws and the symmetries of space and time. They will be able to know the origin of coriolis forces and their consequences on acceleration due to gravity and Foucault's Pendulum. |
| **CO4** | They will learn the rotational motion of a body in general by studying the Euler's Equation. |
| **CO5** | Understand Kepler's Law, Michelson Morley Experiment and its result. |
| **CO6** | Understand the Inertial and Non-inertial frame of references. Concept of Lorentz and Galilean transformations, length contraction, time dilation, relativistic transformation of velocity and relativistic variation of mass. |

**Instructions for Paper Setter:**

The end-semester examination will be of 70 marks and of 3 hours duration. The question paper will consist of three sections, namely Section A, B and C. Section A and B will have four questions each from the respective sections of syllabus. Each question will carry 12 marks and may be segregated into sub-parts. Section C will be compulsory with 11 short answer type questions of 2 marks each covering the entire syllabus.

## Instructions for students

Students have to attempt four questions in all from Section A and B by selecting 2 questions from each Section. Section C will be compulsory, Use of scientific calculator is allowed.

## SECTION –A

**Co-ordinate system and Inverse square law force:** Co-ordinate systems, spherical polar co-ordinates, cylindrical co-ordinate, area, volume, displacement, velocity and acceleration in these systems, solid angle, various forces in nature (brief introduction), Center of mass, Equivalent one body problem, central forces, equation of motion under central force, equation of orbit in inverse square, force field and turning points, Kepler laws and their derivations.

**Conservation laws and symmetries of space and time:** Centrifugal force and its effect on acceleration due to gravity, coriolis force and its applications, variation of acceleration due to gravity with latitude, Focault pendulum (qualitative), elastic collision in laboratory and CM system velocities, angles, and energies, cross section of elastic scattering, Rutherford scattering (qualitative).

## SECTION B

**Rigid body motion**: Rotational motion, principle moments and axes, Euler's equations, precession and elementary gyroscope.

**Special theory of relativity**: Inertial frame of reference, Galilean transformation and invariance, Non-inertial frame of reference, Michelson Morley experiment and its result, Postulates of special theory of relativity, Lorentz transformation, observer and viewer in relativity, relativity simultaneity, length, time, relativistic addition theorem of velocities, Relativistic Doppler effect, variation of mass with velocity, mass energy equivalence, rest mass in an elastic collision, relativistic momentum and energy, their transformation, concept of Minkowski space, four vector formulation.

**Reference Books**


1. Mechanics: Berkeley Physics Course, Volume I by C. Kittel, W D Knight, M Alvin and A Ruderman, Tata McGraw Hill Publication, 1981.
2. Mechanics: H.S Hans and S.P Puri, Tata McGraw Hill, 2003, New Delhi
3. Introduction to Classical Mechanics by R.G Takwale and P. S Puranik, Tata McGrow Hill 2000.
4. Kittel . C. et. al. Mechanics Berkeley Physics Course, Volume 1, Tata McGraw Hill 2007.
5. Fundamentals of Physics by Halliday, D. Resnickel, R. & Walker, J. 9th edition., John Willey & Sons (2010)
6. Engineering Mechanics, By B. Bhattacharya 2nd edition, Oxford University press 2015.

**Semester-I**

**Physics Laboratory**

**Subject Code: BPHY101L**

**(Major Practical)**

**Max. Marks: 50** **Credit: 01**

**End Semester Exam: 35 marks** **Total load: 26 hours**

**Internal Evaluation: 15 marks** **Pass Marks: 35%**

**General Guidelines for End-Semester Practical Examination:**

1. The student will be allotted one experiment out of the experiments mentioned in syllabus and asked to perform.

1. The distribution of marks is as follows:

(i) One full experiment requiring the student to take some data, analyse it and draw conclusions (15 marks)

(ii) Brief theory (05 marks)

(iii) Viva-voice (10 marks)

(iv) Record (practical file) (05 marks)

| S. No | Practical Description |
|---|---|
| 1. | To measure the thickness of wire using Vernier calipers and screw gauge. |
| 2. | Analysis of experimental data by :<br>i) Fitting of given data to a straight line. ii) Calculation of probable error. |
| 3. | To Study Motion of the Centre of Mass of pair of Particles. |
| 4.. | To establish relationship between torque and angular acceleration using fly wheel and hence to find inertia of flywheel. |
| 5.. | Study the dependence of moment of inertia on distribution of mass (by noting time periods of oscillations) using objects of various geometrical shapes but of same mass. |
| 6. | Determination of Poisson's ratio for rubber. |
| 7. | To determine the Young's Modulus By bending of beam. |
| 8. | To measure time period of oscillation of a Maxwell needle and determine modulus of rigidity of the material of a given wire. |
| 9. | To determine energy transfer, co-efficient of restitution and verify laws of conservation linear momentum and kinetic energy in elastic collision using one dimensional collisions hanging spheres. |
| 10. | To study one dimensional collision using two hanging sphere. |
| 11. | Determination of Modulus of rigidity of material of wire using Maxwell's needle. |

| S. No | Reference Books |
|---|---|
| 1. | B.Sc. Practical Physics, By C.L.Arora, S.Chand & Co. |
| 2. | A Laboratory Manual of Physics for undergraduate classes by D.P.Khandelwal. |

**Semester-I**

**MECHANICS**

**Subject Code: BPHY101T**

**(Minor Theory)**

**Max. Marks:** 100 **Credits**: 03

**End-Semester Exam**:70 **Total load**: 40 Hours

**Internal Evaluation**: 30 **Pass Marks**: 35%

| **Course Outcomes:** On successful completion of this course students will: | |
|---|---|
| **CO1** | Understand the various co-ordinate systems and its applications. |
| **CO2** | Student will able to know the fundamental forces of nature, concept of centre of mass, central forces and motion under central force. |
| **CO3** | Know the conservation laws and the symmetries of space and time. They will be able to know the origin of coriolis forces and their consequences on acceleration due to gravity and Foucault's Pendulum. |
| **CO4** | They will learn the rotational motion of a body in general by studying the Euler's Equation. |
| **CO5** | Understand Kepler's Law, Michelson Morley Experiment and its result. |
| **CO6** | Understand the Inertial and Non-inertial frame of references. Concept of Lorentz and Galilean transformations, length contraction, time dilation, relativistic transformation of velocity and relativistic variation of mass. |

**Instructions for Paper Setter:**

The end-semester examination will be of 70 marks and of 3 hours duration. The question paper will consist of three sections, namely Section A, B and C. Section A and B will have four questions each from the respective sections of syllabus. Each question will carry 12 marks and may be segregated into sub-parts. Section C will be compulsory with 11 short- answer type questions of 2 marks each covering the entire syllabus.

## Instructions for students:

Students have to attempt four questions in all from Section A and B by selecting 2 questions from each Section. Section C will be compulsory, Use of scientific calculator is allowed.

## SECTION –A

Co-ordinate system and spherical polar co-ordinates, area, volume, displacement, velocity and acceleration in these systems, solid angle, various forces in nature (brief introduction), Center of mass, Equivalent one body problem, central forces, equation of motion under central force, equation of orbit in inverse square, force field and turning points, Kepler laws and their derivations.

Inertial frame of reference, Galilean transformation and invariance, Non-inertial frame of reference, Centrifugal force and its effect on acceleration due to gravity, coriolis force, variation of acceleration due to gravity with latitude.

## SECTION B

Michelson Morley experiment and its result, Postulates of special theory of relativity, Lorentz transformation, observer and viewer in relativity, relativity simultaneity, length, time, relativistic addition theorem of velocities, Relativistic Doppler effect, variation of mass with velocity, mass energy equivalence, rest mass in an elastic collision, relativistic momentum and energy, their transformation, concept of Minkowski space, four vector formulation.

**Reference Books**


1. Mechanics: Berkeley Physics Course, Volume I by C.Kittel, W D Knight, M Alvin and A Ruderman, Tata McGraw Hill Publication, 1981.
2. Mechanics: H.S Hans and S.P Puri, Tata McGraw Hill, 2003, New Delhi
3. Introduction to Classical Mechanics by R.G Takwale and P. S Puranik, Tata McGrow Hill 2000.
4. Kittel . C. et. al. Mechanics Berkeley Physics Course, Volume 1, Tata McGraw Hill 2007.
5. Halliday, D. Resnickel, R. & Walker, J. Fundamentals of Physics 9th edition., John Willey & Sons (2010)
6. Bhattacharya B. Engineering Mechanics, 2nd edition, Oxford University press 2015.

**Semester-I**

**Subject Code: BPHY101L**

**(Minor - Physics Laboratory Practical)**

**Max. Marks: 50** **Credit: 01**

**End Semester Practical Exam: 35 marks** **Total load: 26 hours**

**Internal Evaluation: 15 marks** **Pass Marks: 35 %**

**General Guidelines for End-Semester Practical Examination:**

1. The student will be allotted one experiment out of the experiments mentioned in syllabus and asked to perform.
2. The distribution of marks is as follows:

i. One full experiment requiring the student to take some data, analyse it and draw conclusions (15 marks)
ii. Brief theory (05 marks)
iii. Viva-voice (10 marks)
iv. Record (practical file) (05 marks)

| S. No | Practical Description |
|---|---|
| 1. | To measure the thickness of wire using vernier calipers and screw gauge. |
| 2. | Determination of Modulus of rigidity of material of wire using Maxwell's needle. |
| 3. | To establish relationship between torque and angular acceleration using fly wheel and hence to find inertia of flywheel. |
| 4. | Study the dependence of moment of inertia on distribution of mass (by noting time periods of oscillations) using objects of various geometrical shapes but of same mass. |
| 5. | Determination of Poisson's ratio for rubber. |
| 6. | To determine the Young's Modulus By bending of beam. |
| 7. | To measure time period of oscillation of a Maxwell needle and determine modulus of rigidity of the material of a given wire. |
| 8. | To study one dimensional collision using two hanging sphere. |
| 9. | To determine energy transfer, co-efficient of restitution and verify laws of conservation linear momentum and kinetic energy in elastic collision using one dimensional collisions hanging spheres. |
| 10. | To study the variation of time period with distance between center of suspension and center of gravity for a bar pendulum and to determine<br>1. Radius of gyration of bar pendulum about an axis through its center of gravity and perpendicular to its length.<br>2. Value of center of gravity "g". |

| S. No | Reference Books |
|---|---|
| 1. | B.Sc. Practical Physics, By C.L.Arora, S.Chand & Co. |
| 2. | A Laboratory Manual of Physics for undergraduate classes by D.P.Khandelwal. |

# Electronics Workshop-I

**Paper code: BSEC 101**

**(Skill Enhancement Course)**

**Max. Marks: 100** **Credits: 03** (2T+1L)

**External Marks: 70** **Total Load: 40 Hour**

**Internal Marks: 30** **Pass Marks: 35%**

**General Guidelines for End-Semester Examination:**

1 .The student will be allotted one activity out of the activities mentioned in syllabus and asked to perform. Examination Time duration will be of 3 Hours.

2. The distribution of marks is as a follows:

(i) One full activity and conclusions. (30)

(ii) Brief theory (10)

(iii) Viva-Voice (15)

(iv) Record (Activity File) (15)

**List of the Activities:**

1. Draw Symbols of various electronic components on drawing sheets. Draw the circuit diagrams of various (Simple to Complex)electronics circuits on drawing sheets.

2. Familiarization of Electronics Measuring Instruments and Components.

3. Testing of electronics components like Resistor, Capacitor, Diode, Transistor Using Multimeter.

4. Measurement of resistance, voltage and current using Digital Multimeter.

5. To study the series and parallel combination of a resistor.

6. Practice to solder different components such as resistor, capacitor, diodes and transistors

7. Sketch, mount, solder and test at least one from following electronic circuit on bread board (Circuits given as a guideline only)

(i) How to build a very simple circuit which lights up a single Light Emitting Diode (LED)?

(ii) To build the transistor timer circuit.

(iii) Electronic Eye Controlled Security System Applications

**Semester-I**

**Evolving Universe (IDC/MDC)**

**Subject Code:** BIDC101

**Max. Marks:** 100 **Credits:** 03

**End-Semester Exam:** 70 **Total load:** 40 Hours

**Internal Evaluation:** 30 **Pass Marks:** 35%

| **Course Outcomes:** At the end of the course students will be able to: | |
|---|---|
| **CO1** | Understand the concept of solar systems: theories of sun, stars, galaxies and planets. |
| **CO2** | Understand the general description of solar system. |
| **CO3** | They will be able to learn the structure and components of astronomy. |
| **CO4** | They will be able to understand the concept of universe. |

**Instructions for Paper Setter:**

The end-semester examination will be of 70 marks and 3 hours duration. The question paper will consist of three sections, namely Section A, B and C. Section A and B will have four questions each from the respective sections of syllabus. Each question will carry 12 marks and may be segregated into sub-parts. Section C will be compulsory with 11 short- answer type questions of 2 marks each covering the entire syllabus.

**Instructions for students:**

Students have to attempt four questions in all from Section A and B by selecting 2 questions from each Section. Section C will be compulsory, Use of scientific calculator is allowed.

**Section-A**

**Solar System:** Terrestrial planets, Jovian planets, natural satellites, minor bodies of the solar system (Asteroids, comets, dwarf planets, trans-Neptunian objects)
Origin of solar system: Basic theories, Sun: structure and general properties.
Stars: Stellar properties (Distances, sizes, Masses0, Interstellar medium (General description), formation of stars, end stages of stars (white dwarfs, neutron stars, supernova, black holes).

## Section B

Galactic Astronomy, Galaxies, classification of galaxies, galactic properties, Milky Way galaxy (structure and components), quasars (brief description)
Universe: Introductory concept, large scale structure of the universe (Group of Galaxies, Clusters, upper clusters), Evolution of universe (steady state theory, Big bang Theory, Oscillating theory), Dark Matter and Dark Energy.

**Reference Books:**


1. Astronomy: Dinah L Moche, John Wiley & ons, INc. Eigth Edition, 2014.
2. The cosmos-Astronomy in the new Millenium: Jam M. Pasachoff & Alex Filipenko, Cambridge University Press, Fourth edition, 2013.
3. The life and death of stars: Kennith R. Lang, Canbridge University Press, First edition, 2013.
4. The Cambridge guide to the solar system: Kennith R. Lang, Cambridge University Press Second edition, 2011.

**Semester-II**

## ELECTRICITY AND MAGNETISM

**Subject Code: BPHY102T**

**(Major Theory)**

**Max. Marks:** 100 ***Credits:*** *03*

**End-Semester Exam**: 70 ***Total load:*** *40 Hours*

**Internal Evaluation**: 30 ***Pass Marks:*** *35%*

| **Course Outcomes:** At the end of the course students will be able to: | |
|---|---|
| **CO1** | Understand the vector algebra vector calculus 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 electric potential and Calculation electric potential due to Dipole, various charge distribution. Potential due to arbitrary charge distribution. |
| **CO3** | Student learn Gauss's divergence theorem, Green's Theorem and Stoke's theorem and applications |
| **CO4** | Students will understand the conduction of electric current in conductors by studying Ohm's law and equation of continuity. **E** in different frames of reference |
| **CO5** | They will understand Lorentz's force law, Ampere's Circuital law, Faraday's Law and Maxwell's equations. They will be learning the origin of magnetism and properties of various kinds of magnetic materials. |

**Instructions for Question Paper Setter:**

The end-semester examination will be of 70 marks and of 3 hours duration. The question paper will consist of three sections, namely Section A, B and C. Section A and B will have four questions each from the respective sections of syllabus. Each question will carry 12 marks and may be segregated into sub-parts. Section C will be compulsory with 11 short- answer type questions of 2 marks each covering the entire syllabus.

**Instructions for students:**

Students have to attempt four questions in all from Section A and B by selecting 2 questions from each Section. Section C will be compulsory, Use of scientific calculator is allowed.

## SECTION-A

**Introduction to vector calculus & Electric field :** Vector and Scalar field, Gradient, Divergence, Curl and their physical significance, Electric field , Electric field due to dipole, line charge and sheet of charge, Electric flux, Gauss's Law and its applications, differential form of Gauss's law, Gauss's divergence theorem, Green's Theorem.

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

## SECTION-B

**Magnetic field and Magnetic properties of Matter**: Current and current density, equation of continuity, Microscopic form of Ohm's Law ($\mathbf{J} = \sigma\mathbf{E}$) and conductivity, Failure of Ohm's Law, Invariance of charge, E in different frames of reference, Field of point charge moving with constant velocity, Interaction between moving charges and force between parallel currents, behavior of various substances in magnetic field, Definition of M and H and their relation to free and bound currents, Permeability and susceptibilities and their inter-relationship.

**Electromagnetism:** Lorentz's force, Ampere's Circuital law and its application, divergence and curl of **B**, Faraday's Law of EM induction, displacement current, Maxwell's equations, Mutual inductance and reciprocity theorem, self-inductance L for solenoid, coupling of Electrical circuits, analysis of LCR series and parallel resonant circuits, Q-factor. Power consumed power factor.

**Reference Books:**


1. Fundamentals of Electricity and Magnetism by Author F. Kipp.
2. Electricity and Magnetism. Berkeley Physics Course. Vol. II by E.M Purcell, McGraw-Hill, 1965.
3. Introduction to classical Electodynamics by David Griffith.
4. EM waves and Radiating systems by Edward C. Jordan and K.G Balmain.
5. Electricity and Magnetism By K. L. Chpora., D. L. Sehgal , N. K. Sehgal , Sultan Chand & Sons.(Since 1950)
6. Electromagnetic Theory & Electrodynamics by Satay Prakash, Published by KNRN , Meerut. India.

## Semester-II

## Physics Laboratory

## Subject Code: BPHY102L

## (Major Practical)

**Credit: 01**

**Max. Marks: 50**

**Total load: 26 hours**

**End Semester Practical Exam: 35 marks**

**Pass Marks: 35%**

**Internal Evaluation: 15 marks**

**General Guidelines for End-Semester Practical Examination:**

1. The student will be allotted one experiment out of the experiments mentioned in syllabus and asked to perform.
2. The distribution of marks is as follows:
   a) One full experiment requiring the student to take some data, analyse it and draw conclusions (15 marks)
   b) Brief theory (05 marks)
   c) Viva-voice (10 marks)
   d) Record (practical file) (05 marks)

| S. No. | Practical Description |
|---|---|
| 1. | To study the dependence of solenoid field on number of turns and current. |
| 2. | To study the magnetic field produced by current carrying solenoid using a search coil and to find the value of permeability of air. |
| 3. | To determine the Hall coefficient of the given sample and hence find the carrier concentration and mobility. |
| 4. | To determine the unknown capacitance using flashing and quenching of a neon lamp. |
| 5. | To study the induced emf as a function of velocity of magnet. |
| 6. | To study the charging and discharging capacitance of a capacitor. |
| 7. | Determination of RC Circuit. |
| 8. | To study B-H curve. |
| 9. | To study the resonance in series LCR Circuits for different resistances and calculate Value. |
| 10. | To study the resonance in parallel LCR Circuits for different resistances and calculate Value. |
| 11. | To study the phase relationship between voltage and current using impedance triangle. |

**Reference Books**

1. B.Sc. Practical Physics, By C. L. Arora, S.Chand & Co.
2. A Laboratory Manual of Physics for undergraduate classes by D.P.Khandelwal.

**Semester-II**

**ELECTRICITY AND MAGNETISM**

**Subject Code: BPHY102T**

**(Minor Theory)**

**Max. Marks:** 100 **Credits:** 03

**End-Semester Exam:** 70 **Total load:** 40 Hours

**Internal Evaluation:** 30 **Pass Marks:** 35%

**Instructions for Paper Setter:**

The end-semester examination will be of 70 marks and of 3 hours duration. The question paper will consist of three sections, namely Section A, B and C. Section A and B will have four questions each from the respective sections of syllabus. Each question will carry 12 marks and may be segregated into sub-parts. Section C will be compulsory with 11 short- answer type questions of 2 marks each covering the entire syllabus.

**Instructions for students:**

Students have to attempt four questions in all from Section A and B by selecting 2 questions from each Section. Section C will be compulsory, Use of scientific calculator is allowed.

**SECTION-A**

**Introduction to vector calculus & Electric field:** Gradient, Divergence, curl and their physical significance, Electric field , Electric field due to dipole, line charge and sheet of charge, Electric flux, Gauss's Law and its applications, differential form of Gauss's law, Green's Theorem, Gauss's divergence theorem.

**Electric Potential:** Work and potential difference, potential difference as line integral of electric field, Electric potential due to a point charge, a group or point charges, dipole and quadruple moments. Charged disc, Stoke's theorem and its application in Electrostatics field, curl E=0, Electric field as gradient of scalar potential.

**SECTION-B**

**Magnetic field and Magnetic properties of Matter**: Current and current density, equation of continuity, Microscopic form of Ohm's Law (J= σE) and conductivity, Failure of Ohm's Law, Invariance of charge, E in different frames of reference, Field of point charge moving with constant velocity, Interaction between moving charges and force between parallel currents,

behavior of various substances in magnetic field, Definition of M and H and their relation to free and bound currents, Permeability and susceptibilities and their inter-relationship.

**Electromagnetism:** Lorentz's force, Ampere's Circuital law and its application, divergence and curl of B, Faraday's Law of EM induction, displacement current, Maxwell's equations, Mutual inductance and reciprocity theorem, self-inductance L for solenoid, coupling of Electrical circuits.

**Text & Reference Books:**


1. Fundamentals of Electricity and Magnetism by Author F.Kipp.
2. Electricity and Magnetism. Berkeley Physics Course. Vol. II by E.M Purcell, McGraw-Hill, 1965.
3. Introduction to classical Electodynamics by David Griffith.
4. EM waves and Radiating systems by Edward C. Jordan and K.G Balmain.
5. Electricity and Magnetism By K. L. Chpora., D. L. Sehgal , N. K. Sehgal , Sultan Chand & Sons.(Since 1950)
6. Electromagnetic Theory & Electrodynamics by Satay Prakash, Published by KNRN, Meerut. India.

**Semester-II**

**Subject Code: BPHY102L**

**((Minor - Physics Laboratory Practical)**

**Max. Marks: 50** **Credit: 01**

**End Semester Practical Exam: 35 marks** **Total load: 26 hours**

**Internal Evaluation: 15 marks** **Pass Marks: 35 %**

**General Guidelines for End-Semester Practical Examination:**

1. The student will be allotted one experiment out of the experiments mentioned in syllabus and asked to perform.
2. The distribution of marks is as follows:

a. One full experiment requiring the student to take some data, analyse it and draw conclusions (15 marks)
b. Brief theory (05 marks)
c. Viva-voice (10 marks)

d. Record (practical file) (05 marks)

| S. No. | Practical Description |
|---|---|
| 1. | To study the dependence of solenoidal field on number of turns and current. |
| 2. | To study the magnetic field produced by current carrying solenoid using a search coil and to find the value of permeability of air. |
| 3. | To determine the Hall coefficient of the given sample and hence find the carrier concentration and mobility. |
| 4. | To determine the unknown capacitance using flashing and quenching of a neon lamp. |
| 5. | To study the induced emf as a function of velocity of magnet. |
| 6. | To study the charging and discharging capacitance of a capacitor. |
| 7. | To calculate the angle of prism using spectrometer. |
| 8. | Determination of RC constant. |
| 9. | To study the resonance in series LCR Circuits for different resistances and calculate Q-Value. |
| 10. | To study the resonance in parallel LCR Circuits for different resistances and calculate Q-Value. |
| 11. | To study the phase relationship between voltage and current using impedance triangle. |

**Reference Books**


1. B.Sc. Practical Physics, By C. L. Arora, S. Chand & Co.
2. A Laboratory Manual of Physics for undergraduate classes by D. P. Khandelwal.

**Semester-II**

**Electronics Workshop-II**

**Paper code: BSEC 102**

**(Skill Enhancement Course)**

**Max. Marks: 100** **Credits: 03 (2T + 1L)**

**End-Semester Exam: 70** **Total Loads: 40 Hour**

**Internal Evaluation: 30** **Pass Marks: 35%**

**General Guidelines for End-Semester Examination:**

1 .The student will be allotted one activity out of the activities mentioned in syllabus and asked to perform. Examination Time duration will be of 3 Hours.

2. The distribution of marks is as a follows:

(i) One full activity and draw conclusions. (20)

(ii) Brief theory (10)

(iii) Viva-Voice (15)
(iv) Record (Activity File) (25)

**List of the Activities:**

1. Familiarization of Electronics Measuring Instruments and Components.
2. Methods for testing of electronics components like Resistor, Capacitor, Diode ,Transistor Using Multimeter.
2. Draw the circuit diagrams of various (Simple to Complex) electronics circuits on drawing sheets. Understand their operation.
3. To create schematic and layout of given electronic circuit (any three) using any PCB Design software:

   A. Door safety using Reed and Magnet.

   B. Light operated relay.

   C. Fire alarm

   D. Water Alarm

   E. Using LDR construction of Opaque Object sensing alarm.

4. Build extension board with at least two 5 pin socket, four switches, fuse and indicating lamp.

**Semester-II**

**Evolution of science**

**Subject Code: BIDC102**

**(IDC/MDC)**

**Max Marks: 100** **Credits: 03**

**End-Semester Exam: 70** **Total Load: 40 Hours**

**Internal Evaluation: 30** **Pass Marks: 35%**

**Instructions for Paper setter:**

The end-semester examination will be of 70 marks and of 3 hours duration. The question paper will consist of three sections, namely A, B and C. Section A and B will have four questions each from the respective sections of syllabus. Each question will carry 12 marks and may be segregated into sub-parts. Section-C will be compulsory with 11 short-answer type questions of 2 marks each covering the entire syllabus.

**Instructions for students:**

Students have to attempt four questions in all from section A and B by selecting 2 questions from each section. Section C will be compulsory.

**Section-A**

**Pre-Modern Era (Before 1500s)**

Aristotelian Science: Emphasis on philosophical and theoretical aspects of science, with a focus on understanding natural phenomena through reasoning and observation.

Medieval Universities: Science education focused on the study of classical texts, such as Aristotle's works, and the development of scholasticism.

**Modern Era (1500s-1800s)**

Scientific Revolution: Introduction of empirical methods, experimentation, and the development of modern scientific instruments.

Classical Mechanics: Emphasis on the study of motion, forces, and energy, with a focus on the works of Galileo, Kepler, and Newton.

Emergence of Scientific Disciplines: Development of distinct scientific fields, such as physics, chemistry, biology, and mathematics.

## Section-B

### Contemporary Era (1900s-Present)

Quantum Mechanics and Relativity: Development of quantum mechanics and relativity, which transformed our understanding of space, time, and matter.

Molecular Biology and Genetics: Emergence of molecular biology and genetics, which have led to significant advances in our understanding of life and disease.

Interdisciplinary Approaches: Increased emphasis on interdisciplinary approaches, such as biochemistry, biophysics, and environmental science.

Computational Science and Data Analysis: Growing importance of computational science and data analysis in scientific research and education.

**References:**


1. The History of Science, N. Chalton and M. Macardle O' Mara Books Ltd.
2. The Scientist: A History of Science Told Through the Lives of Its Grestest Inventors, John Gribbin and Adam Hook.
3. The Invention of Science: A New History of the Scientific Revolution by David Wootton.