Department of Physics

Scheme of Examination and Syllabus for
Under Graduate Programme

Under Multiple Entry and Exit, Internship and
CBCS-LOCF as per NEP-2020
w.e.f. session 2024-25 (in phased manner)

Subject: Physics

Guru Jambheshwar University of Science &Technology
Hisar-125001, Haryana

(A+ NAAC Accredited State Govt. University)

Guru Jambheshwar University of Science and Technology
Hisar-125001, Haryana
('A+' NAAC Accredited State Govt. University)

Scheme of Examination and Syllabus for UG Programme w.e.f. session 2024-25
(For Affiliated Degree Colleges according to National Education Policy-2020)

Subject-Physics

FIRST YEAR

SEMESTER-I								
Type of Course	**Course Code**	**Nomenclature of Paper/Course**	**Credits**	**Contact Hours**	**Internal Marks**	**External Marks**	**Total Marks**	**Duration of Exam (Hrs)**
Discipline Specific Course (DSC)	C24PHY101T/ C24MIN133T	Mechanics	3	3	20	50	70	3
	C24PHY101P/ C24MIN133P	Mechanics Lab	1	2	10	20	30	3
Minor Course (MIC)	C24MIC133T	Fundamental of Electronics-I	2	2	15	35	50	2
Minor Course #	**C24MIN133T/ C24PHY101T**	**Mechanics**	**3**	**3**	**20**	**50**	**70**	**3**
	C24MIN133P/ C24PHY101P	**Mechanics Lab**	**1**	**2**	**10**	**20**	**30**	**3**
Multidisciplinary Course (MDC)	C24MDC123T	Fundamental of Physics-I	2	2	15	35	50	2
	C24MDC123P	Fundamental of Physics-I Lab	1	2	10	15	25	3
Skill Enhancement Course (SEC)	C24SEC130T	Instrumentation-I	2	2	15	35	50	2
	C24SEC130P	Instrumentation-I Lab	1	2	10	15	25	3
Value Added Course (VAC)	C24VAC119T	Electronic Components and Measuring Instruments	2	2	15	35	50	2
SEMESTER-II								
Type of Course	**Course Code**	**Nomenclature of Paper/Course**	**Credits**	**Contact Hours**	**Internal Marks**	**External Marks**	**Total Marks**	**Duration of Exam (Hrs)**
Discipline Specific Course (DSC)	C24PHY201T/ C24MIN233T	Electricity and Magnetism	3	3	20	50	70	3
	C24PHY201P/ C24MIN233P	Electricity and Magnetism Lab	1	2	10	20	30	3
Minor Course (MIC)	C24MIC233T	Fundamental of Electronics-II	2	2	15	35	50	2
Minor Course #	**C24MIN233T/ C24PHY201T**	**Electricity and Magnetism**	**3**	**3**	**20**	**50**	**70**	**3**
	C24MIN233P/ C24PHY201P	**Electricity and Magnetism Lab**	**1**	**2**	**10**	**20**	**30**	**3**
Multidisciplinary Course (MDC)	C24MDC223T	Fundamental of Physics-II	2	3	15	35	50	2
	C24MDC223P	Fundamental of Physics-II Lab	1	3	10	15	25	3
Skill Enhancement Course (SEC)	C24SEC230T	Instrumentation-II	2	2	15	35	50	2
	C24SEC230P	Instrumentation-II Lab	1	2	10	15	25	3
Value Added Course (VAC)	C24VAC119T	Electronic Components and Measuring Instruments	2	2	15	35	50	2

 # for scheme C only

Program Outcomes	
PO1	Identification of fundamentals of properties of matter and mechanics.
PO2	Explanation of basics of magnetism and electricity.
PO3	Design, construct, and analysis of basic electronic and digital circuits.
PO4	Knowing the fundamentals of physics and apply it to various numerical problems.
PO5	Build effective communication skills.
PO6	Develop experimental skills and independent work culture through a series of experiments that compliment theories and projects.
PO7	Understand and solve problems of relevance to society to meet the specified needs using the knowledge, skills and attitudes acquired from physical science.

Physics
Discipline Specific Course (DSC)
Mechanics (Semester I)

Paper Code: C24PHY101T/C24MIN133T
45 Hrs (3Hrs /week) **External Marks: 50**
Credits: 3 **Internal Marks: 20**
Time: 3 Hrs **Total Marks: 70**

Note: The examiner is required to set nine questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one from each unit in addition to the compulsory Question No.1. All questions carry equal marks. 20% numerical problems are to be set and use of scientific calculator (nonprogrammable) is allowed.

Unit-I

Fundamentals of Dynamics: Rigid body, Moment of Inertia, Radius of Gyration, Theorems of perpendicular and parallel axis (with proof), Moment of Inertia of ring, Disc, Angular Disc, Solid cylinder, Solid sphere, Hollow sphere, Torque, Rotational Kinetic Energy, Angular momentum, Law of conservation of angular momentum, rolling motion, condition for pure rolling, acceleration of body rolling down an inclined plane, Fly wheel, Moment of Inertia of an irregular body.

Unit-II

Elasticity: Deforming force, Elastic limit, stress, strain and their types, Hooke's law, Modulus of rigidity, Relation between shear angle and angle of twist, elastic energy stored/volume in an elastic body, Elongation produced in heavy rod due to its own weight and elastic potential energy stored in it, Tension in rotating rod, Poisson's ratio and its limiting value, Elastic Constants, and their relations. Torque required for twisting cylinder, bending of beam, bending moment and its magnitude, determination of elastic constants for material of wire by Searle's method.

Unit-III

Gravitation and central force motion: Law of gravitation, Gravitational potential energy, Inertial and gravitational mass, Potential and field 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, Differential Equation of motion with central force and its solution, Concept of power Law Potentials, Kepler's Laws of Planetary motion.

Unit-IV

Special Theory of Relativity: Michelson's Morley experiment and its outcomes, Postulates of special theory of relativity, Lorentz Transformations, Simultaneity and order of events, Lorentz contraction, Time dilation, Relativistic transformation of velocity, relativistic addition of velocities, variation of mass-energy equivalence, relativistic Doppler effect, relativistic kinematics, transformation of energy and momentum, transformation of force.

Mechanics Lab

Paper Code: C24PHY101P/ C24MIN133P
30 Hrs (2 Hrs /week) **External Marks: 20**
Credit: 1 **Internal Marks: 10**
Time: 3 Hrs **Total Marks: 30**

Practical

1. Measurement of length (or diameter) using Vernier Caliper, screw gauge and travelling microscope.
2. To study the random error in observations.
3. To determine the area of window using a sextant.
4. Moment of Inertia of a Fly Wheel
5. Moment of Inertia of irregular body using a Torsion Pendulum.
6. Young's Modulus by Bending of Beam.
7. Modulus of rigidity of material of wire by Maxwell's Needle.
8. Elastic constants by Searle's method.

9. To determine the value of 'g' by using Bar pendulum.
10. To compare Moment of Inertia of a solid Sphere, Hollow Sphere, and solid Disc of same mass with the help of Torsion Pendulum.
11. To determine the bending moment of a cantilever beam with uniformly distributed load, uniformly varying load and point load.

Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination. Students are required to get minimum pass marks separately as per university rules in theory and practical components of the course.

Suggested Books:

1. Mechanics "Berkeley Physics Course Vol. I", Charles Kittel, Tata McGraw-Hill
2. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
3. Elements of Properties of Matter, D.S. Mathur, S. Chand & Com. Pt. Ltd., New Delhi
4. Physics, Resnick, Halliday & Walker, Wiley
5. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
6. B.Sc. Practical Physics, C.L. Arora, S. Chand Publisher, New Delhi

Course Outcomes (CO)

After completing this course, the student will be able to:

CO1. Understand the motion of rigid object along the surface, so that they can calculate moment of inertia, velocity, acceleration, total kinetic energy of an object that undergoing both translational and rotational motion and apply energy conservation in analyzing such motion.

CO2. Know about the basic concepts of elasticity, bending moment, torsional oscillations, and modulus of rigidity

CO3. Understand postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence.

CO4. Comprehend the general characteristics of central forces and the application of Kepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.

CO5. Perform experiments on Properties of matter such as the determination of moduli of elasticity viz., Young's modulus, Rigidity modulus of certain materials; Sextant, Moment of inertia of some regular bodies by different methods and compare the experimental values with the standard values

Mapping of CO with PO

C24PHY101T/ C24MIN133T and C24PHY101P/ C24MIN133P

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	M	M	S	S
CO2	S	M	M	M	M	S	S
CO3	S	M	M	M	M	S	S
CO4	S	M	S	M	M	S	S
CO5	S	M	S	S	S	S	S

S= Strong, M = Medium, W= Weak

Physics
Minor Course (MIC)
Fundamental of Electronics- I (Semester I)

Paper Code: C24MIC133T
30 Hrs (2 Hrs /week) **External Marks: 35**
Credits: 2 **Internal Marks: 15**
Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Unit-I

Energy bands in solids: Charge particles, field intensity, potential, energy and its unit, nature of atom, atomic energy levels, electronic structure of the elements, energy band theory of crystals, Insulators, semiconductors, and metals.
Transport phenomena in semiconductors: mobility and conductivity, Intrinsic and extrinsic semiconductors, charge density in a semiconductor, Electrical properties of Ge and Si, Hall effect, Generation and recombination of charges, Diffusion, and continuity equation.

Unit-II

p-n junction: open circuited p-n junction, current component of p-n diode, VI characteristics and its temperature dependence behavior, p-n junction as rectifier, space charge and transition capacitance, diffusion capacitance, Breakdown diodes, Zener diode and its characteristics. Applications of diode; Diode as a rectifier, LED, Solar cell, tunnel diodes.

Suggested Books:

1. Physics of Semiconductor Devices, S. M. Sze, Willey Publisher.
2. Integrated Electronics, Jacob Millman and C C Halkias, TATA McGraw-Hill Edition.
3. A text book in Electrical Technology- B L Theraja – S Chand & Co.
4. Basic Electronics and Linear Circuits, N N Bhargava, McGraw-Hill Edition

Course Outcomes (CO)

After completing this course, the student will be able to:

CO1. Understand the types of materials such as Insulators, semiconductors, and metals.
CO2. Know about the mobility and conductivity, Intrinsic and extrinsic semiconductors, charge density in a semiconductor, Electrical properties of Ge and Si and Hall effect
CO3. Understand the V-I characteristics of p-n junction, Zener diode and applications of diode as LED and solar cell.

Mapping of CO with PO
C24MIC133T

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	M	S	S	M	S	S
CO2	M	M	S	S	M	S	S
CO3	M	S	S	S	M	S	S

S= Strong, M = Medium, W= Weak

Physics
Minor Course (MIN)
Mechanics (Semester I)

Paper Code: C24MIN133T/C24PHY101T
45 Hrs (3 Hrs /week) **External Marks: 50**
Credits: 3 **Internal Marks: 20**
Time: 3 Hrs **Total Marks: 70**

Note: The examiner is required to set nine questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one from each unit in addition to the compulsory Question No.1. All questions carry equal marks. 20% numerical problems are to be set and use of scientific calculator (nonprogrammable) is allowed.

Unit-I

Fundamentals of Dynamics: Rigid body, Moment of Inertia, Radius of Gyration, Theorems of perpendicular and parallel axis (with proof), Moment of Inertia of ring, Disc, Angular Disc, Solid cylinder, Solid sphere, Hollow sphere, Torque, Rotational Kinetic Energy, Angular momentum, Law of conservation of angular momentum, rolling motion, condition for pure rolling, acceleration of body rolling down an inclined plane, Fly wheel, Moment of Inertia of an irregular body.

Unit-II

Elasticity: Deforming force, Elastic limit, stress, strain and their types, Hooke's law, Modulus of rigidity, Relation between shear angle and angle of twist, elastic energy stored/volume in an elastic body, Elongation produced in heavy rod due to its own weight and elastic potential energy stored in it, Tension in rotating rod, Poisson's ratio and its limiting value, Elastic Constants, and their relations. Torque required for twisting cylinder, bending of beam, bending moment and its magnitude, determination of elastic constants for material of wire by Searle's method.

Unit-III

Gravitation and central force motion: Law of gravitation, Gravitational potential energy, Inertial and gravitational mass, Potential and field 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, Differential Equation of motion with central force and its solution, Concept of power Law Potentials, Kepler's Laws of Planetary motion.

Unit-IV

Special Theory of Relativity: Michelson's Morley experiment and its outcomes, Postulates of special theory of relativity, Lorentz Transformations, Simultaneity and order of events, Lorentz contraction, Time dilation, Relativistic transformation of velocity, relativistic addition of velocities, variation of mass-energy equivalence, relativistic Doppler effect, relativistic kinematics, transformation of energy and momentum, transformation of force.

Mechanics Lab

Paper Code: C24MIN133P/ C24PHY101P
30 Hrs (2 Hrs /week) **External Marks: 20**
Credit: 1 **Internal Marks: 10**
Time: 3 Hrs **Total Marks: 30**

Practical

1. Measurement of length (or diameter) using Vernier Caliper, screw gauge and travelling microscope.
2. To study the random error in observations.
3. To determine the area of window using a sextant.
4. Moment of Inertia of a Fly Wheel
5. Moment of Inertia of irregular body using a Torsion Pendulum.
6. Young's Modulus by Bending of Beam.
7. Modulus of rigidity of material of wire by Maxwell's Needle.
8. Elastic constants by Searle's method.

9. To determine the value of 'g' by using Bar pendulum.
10. To compare Moment of Inertia of a solid Sphere, Hollow Sphere, and solid Disc of same mass with the help of Torsion Pendulum.
11. To determine the bending moment of a cantilever beam with uniformly distributed load, uniformly varying load and point load.

Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination. Students are required to get minimum pass marks separately as per university rules in theory and practical components of the course.

Suggested Books:

1. Mechanics "Berkeley Physics Course Vol. I", Charles Kittel, Tata McGraw-Hill
2. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
3. Elements of Properties of Matter, D.S. Mathur, S. Chand & Com. Pt. Ltd., New Delhi
4. Physics, Resnick, Halliday & Walker, Wiley
5. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
6. B.Sc. Practical Physics, C.L. Arora, S. Chand Publisher, New Delhi

Course Outcomes (CO)

After completing this course, the student will be able to:

CO1. Understand the motion of rigid object along the surface, so that they can calculate moment of inertia, velocity, acceleration, total kinetic energy of an object that undergoing both translational and rotational motion and apply energy conservation in analyzing such motion.

CO2. Know about the basic concepts of elasticity, bending moment, torsional oscillations, and modulus of rigidity

CO3. Understand postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence.

CO4. Comprehend the general characteristics of central forces and the application of Kepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.

CO5. Perform experiments on Properties of matter such as the determination of moduli of elasticity viz., Young's modulus, Rigidity modulus of certain materials; Sextant, Moment of inertia of some regular bodies by different methods and compare the experimental values with the standard values

Mapping of CO with PO
C24MIN133T/C24PHY101T and C24MIN133P/ C24PHY101P

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	M	M	S	S
CO2	S	M	M	M	M	S	S
CO3	S	M	M	M	M	S	S
CO4	S	M	S	M	M	S	S
CO5	S	M	S	S	S	S	S

S= Strong, M = Medium, W= Weak

Physics
Multidisciplinary Course (MDC)
Fundamental of Physics-I (Semester I)

Paper Code: C24MDC123T
30 Hrs (2 Hrs /week) **External Marks: 35**
Credits: 2 **Internal Marks: 15**
Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Unit-I

Fundamental of Physics: System of Measuring Units-Need for measurement, measuring process, concept of mass, length, time; Fundamental and derive units, system of units, concepts of error, types of error (only definition), Accuracy and precision in measurement, least count and applications of measuring instruments -Vernier caliper, Screw Gauge. Scalar and Vector quantities.

Unit-II

Laws of motion: Description of motion along a straight line- distance and displacement, uniform motion and non-uniform motion, average and instantaneous speed, average and instantaneous velocity, acceleration; graphical analysis of straight-line motion- distance- time graph, velocity-time graph, equation of motions and their applications.
Causes of motion- concept of force, Newton's Ist law of motion, inertia, and mass; Newton's 2^{nd} law of motion, momentum, and force; 3^{rd} law of motion, daily life applications of Newton's laws of motion.
Universal law of gravitation and its importance, acceleration due to gravity and free fall of a body; mass and weight of an object on earth and moon, concept of thrust and pressure and importance in daily life.

Fundamental of Physics-I Lab

Paper Code: C24MDC123P
30 Hrs (2 Hrs /week) **External Marks: 15**
Credit: 1 **Internal Marks: 10**
Time: 3 Hrs **Total Marks: 25**
Practical

1. To measure the diameter of a small spherical / cylindrical body.
2. To measure the length, width and height of the given rectangular block using vernier calipers.
3. To measure the internal diameter and depth of a given beaker/calorimeter and hence find its volume.
4. Use of screw gauge to measure diameter of a given wire.
5. Use of screw gauge to measure thickness of a given sheet
6. Diameter of thin wire using Screw gauge

Note: The examiner will allot one practical at the time of end term examination. Students are required to get minimum pass marks separately as per university rules in theory and practical components of the course.

Suggested Books:

1. Essential University Physics, Vol.-1 &2 by Richard Wolfson, Pearson Education, Patparganj, Delhi, India.
2. Concept of Physics by H.C. Verma, Bharti Bhawan, Ansari Road, Daryaganj, New Delhi, India.
3. Modern Physics (2^{nd} edition), by S.L. Kakani and Shubhra Kakani, Viva Books, New Delhi.
4. Physics for Scientists and Engineers with Modern Physics, 7^{th} edition, by Raymond A. Serway and John W. Jewett, Jr., Thomson Higher Education 10 Davis Drive Belmont, CA 94002-3098 USA.
5. Physics For You, Fifth Edition, by Keith Johnson, OUP Oxford.

Course Outcomes (CO)

After completing this course, the student will be able to:

CO1. Understand the system of Measuring Units-Need for measurement, measuring process, concept of mass, length, time; and applications of measuring instruments -Vernier caliper, Screw Gauge.

CO2. Know about the description of motion along a straight line- distance and displacement, uniform motion and non-uniform motion, and about universal law of gravitation and its importance.

CO3. Perform experiments on measuring the diameter of a small spherical / cylindrical body; use of screw gauge to measure diameter of a given wire and compare the experimental values with the standard values.

Mapping of CO with PO
C24MDC123T & C24MDC123P

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	M	S	S	M	S	S
CO2	M	M	S	S	M	S	S
CO3	M	M	S	S	M	S	S

S= Strong, M = Medium, W= Weak

Physics
Skill Enhancement Course (SEC)
Instrumentation-I (Semester I)

Paper Code: C24SEC130T
30 Hrs (2 Hrs /week) **External Marks: 35**
Credits: 2 **Internal Marks: 15**
Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Unit-I

Error in measurement, Types of error, Ohm's law, Kirchhoff's current law, Kirchhoff's voltage law, Wheatstone bridge, Potentiometer, Measurement of emf of a cell using potentiometer, Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance. Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage measurement (block diagram only).

Unit-II

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace.

Instrumentation-I Lab

Paper Code: C24SEC130P
30 Hrs (2 Hrs /week) **External Marks: 15**
Credit: 1 **Internal Marks: 10**
Time: 3 Hrs **Total Marks: 25**

Practical

1. To study different types of measuring tools such as Vernier Calipers, Screw Gauge and determine their least count.
2. Verification of ohm's law from unknown resistance.
3. To determine value of unknown resistance using Wheatstone bridge.
4. Measurement of voltage, frequency, time period and phase angle using CRO.
5. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
6. Electronic Voltmeter measurement of peak, average and R.M.S. value of signal.
7. To observe the limitations of a multimeter for measuring high frequency voltage and currents.

Note: The examiner will allot one practical at the time of end term examination. Students are required to get minimum pass marks separately as per university rules in theory and practical components of the course.

Suggested Books:

1. Essential University Physics, Vol.-1 &2 by Richard Wolfson, Pearson Education, Patparganj, Delhi, India.
2. Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill.
3. Fundamental of Physics by Resnick, Halliday and Walker, WILEY student edition.
4. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.

Course Outcomes (CO)

After completing this course, the students will be able to:
CO1. Understand the error involved in measurements and different techniques used in resistance measurements.
CO2. Know about the functioning of CRO and its use in electronic circuits.
CO3. Perform experiments related resistance measurement; use of CRO in various experiments.

Mapping of CO's with PO's
C24SEC130T & C24SEC130P

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	M	M	S	M	S	S
CO2	M	M	S	S	M	S	M
CO3	M	M	S	S	M	S	S

S= Strong, M = Medium, W= Weak

Physics
Value Added Course (VAC)
Electronic Components and Measuring Instruments (Semester I/Semester II)

Paper Code: C24VAC119T
30 Hrs (2 Hrs /week) **External Marks: 35**
Credits: 2 **Internal Marks: 15**
Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Unit-I

Electronic Components: Passive Components: Resistors, Capacitors, Inductors, Transformers, Fuses (their types & applications).
Junction Diodes: Rectifying diode, Forward and reverse bias characteristics, Varactor Diode, Light Emitting Diode, Photo diode and Photo transistors (qualitative only).
Rectifiers: Half wave, Full wave, Bridge, Clipping and Clamping circuits.
Zener diode: Zener diode as voltage regulator.

Unit-II

Measuring Instruments: Multimeter, CRO, Signal Generator, Frequency Counter, LCR meter, Thermocouples or IR Thermometer, Digital Storage Oscilloscope (DSO), DC power supply, Impedance analyzer, Hall Effect Meter, Telecommunications test set, Thermocouple and temperature Sensors, RF power supply, Network analyzer, Spectrum Analyzer.

Suggested Books:

1. Physics of Semiconductor Devices, S. M. Sze, Willey Publisher.
2. Integrated Electronics, Jacob Millman and C C Halkias, TATA McGraw-Hill Edition.
3. A text book in Electrical Technology- B L Theraja – S Chand & Co.
4. Basic Electronics and Linear Circuits, N N Bhargava, McGraw-Hill Edition.

Course Outcomes (CO)
After completing this course, the student will be able to:
CO1. Understand the basics of electronic components such as resistor, capacitor, and inductor.
CO2. Know about the p-n junction, Zener diode and applications of diode as LED and solar cell
CO3. Understand the transistor configuration and various application in electronics

Mapping of CO with PO
C24VAC119T

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	M	S	S	M	S	S
CO2	M	M	S	M	M	S	S
CO3	M	M	S	M	M	S	M

S= Strong, M = Medium, W= Weak

Physics
Discipline Specific Course (DSC)
Electricity and Magnetism (Semester II)

Paper Code: C24PHY201T/C24MIN233T
45 Hrs (3 Hrs /week) **External Marks: 50**
Credits: 3 **Internal Marks: 20**
Time: 3 Hrs **Total Marks: 70**

Note: The examiner is required to set nine questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one from each unit in addition to the compulsory Question No.1. All questions carry equal marks. 20% numerical problems are to be set. Use of scientific calculator (nonprogrammable) is allowed.

Unit-I

Vector Background a**nd Electric Field**: Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field, Divergence and curl of a vector and their physical significance, Gauss's divergence theorem, Stoke's theorem. Conservative nature of Electrostatic Field, Electrostatic Potential, Potential as line integral of field, potential difference Derivation of electric field E from potential as gradient. Derivation of Laplace and Poisson equations. Electric flux, Gauss's Law, Differential form of Gauss's law and applications of Gauss's law.

Unit-II

Magnetic Field: Biot-Savart law and its applications: straight wire and circular loop, Current Loop as a Magnetic Dipole and its Dipole Moment, Ampere's Circuital Law, and its applications to (1) Solenoid and (2) Toroid,

Magnetic Properties of Matter: Force on a dipole in an external field, Electric currents in Atoms, Electron spin and Magnetic moment, types of magnetic materials, Magnetization vector (M), Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B, H and M, Electronic theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin's theory), B-H curve and hysteresis loop, importance of Hysteresis loop.

Unit-III

Time varying electromagnetic fields: Electromagnetic induction, Faraday's laws of induction and Lenz's Law, Self-inductance, Mutual inductance, Energy stored in a Magnetic field, Derivation of Maxwell's equations, Displacement current, Maxwell's equations in differential and integral form and their physical significance.

Electromagnetic Waves: Electromagnetic waves, Transverse nature of electromagnetic wave, energy transported by electromagnetic waves, Poynting vector, Poynting's theorem. Propagation of Plane electromagnetic waves in free space & Dielectrics.

Unit-IV

DC current Circuits: Electric current and current density, Electrical conductivity, and Ohm's law, Kirchhoff's laws for D.C. networks, Network theorems: Thevenin's theorem, Norton theorem, Superposition theorem.

Alternating Current Circuits: A resonance circuit, Phasor, Complex Reactance and Impedance, Analysis for RL, RC and LC Circuits, Series LCR Circuit: (1) Resonance, (2) Power Dissipation (3) Quality Factor and (4) Band Width, Parallel LCR Circuit.

Electricity and Magnetism Lab

Paper Code: C24PHY201P/C24MIN233P
30 Hrs (2 Hrs /week) **External Marks: 20**
Credit: 1 **Internal Marks: 10**
Time: 3 Hrs **Total Marks: 30**

Practical

1. Use of Multimeter for measuring Resistance, A.C. and D.C. Voltage and Current, checking of electrical fuses.
2. Determination of Impedance of an A.C. circuit and its verification.
3. Frequency of A.C. mains using an electromagnet.
4. Frequency of A.C. mains Electrical vibrator.
5. High resistance by substitution method.
6. To study the Characteristics of a Series RC Circuit.
7. To study a series LCR circuit and determine its (a) Resonant frequency, (b) Quality factor.
8. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor.
9. To verify the Thevenin and Norton theorems.
10. To verify the Superposition and Maximum Power Transfer Theorems.

Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination. Students are required to get minimum pass marks separately as per university rules in theory and practical components of the course.

Suggested Books:

1. Electricity and Magnetism (Berkley, Phys. Course 2), Edward M. Purcell, 1986 McGraw-Hill Education
2. Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn., 1998, Benjamin Cummings.
3. Feynman Lectures Vol.2, R.P. Feynman, R.B. Leighton, M. Sands, 2008, Pearson Education
4. Electricity and Magnetism, J.H.Fewkes & J.Yarwood. Vol. I, 1991, Oxford Univ. Press.
5. Field and Wave Electromagnetics (2nd Edn.), David K. Cheng, Addison-Wesley Publishing Company.
6. B.Sc. Practical Physics, C.L. Arora, S. Chand Publisher, New Delhi.
7. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House.

Course Outcomes (CO)

After completing this course, the students will be able to:

CO1. Understand the Gauss law and its application to obtain electric field in different cases.
CO2. Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents.
CO3. Distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances.
CO4. Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves.
CO5. Phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q- factor, Power factor and the comparative study of series and parallel resonant circuits.
CO6. Learn to present observations, results analysis and different concepts related to experiments of Electricity and Magnetism

Mapping of CO with PO

C24PHY201T/C24MIN201T and C24PHY201P/C24MIN201P

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	S	M	M	M	S	M
CO2	M	S	M	M	M	S	M
CO3	M	S	M	M	M	S	M
CO4	M	S	S	M	M	S	S
CO5	M	S	S	S	M	S	S
CO6	M	S	S	S	M	S	S

S= Strong, M = Medium, W= Weak

Physics
Fundamental of Electronics- II (Semester II)
Minor Course (MIC)

Paper Code: C24MIC233T
30 Hrs (2 Hrs /week) **External Marks: 35**
Credits: 2 **Internal Marks: 15**
Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Unit-I

Transistors: The junction transistor, transistor current components, types of transistors (npn and pnp), and its configurations (CB, CE, CC) and characteristics, Working Regions of Transistors (cutoff, saturation, and active regions), Transistor as an amplifier, current gain of transistor, maximum voltage rating, Phototransistor.

Unit-II

Digital circuits: Difference between analog and digital circuits, Binary numbers, decimal to binary and binary to decimal conversion, Logic gates (AND, OR and NOT Gates, NAND and NOR) using DL and TTL, De Morgan's Theorem, Boolean's Laws.

Suggested Books:

1. Physics of Semiconductor Devices, S. M. Sze, Willey Publisher.
2. Integrated Electronics, Jacob Millman and C C Halkias, TATA McGraw-Hill Edition.
3. A text book in Electrical Technology- B L Theraja – S Chand & Co.
4. Basic Electronics and Linear Circuits, N N Bhargava, McGraw-Hill Edition.
5. Modern Electronic Instrumentation & Measurement Tech., Helfrick & Cooper, 1990, PHI Learning.

Course Outcomes (CO)

After completing this course, the students will be able to:
CO1. Understand the types of transistors, biasing and working regions of transistors.
CO2. Know about the analog and digital circuits and about the number conversion such as binary to decimal etc.
CO3. Understand the working condition of various logic gates

Mapping of CO with PO
C24MIC233T

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	M	S	S	M	S	M
CO2	M	M	S	S	M	S	S
CO3	M	M	S	S	M	S	S

S= Strong, M = Medium, W= Weak

Physics
Minor Course (MIN)
Electricity and Magnetism (Semester II)

Paper Code: C24MIN233T/C24PHY201T
45 Hrs (3 Hrs /week) **External Marks: 50**
Credits: 3 **Internal Marks: 20**
Time: 3 Hrs **Total Marks: 70**

Note: The examiner is required to set nine questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one from each unit in addition to the compulsory Question No.1. All questions carry equal marks. 20% numerical problems are to be set. Use of scientific calculator (nonprogrammable) is allowed.

Unit-I

Vector Background and Electric Field: Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field, Divergence and curl of a vector and their physical significance, Gauss's divergence theorem, Stoke's theorem. Conservative nature of Electrostatic Field, Electrostatic Potential, Potential as line integral of field, potential difference Derivation of electric field E from potential as gradient. Derivation of Laplace and Poisson equations. Electric flux, Gauss's Law, Differential form of Gauss's law and applications of Gauss's law.

Unit-II

Magnetic Field: Biot-Savart law and its applications: straight wire and circular loop, Current Loop as a Magnetic Dipole and its Dipole Moment, Ampere's Circuital Law, and its applications to (1) Solenoid and (2) Toroid,

Magnetic Properties of Matter: Force on a dipole in an external field, Electric currents in Atoms, Electron spin and Magnetic moment, types of magnetic materials, Magnetization vector (M), Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B, H and M, Electronic theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin's theory), B-H curve and hysteresis loop, importance of Hysteresis loop.

Unit-III

Time varying electromagnetic fields: Electromagnetic induction, Faraday's laws of induction and Lenz's Law, Self-inductance, Mutual inductance, Energy stored in a Magnetic field, Derivation of Maxwell's equations, Displacement current, Maxwell's equations in differential and integral form and their physical significance.

Electromagnetic Waves: Electromagnetic waves, Transverse nature of electromagnetic wave, energy transported by electromagnetic waves, Poynting vector, Poynting's theorem. Propagation of Plane electromagnetic waves in free space & Dielectrics.

Unit-IV

DC current Circuits: Electric current and current density, Electrical conductivity, and Ohm's law, Kirchhoff's laws for D.C. networks, Network theorems: Thevenin's theorem, Norton theorem, Superposition theorem.

Alternating Current Circuits: A resonance circuit, Phasor, Complex Reactance and Impedance, Analysis for RL, RC and LC Circuits, Series LCR Circuit: (1) Resonance, (2) Power Dissipation (3) Quality Factor and (4) Band Width, Parallel LCR Circuit.

Electricity and Magnetism Lab

Paper Code: C24MIN233P/C24PHY201P

30 Hrs (2 Hrs /week) **External Marks: 20**

Credit: 1 **Internal Marks: 10**

Time: 3 Hrs **Total Marks: 30**

Practical

1. Use of Multimeter for measuring Resistance, A.C. and D.C. Voltage and Current, checking of electrical fuses.
2. Determination of Impedance of an A.C. circuit and its verification.
3. Frequency of A.C. mains using an electromagnet.
4. Frequency of A.C. mains Electrical vibrator.
5. High resistance by substitution method.
6. To study the Characteristics of a Series RC Circuit.
7. To study a series LCR circuit and determine its (a) Resonant frequency, (b) Quality factor.
8. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor.
9. To verify the Thevenin and Norton theorems.
10. To verify the Superposition and Maximum Power Transfer Theorems.

Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination. Students are required to get minimum pass marks separately as per university rules in theory and practical components of the course.

Suggested Books:

1. Electricity and Magnetism (Berkley, Phys. Course 2), Edward M. Purcell, 1986 McGraw-Hill Education
2. Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn., 1998, Benjamin Cummings.
3. Feynman Lectures Vol.2, R.P. Feynman, R.B. Leighton, M. Sands, 2008, Pearson Education
4. Electricity and Magnetism, J.H.Fewkes & J.Yarwood. Vol. I, 1991, Oxford Univ. Press.
5. Field and Wave Electromagnetics (2nd Edn.), David K. Cheng, Addison-Wesley Publishing Company.
6. B.Sc. Practical Physics, C.L. Arora, S. Chand Publisher, New Delhi.
7. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House.

Course Outcomes (CO)

After completing this course, the students will be able to:

CO1. Understand the Gauss law and its application to obtain electric field in different cases.

CO2. Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents.

CO3. Distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances.

CO4. Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves.

CO5. Phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q- factor, Power factor and the comparative study of series and parallel resonant circuits.

CO6. Learn to present observations, results analysis and different concepts related to experiments of Electricity and Magnetism

Mapping of CO with PO

C24MIN201T/C24PHY201T and C24MIN201P/C24PHY201P

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	S	M	M	M	S	M
CO2	M	S	M	M	M	S	M
CO3	M	S	M	M	M	S	M
CO4	M	S	S	M	M	S	S
CO5	M	S	S	S	M	S	S
CO6	M	S	S	S	M	S	S

S= Strong, M = Medium, W= Weak

Physics
Multidisciplinary Course (MDC)
Fundamental of Physics-II (Semester II)

Paper Code: C24MDC223T
30 Hrs (2 Hrs /week) **External Marks: 35**
Credits: 2 **Internal Marks: 15**
Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Unit-I

Light and Optics-Nature and properties of light, its speed, frequency, and wavelength; Reflection of light-types of reflection and their importance in daily life, laws of reflection, multiple reflection by mirrors and their applications.
Refraction of light- laws of refraction, refractive index, refraction of light through prism (dispersion of light), formation Rainbow, twinkling of stars, advance Sunrise, and delayed Sunset; Scattering of light and blue colour of the sky; apparent depth, total internal reflection, and its important applications.

Unit-II

Electricity- electric charge, types of charges, unit of charge, frictional electricity, electricity by conduction and electric current, units of electric current, measurement of current, conductors and insulators; resistance, resistivity and Ohm's law, electric potential and potential difference, emf; Electric circuit- resistor, capacitor, battery, ammeter and voltmeter; Series and parallel combinations of resistors, electrical wiring in houses and electrical safety (fuse, hot wire, neutral, ground and short circuit), electric power and electric power transmission; Heating effect of current and its practical applications.

Fundamental of Physics-II Lab

Paper Code: C24MDC223P
30 Hrs (2 Hrs /week) **External Marks: 15**
Credit: 1 **Internal Marks: 10**
Time: 3 Hrs **Total Marks: 25**

Practical

1. To determine radius of curvature of a given spherical surface by a spherometer.
2. To study the reflection of light.
3. To study the dispersion of light.
4. To find the current and voltage in electronic circuit.
5. To determine the least count of ammeter, voltmeter, travelling microscope and spectrometer.
6. To study the total internal reflection of light.

Note: The examiner will allot one practical at the time of end term examination. Students are required to get minimum pass marks separately as per university rules in theory and practical components of the course

Suggested Books:

1. Essential University Physics, Vol.-1 &2 by Richard Wolfson, Pearson Education, Patparganj, Delhi, India.
2. Concept of Physics by H.C. Verma, Bharti Bhawan, Ansari Road, Daryaganj, New Delhi, India.
3. Modern Physics (2^{nd} edition), by S.L. Kakani and Shubhra Kakani, Viva Books, New Delhi.
4. Physics for Scientists and Engineers with Modern Physics, 7^{th} edition, by Raymond A. Serway and John W. Jewett, Jr., Thomson Higher Education 10 Davis Drive Belmont, CA 94002-3098 USA.
5. Physics For You, Fifth Edition, by Keith Johnson, OUP Oxford.

Course Outcomes (CO)

After completing this course, the students will be able to:

CO1. Understand the light behavior such as reflection, refraction, dispersion and scattering and various applications.

CO2. Know about the electric charge, conductors, insulators, resistance, electric current and various laws that describe their applications in various fields.

CO3. Perform experiments using light, to measure the resistance and current in a circuit; use of ammeter and voltmeter in electric circuit and various experiments

Mapping of CO with PO
C24MDC223T and C24MDC223P

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	M	M	M	M	S	M
CO2	M	S	S	S	M	S	S
CO3	M	S	S	S	M	S	S

S= Strong, M = Medium, W= Weak

Physics
Skill Enhancement Course (SEC)
Instrumentation-II (Semester II)

Paper Code: C24SEC230T
30 Hrs (2 Hrs /week) **External Marks: 35**
Credits: 2 **Internal Marks: 15**
Time: 2 Hrs **Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Unit-I

Self-induction, Coefficient of self-induction of solenoid, Mutual induction, Coefficient of mutual induction of solenoid, B-H curve, Hysteresis loop, Permanent magnets, Transformers. Efficiency of transformers, Losses in transformers.

Introduction to semiconductors, Intrinsic and Extrinsic semiconductors (n and p-type semiconductors), p-n junction, Forward bias, Reverse bias, Zener breakdown, Different types of diode, Half-wave and Full-wave rectifier, Zener diode as voltage regulator.

Unit-II

Bipolar Junction Transistors: n-p-n and p-n-p, Biasing of transistor in active, cut-off and saturation modes, Circuit configuration and characteristics of Common Base, Common Emitter, Common Collector Transistors, Current gains α and β.

Instrumentation-II Lab

Paper Code: C24SEC230P
30 Hrs (2 Hrs /week) **External Marks: 15**
Credit: 1 **Internal Marks: 10**
Time: 3 Hrs **Total Marks: 25**

Practical

1. Forward and Reverse Bias characteristics of p-n junction diode.
2. Zener Diode as Voltage Regulator.
3. To draw Common Base characteristics of a transistor and calculate transistor characteristics parameters.
4. To draw Common Emitter characteristics of a transistor and calculate transistor characteristics parameters.
5. Study the BH curve using Oscilloscope.
6. Frequency of A.C. mains using Sonometer.
7. Frequency of A.C. mains using Electric Vibrator.

Note: The examiner will allot one practical at the time of end term examination. Students are required to get minimum pass marks separately as per university rules in theory and practical components of the course.

Suggested Books:

1. Essential University Physics, Vol.-1 &2 by Richard Wolfson, Pearson Education, Patparganj, Delhi, India.
2. Concept of Physics by H.C. Verma, Bharti Bhawan, Ansari Road, Daryaganj, New Delhi, India.
3. Fundamental of Physics by Resnick, Halliday and Walker, WILEY student edition.
4. Physics of Semiconductor Devices, S. M. Sze, Willey Publisher.
5. Integrated Electronics, Jacob Millman and C C Halkias, TATA McGraw-Hill Edition.

Course Outcomes (CO)

After completing this course, the students will be able to:

CO1. Understand the concept of induction, B-H curve and functioning of transformer.
CO2. Know about the basics of p-n junction, transistors, and their use in devices.
CO3. Perform experiments related to Zener diode, transistors configuration, B-H curve and to calculate the frequency of alternating current

Mapping of CO with PO
C24SEC230T and C24SEC230P

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	S	M	S	M	S	S
CO2	M	M	S	S	M	S	S
CO3	M	M	S	S	M	S	S

S= Strong, M = Medium, W= Weak