



Rayat Shikshan Sanstha's
R. B. Narayanrao Borawake College, Shrirampur
(Autonomous)

(Affiliated to Savitribai Phule Pune University, Pune)

Department of Physics

FYUG (Physics) Syllabus as per NEP-2020

Implemented
From
Academic Year: 2023-24

F.Y.B.Sc. (Physics) Core Subjects (Semester-I)

Year	Semester	Course Type	Course Code	Course Title	Theory/ Practical	Credits	No. of Lectures/ Practical to be conducted	Page No.
1 st	I	DSC (Major)	PH-MJ-111T	Mechanics and Properties of Matter	Theory	2	30L	4-5
			PH-MJ-112T	Physics Principles and Applications	Theory	2	30L	6-7
			PH-MJ-113P	Physics Laboratory- IA	Practical	2	8P	8-9
		VSC	PH-VSC-114T	Data Handling and Analysis using MS-Office	Theory	2	30L	10-11
		SEC	PH-SEC-115T	Physics Instrumentation Skills	Theory	2	30L	12-13
		IKS	PH-IKS-116T	Basics of Indian Astronomy	Theory	2	30L	14-15

F.Y.B.Sc. (Physics) Core Subjects (Semester-II)

Year	Semester	Course Type	Course Code	Course Title	Theory/ Practical	Credits	No. of Lectures/ Practical to be conducted	Page No.
1 st	II	DSC (Major)	PH-MJ-121T	Heat and Thermodynamics	Theory	2	30L	17-18
			PH-MJ-122T	Electricity and Magnetism	Theory	2	30L	19-20
			PH-MJ-123P	Physics Laboratory-IB	Practical	2	8P	21-22
		VSC	PH-VSC-124P	Data Handling and Analysis using MS-Office Practical	Practical	2	8P	23-24
		SEC	PH-SEC-125P	Photography	Practical	2	8P	25-26

Syllabus for F. Y. B. Sc. (Physics) Semester I

DISCIPLINE SPECIFIC CORE COURSE (PH-MJ-111T):
Mechanics and Properties of Matter

Course Code & Title	Credits	Credit Distribution of the Course	
		Theory	Practical
PH-MJ-111T - Mechanics and Properties of Matter	2	2	--

❖ **LEARNING OBJECTIVES:**

The learning objectives of this course are as follows:

1. To understand the fundamental concepts of mechanics, such as force, motion, and energy.
2. To apply these concepts to solve problems in classical mechanics, such as projectile motion, collisions and vibrations.
3. To understand the properties of matter, such as mass, density and elasticity.
4. To develop critical thinking and problem-solving skills.

❖ **COURSE OUTCOMES:**

On successful completion of this course students should be able to do the following:

CO1: Demonstrate an understanding of Newton's laws and applying them in calculations of the motion of simple systems.

CO2: Use the free body diagrams to analyze the forces on the object.

CO3: Understand the concepts of energy, work, power, the concepts of conservation of energy and be able to perform calculations using them.

CO4: Understand the concepts of elasticity and perform calculations using them.

CO5: Understand physical properties like elasticity, viscosity and surface tension.

CO6: Use of Bernoulli's theorem in real life problems.

CO7: Demonstrate quantitative problem-solving skills in all the topics covered.

SYLLABUS OF PH-MJ-111T: Mechanics and Properties of Matter [30 Hours]

Unit-I: Motion [09 Hours]

- 1.1 Displacement, Velocity, Acceleration, Moment of Inertia,
- 1.2 Introduction to motion, Types of motion, Newton's laws of motion with their explanations, Various types of forces in nature,
- 1.3 Frames of reference (Inertial and Non inertial), Laws of motion and its real-life applications, Problems.
- 1.4 Motion of a particle under a central force field. Two-body problem and its reduction to one-body problem and its solution.
- 1.5 Kepler's Laws, Geosynchronous orbits, Weightlessness. Basic idea of global positioning system(GPS).

Unit-II: Work and Energy [06 Hours]

- 2.1 Kinetic energy, Work Energy Theorem, Work done with constant force, Work done with

varying force (spring force),

- 2.2 Conservative and Non conservative forces, Potential energy, Law of energy conservation,
- 2.3 Gravitational potential energy, Power (Definition, Unit, Relation with Energy)
- 2.4 Problems.

Unit-III: Fluid Mechanics**[07 Hours]**

- 3.1 Viscous flow, Concept of viscous force and viscosity, Coefficient of viscosity, Steady and Turbulent flow, Reynolds number, Equation of continuity,
- 3.2 Bernoulli's Principle, Applications of Bernoulli's Principle (Venturi Meter, Pitot Tube), Applications of viscous fluids,
- 3.3 Problems.

Unit-IV: Properties of Matter**[08 Hours]**

- 4.1 Surface tension, Angle of contact, Factors affecting surface tension,
- 4.2 Jaeger's method for determination of surface tension, Applications of surface tension.
- 4.3 Stress and Strain, Hook's law and Coefficient of elasticity, young's modulus, Bulk modulus, Modulus of rigidity,
- 4.4 Work done during longitudinal strain, Volume strain, Shearing strain, Poisson's ratio, Relation between three elastic moduli, (Y , η , K), Applications of elasticity,
- 4.5 Problems.

❖ ESSENTIAL/RECOMMENDED READINGS:

1. Physics: Resnick, Halliday & Walker 9/e, Wiley.
2. University Physics: Sears and Zeeman sky, XIth/XIIth Edition, Pearson Education.
3. Mechanics: D. S. Mathur, S. Chand and Company, New Delhi.
4. Elements of Properties of Matter: D. S. Mathur, S. Chand, New Delhi.
5. Concepts of Physics: H. C. Verma, Bharati Bhavan Publisher.
6. Problems in Physics: P. K. Srivastava, Wiley Eastern Ltd.
7. Applied Fluid Mechanics: Mott Robert, Pearson Benjamin Cummir VI Edition. Pearson Education /Prentice Hall International, New Delhi.
8. Fundamentals of Mechanics: J C Upadhyaya, Himalaya Publishing House.
9. Mechanics: D. S. Mathur, Revised by P. S. Hemne, S. Chand and Company, New Delhi.
10. Undergraduate Mechanics, Arun Kumar, J. P. Agarwal and Nutan Lata, Pragati Prakashan.

DISCIPLINE SPECIFIC CORE COURSE (PH-MJ-112T):
Physics Principles and Applications

Course Code & Title	Credits	Credit Distribution of the Course	
		Theory	Practical
PH-MJ-112T - Physics Principles and Applications	2	2	--

❖ **LEARNING OBJECTIVES:**

The learning objectives of this course are as follows:

1. To understand the fundamental concepts of physics, such as atom, spectrum.
2. To understand the basic principles of laser operation, such as stimulated emission and optical cavities.
3. To understand the basic principles of solar cell operation, such as the photovoltaic effect and the band gap.

❖ **COURSE OUTCOMES:**

On successful completion of this course students should be able to understand:

CO1: the general structure of atom, spectrum of hydrogen atom.

CO2: the atomic excitation and LASER principles.

CO3: the solar cell principles, characteristics.

CO4: electromagnetic waves and its spectrum.

CO5: the types and sources of electromagnetic waves and applications.

CO6: quantitative problem-solving skills in all the topics covered.

SYLLABUS OF PH-MJ-112T: Physics Principles and Applications [30 Hours]

Unit-I: Physics of Atoms [09 Hours]

- 1.1 Physics of Atoms, Introduction to Atom, Atomic Models, Thomson's Atomic Model, Rutherford's Atomic Model, Bohr's Atomic Model,
- 1.2 Atomic Spectra: Emission line Spectrum, Absorption line spectrum, Uses of Atomic Spectra,
- 1.3 The Bohr Theory of the Hydrogen Atom, The Hydrogen Spectrum,
- 1.4 Frank-Hertz experiment
- 1.5 Problems.

Unit-II: LASERS and Its Applications [06 Hours]

- 2.1 Introduction to LASERS, Basic Principle of Lasers: Three Processes, Characteristics of Lasers
- 2.2 Boltzmann Distribution Law, Population Inversion, Pumping and Metastable state,

- 2.3 Energy Level Systems for LASER Action, Three energy level system, Four energy level System,
2.4 Uses of Lasers,
2.5 Problems.

Unit-III: Sources of Electromagnetic Waves [07 Hours]

- 3.1 Introduction to Electromagnetic Waves: Historical Perspective, General properties of Electromagnetic radiations, Electromagnetic spectrums and its sources,
3.2 Production of electromagnetic waves: Hertz experiment, Planck's hypothesis of Photons,
3.3 Applications of various waves in electromagnetic spectrum, Problems.
3.4 Applications of Electromagnetic Waves: Microwave oven, Pyroelectric thermometer, X-ray, CT scan, RADAR.

Unit-IV: Solar Cell [08 Hours]

- 4.1 Basic Semiconductor Physics, Energy bands and bandgap, Doping and formation of p-n junctions, Carrier generation and recombination in semiconductors,
4.2 Introduction to solar energy,
4.3 Photovoltaic Effect and Solar Cell Operation, Current-Voltage (I-V) Characteristics: Open-Circuit Voltage (V_{oc}), Short-Circuit Current (I_{sc}), Fill Factor (FF), Maximum Power Point (MPP), Efficiency.

❖ **ESSENTIAL/RECOMMENDED READINGS:**

1. Concepts of Modern Physics: A Beiser (6th ed., McGraw Hill, 2003)
2. Modern Physics: Raymond A. Serway, Clement J. Moses, Curt A. Moyer
3. Sears and Zemansky's University Physics: H.D. Young R. A. Freedman, Sandin(11th Ed. Pearson Education)
4. LASERS: M. N. Avdhanulu, S. Chand Publications.
5. Electricity and Magnetism; Murugesan; S. Chand; (2020).
6. Solar Energy – S.P. Sukatme, Tata McGraw Hill Publication

DISCIPLINE SPECIFIC CORE COURSE (PH-MJ-113P):
Physics Laboratory-IA

Course Code & Title	Credits	Credit Distribution of the Course	
		Theory	Practical
PH-MJ-113P - Physics Laboratory-IA	2	--	2

❖ **LEARNING OBJECTIVES:**

The learning objectives of this course are as follows:

1. To develop experimental skills, such as the ability to set up and operate equipment, collect and analyze data and report results.
2. To apply the principles of physics to solve experimental problems.
3. To develop critical thinking and problem-solving skills.

❖ **COURSE OUTCOMES:**

On successful completion of this course students should be able to do the following:

CO1. Learn how to use lab tools like a spectrometer, screw gauge, DMM and travelling microscope.

CO2. Acquire skills how to align the microscope, focus the image and accurately read the measurements.

CO3. Utilize scientific methods to conduct experiments based on the fundamental principles of optics and mechanics.

CO4. Analyze the experimental data through graph plotting and numerical calculations.

CO5. Compare the experimental results with theoretical predictions.

CO6. Understand the fundamental Physics concepts through experiments and its applications in science and technology.

SYLLABUS OF PH-MJ-113P: Physics Laboratory -IA

Lab Experiment List

1. Study and use of various measuring Instruments.
2. Vernier caliper 2. Micrometer Screw Gauge 3. Travelling Microscope
3. Study of Moment of Inertia of wire using Torsional Oscillations
4. Determination of coefficient of Viscosity by Poiseuille's method
5. Determination of “ η ” by flat spiral spring
6. Determination of “Y” by bending method
7. Study of surface tension by Jaeger’s method
8. Study of Poisson’s ratio of rubber using rubber tube /rubber chord
9. Study of surface tension of liquid using Fergusson Method
10. Study of Spectrometer and determination of angle of prism
11. Study of Spectrometer calibration and determination of refractive indices of different colors

12. Study of divergence of LASER beam
13. Study of total internal reflection using LASER
14. Determination of Plank's constant
15. Determination of wavelength of LASER light by plane diffraction grating
16. Study of I-V characteristics of solar cell

❖ **ESSENTIAL/RECOMMENDED READINGS:**

1. B. Sc. Practical Physics by Dr.P.S.Hemne, S.Chand Publication.
2. Practical Physics: R.K. Shukla, A. Srivastava, New Age International (P) Ltd.
3. Advanced Practical Physics for Students: B.L. Worsnop and H.T. Flint, Little hampton Book Services Ltd.

VOCATIONAL SKILL COURSE (PH-VSC-114T):
Data Handling and Analysis using MS-Office

Course Code & Title	Credits	Credit Distribution of the Course	
		Theory	Practical
PH-VSC-114T - Data Handling and Analysis using MS-Office	2	2	--

❖ **LEARNING OBJECTIVES:**

The learning objectives of this course are as follows:

1. Perform basic operations on MS-office.
2. Creating and formatting of data using MS-Word, MS- Excel, etc. and Data handling like sorting, filtering.
3. Use of MS- Office functions to smoother the work

❖ **COURSE OUTCOMES:**

On successful completion of this course students should be able to do the following:

- CO1.** Create and manage professional documents using word.
CO2. Analyze, manage and present data using excel. Create and manage presentation using power point.
CO3. Can design and develop professional documents using MS-Office.

SYLLABUS OF PH-VSC-114T: Data Handling and Analysis using MS-Office [30 Hours]

Unit I: Introduction to MS-Office and MS-Word [08 Hours]

- 1.1 Microsoft Word, Microsoft Excel, Microsoft Power Point, Microsoft Access, Microsoft Mail, Microsoft Publisher,
- 1.2 Document design with pictures, newspaper layout, editing features, bullets and numbering, columns, headers and footers, page numbers, tables, sorting in tables, mail merge, macros, hyperlink the word documents.

Unit II: MS-Excel [08 Hours]

- 2.1 Cell formatting, merge and split cells, cell border shading and pattern the data in sheet, different font settings, conditional formatting
- 2.2 Rename the worksheet, formulae, arithmetic and logical formulae, filter options, sort options, macros, linking and embedding, charts

Unit III: MS-PowerPoint [07 Hours]

- 3.1 Inserting slides, images, formatting and application of pens, action buttons, hyperlinks, animations, headers and footers.

Unit IV: MS-Accesses**[07 Hours]**

- 4.1 Interdiction to databases, tables, record, field, writing query, primary key,
4.2 Insert a record, delete a record, edit a record, display records based on query, forms, user interface and reports.

❖ ESSENTIAL/RECOMMENDED READINGS:

1. "Microsoft Office Excel, Access, and PowerPoint: Data Handling and Analysis" by John Doe
2. Walken Bach, John; Tyson Herb; Wempen, Faithe; Microsoft 2007, John Wiley and sons, 2009
3. Saxena Sanjay MS Office XP: for everyone Also Introducing M5Office 2007, Vilas publishing house

SKILL ENHANCEMENT COURSE (PH-SEC-115T):**Instrumentation Skills**

Course Code & Title	Credits	Credit Distribution of the Course	
		Theory	Practical
PH-SEC-115T - Instrumentation Skills	2	2	--

❖ LEARNING OBJECTIVES:

The learning objectives of this course are as follows:

1. To develop experimental skills, such as the ability to set up and operate equipment, collect and analyze data and report results.
2. To apply the principles of physics to solve experimental problems.
3. To develop critical thinking and problem-solving skills.

❖ COURSE OUTCOMES:

On successful completion of this course students should be able to do the following:

CO1. Demonstrate proficiency in using common laboratory equipment and tools.

CO2. Understand and apply principles of experimental design.

CO3. Acquire data through experimentation and demonstrate skills in data collection and analysis.

CO4. Apply proper safety procedures and protocols while working in the physics laboratory.

SYLLABUS OF PH-SEC-115T: Instrumentation Skills**[30 Hours]****Unit-I: Basic of Measurement****[10 Hours]**

1.1 Accuracy, precision, sensitivity, resolution, range etc.

1.2 Errors in measurements and loading effects.

1.3 Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter.

1.4 Multimeter: Block diagram and working of a digital multimeter.

1.5 Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance.

1.6 Specifications of a multimeter and their significance.

Unit-II: Electronic Components and Electronic Voltmeter**[10 Hours]**

2.1 Introduction of basic Electronic Components (passive and active)

2.2 Principles of voltmeter, Construction (block diagram only).

2.3 Specifications of an electronic Voltmeter and their significance.

Unit-III: Cathode Ray Oscilloscope**[10 Hours]**

3.1 Block diagram of basic CRO.

- 3.2 Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only-no mathematical treatment),
- 3.3 Specifications of a CRO and their significance.
- 3.4 Use of CRO for the measurement of voltage (dc and ac frequency, time period).
- 3.5 Special features of dual trace oscilloscope.
- 3.6 Introduction to digital oscilloscope, Block diagram and principle and working.

❖ **ESSENTIAL/RECOMMENDED READINGS:**

- 1. A text book in Electrical Technology - B L Theraja - S Chand and Co.
- 2. Performance and design of AC machines - M G Say ELBS Edn.
- 3. Digital Circuits and systems, Venugopal, 2011, Tata Mc Graw Hill. Logic circuitdesign, Shimon P. Vingron, 2012, Springer.
- 4. Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3, 2012, Tata Mc-Graw Hill
- 5. Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer ElectronicDevices, 7/e Thomas L. Floyd, 2008, Pearson India Ltd

INDIAN KNOWLEDGE SYSTEM (PH-IKS-116T):**Basics of Indian Astronomy**

Course Code & Title	Credits	Credit Distribution of the Course	
		Theory	Practical
PH-IKS-116T - Basics of Indian Astronomy	2	2	--

❖ LEARNING OBJECTIVES:

The learning objectives of this course are as follows:

1. Students will be able to understand the basic concepts of Indian astronomy.
2. Students will be able to explain the different astronomical theories and models that were developed in India.
3. Students will be able to discuss contributions of Indian astronomers to the field of astronomy.

❖ COURSE OUTCOMES:

On successful completion of this course students should be able to do the following:

CO1: Appreciate the cultural and historical significance of Indian astronomy.

CO2: Communicate their understanding of Indian astronomy to others in a clear and concise way.

CO3: Explain the different astronomical theories and models that were developed in India, such as the chakravala system and the nakṣatras.

SYLLABUS OF PH-IKS-116T: Basics of Indian Astronomy**[30 Hours]****Unit-I: Introduction****[8 Hours]**

- 1.1 The science of Astronomy, Astronomy as one of earliest sciences, observational astronomy in the Vedic corpus.
- 1.2 Emergence of Jyotiḥśhāstra encompassing the three skandhas of Gaṇita (Astronomy), Horā (Horoscopic Astrology and Saṃhitā (Omens and Natural Phenomena), The purpose of Astronomy—as stated in the texts, Contents of a typical Indian astronomical Siddhānta text.
- 1.3 Names of some prominent astronomers and their important contributions.

Unit-II: The different units of time discussed in texts**[8 Hours]**

- 2.1 Brief introduction to the concept of time (approach of physics and philosophy),
- 2.2 Recount the currently used units of time—duration of year, month, week, etc. in the Gregorian calendric system—subtly point out that they do not have any astronomical basis whatsoever.
- 2.3 Introduce the different shorter units of time discussed in Indian astronomical texts year, month, fortnight, tithi, etc. Introduce larger units of time like yuga, mahāyuga, manvantara

and kalpa.

Unit-III: Systems employed for representing numbers [7 Hours]

- 3.1 Highlight the need for having different systems for representing numbers in those days.
- 3.2 Explain the three systems adopted- Bhūtasāṅkhyā, Kaṭapayādi and Āryabhaṭīyapaddhati.
- 3.3 With illustrative examples, bring out their beauty and ingenuity, Discuss the advantages in each of these systems.

Unit-IV: Spherical trigonometry [7 Hours]

- 4.1 Introduce the notion of shortest path on a non-Euclidean surface.
- 4.2 Definition of great circle, small circle, spherical triangle, etc. Their illustration using the Earth as an example.

❖ **ESSENTIAL/RECOMMENDED READINGS:**

1. S. N. Sen and K. S. Shukla, History of Astronomy in India, 2nd Ed., INSA, Delhi, 2001.
2. S. Balachandra Rao, Indian Astronomy an Introduction, Universities Press, Hyderabad, 2000
3. History of Astronomy: A Handbook, Edited by K. Ramasubramanian, Aniket Sule and Mayank Vahia, SandHI, IIT Bombay, and T.I.F.R. Mumbai, 2016.
4. B.V. Subbarayappa and K.V. Sarma, Indian Astronomy: A Source Book, Nehru Centre, Bombay, 1985.
5. Tantrasaṅgraha of Nīlakaṇṭha Somayājī, Translation and Notes, K. Ramasubramanian and M. S. Sriram, Hindustan Book Agency, New Delhi, 2011.



Syllabus for F. Y. B. Sc. (Physics) Semester II

DISCIPLINE SPECIFIC CORE COURSE (PH-MJ-121T):
Heat and Thermodynamics

Course Code & Title	Credits	Credit Distribution of the Course	
		Theory	Practical
PH-MJ-121T - Heat and Thermodynamics	2	2	--

❖ **LEARNING OBJECTIVES:**

The learning objectives of this course are as follows:

1. To understand the fundamental concepts of heat and thermodynamics, such as temperature, heat, work, and energy.
2. To apply these concepts to solve problems in thermodynamics, such as heat transfer and phase changes.
3. To understand the different types of thermodynamic systems, such as closed systems, open systems, and isolated systems.
4. To apply the laws of thermodynamics to solve problems in thermodynamics.
5. To understand the applications of thermodynamics in a variety of fields, such as engineering, chemistry and physics.

❖ **COURSE OUTCOMES:**

On successful completion of this course students should be able to do the following:

- CO1. Understand the basics of physics fundamental concepts and the thermodynamic laws.
 CO2. Analyze entropy changes in a variety of processes and decide whether process is reversible or irreversible using such calculations.
 CO3. Study of various heat cycles and principle of refrigerator and air conditioner.
 CO4. Study of principle and construction of various types of thermometers.
 CO5. Understand the interrelationship between thermodynamic functions and ability to use such relationships to solve practical problems.

SYLLABUS OF PH-MJ-121T: Heat and Thermodynamics

[30 Hours]

Unit-I: Fundamentals of Thermodynamics

[09 Hours]

- 1.1 Concept of thermodynamic state, Equation of state, Van der Waal's equation of state, Thermal equilibrium, zeroth law of thermodynamics,
- 1.2 Thermodynamic processes: Adiabatic, Isothermal, Isobaric and Isochoric changes, Indicator diagram,
- 1.3 Work done during isothermal change, Adiabatic relations, Work done during adiabatic change, Internal energy, Internal energy as state function,
- 1.4 First law of thermodynamics, Reversible and Irreversible changes,
- 1.5 Problems.

Unit-II: Applied Thermodynamics [06 Hours]

- 2.1 Conversion of heat into work and its converse, Carnot's cycle and Carnot's heat engine and its efficiency, Second law of thermodynamics,
- 2.2 Concept of entropy, Temperature - entropy diagram (Thermodynamic diagrams: P-V, T-S diagrams), T-dS equations,
- 2.3 Clausius - Clapeyron latent heat equations,
- 2.4 Problems.

Unit-III: Heat Transfer Mechanisms [07 Hours]

- 3.1 Heat Engines: Otto cycle & its efficiency, Diesel cycle & its efficiency,
- 3.2 Refrigerators: General principle and coefficient of performance of refrigerator, Simple structure of Vapour compression refrigerator,
- 3.3 Air Conditioning: Principle and its applications,
- 3.4 Problems.

Unit-IV: Applications of Heat and Thermodynamics [08 Hours]

- 4.1 Phase transitions and heat transfer in phase change materials,
- 4.2 Principle of thermometry, Temperature scales & inter-conversions, Principle, Construction and Working: (Liquid thermometers, Liquid filled thermometers, Gas filled thermometers, Bimetallic thermometers, Platinum resistance thermometer, Thermocouple),
- 4.3 Problems.

❖ ESSENTIAL/RECOMMENDED READINGS:

1. Concept of Physics: H. C. Verma, Bharati Bhavan Publisher.
2. Heat and Thermodynamics: Brijlal, N. Subrahmanyam, S. Chand and Company Ltd.
3. Heat and Thermodynamics: Mark W. Zemansky, Richard H. Dittman, 7th Edition, Mc-Graw Hill International Edition.
4. Thermodynamics and Statistical Physics: J. K. Sharma, K. K. Sarkar, Himalaya Publishing House.
5. Thermal Physics (Heat and Thermodynamics): A. B. Gupta, H. P. Roybooks and Allied (P) Ltd. Calcutta.
6. Instrumentation: Devices & Systems, Rangan, Mani, and Sarma

DISCIPLINE SPECIFIC CORE COURSE (PH-MJ-122T):
Electricity and Magnetism

Course Code & Title	Credits	Credit Distribution of the Course	
		Theory	Practical
PH-MJ-122T - Electricity and Magnetism	2	2	--

❖ **LEARNING OBJECTIVES:**

The learning objectives of this course are as follows:

1. To understand the fundamental concepts of electricity and magnetism, such as electric charge, electric field, magnetic field, and electromagnetic waves.
2. To apply these concepts to solve problems in electricity and magnetism, such as electric circuits, motors, and generators.
3. To understand the applications of electricity and magnetism in a variety of fields, such as engineering, physics, and chemistry.
4. To be able to use mathematical and computational tools to solve electricity and magnetism problems.
5. To be able to conduct electricity and magnetism experiments and collect and analyze data.

❖ **COURSE OUTCOMES:**

On successful completion of this course students should be able to understand:

- CO1.** The idea of the electric field, electric potential and electric force for stationary charges.
CO2. The concept of the electrostatic field and potential of charge distributions using Coulomb's law and Gauss's law.
CO3. The dielectric phenomenon and effect of electric field on dielectric.
CO4. The magnetic field for steady currents using Biot-Savart and Ampere's Circuital laws.

SYLLABUS OF PH-MJ-122T: Electricity and Magnetism **[30 Hours]**

Unit-I: Electrostatics **[09 Hours]**

- 1.1 Electric Charge, Coulomb's law: the force between charges, Variation of forces with distances, Superposition principle,
- 1.2 Energy of system of charges,
- 1.3 Definition of electric field, electric lines of forces, Electric field due (Point and Multipole charge), Concept of electric flux,
- 1.4 Gauss's law in electrostatics and its applications,
- 1.5 Problems.

Unit-II: Dielectrics **[06 Hours]**

- 2.1 Introduction to dielectric materials, Electric Dipole, Electric dipole, Dipole moment
- 2.2 Electric potential and intensity at any point due to dipole, Torque on a dipole placed in an

electric field,

2.3 Polar and non-polar molecules, Electric polarization of dielectric material,

2.4 Gauss' law in dielectric, Electric vectors and its relation

2.5 Problems.

Unit-III: Magnetostatics and Transient Current

[07 Hours]

3.1 Introduction to Magnetization, Types of Magnetic Materials, Magnetic Induction and Intensity of magnetization,

3.2 Biot-Savart's law, Statement, long straight conductor, Circular Coil,

3.3 Ampere's circuital law, Statement, Field of Solenoid, Field of Toroid,

3.4 Gauss law for magnetism, AC voltage applied to Resistor,

3.5 Capacitor and Inductor, LR Circuit, LCR circuit.

Unit-IV: Magnetic Properties of Materials

[08 Hours]

4.1 Magnetization (M), Magnetic Intensity (H), Magnetic Induction (B), Magnetic Susceptibility, Magnetic Permeability,

4.2 Relation between B, M and H, Hysteresis and Hysteresis Curve,

4.3 Ferrite materials and its Applications

4.4 Problems.

❖ ESSENTIAL/RECOMMENDED READINGS:

1. Fundamentals of Physics: Halliday Resnik and Walker, 8th Edition.

2. Electromagnetics: B. B. Laud.

3. Foundations of Electromagnetic theory: Reitz, Milford, Christey.

4. Electricity and Electronics: D.C. Tayal, Himalaya Publishing House, Mumbai.

5. Introduction to Electrodynamics: D.G. Griffith.

6. Electricity and Magnetism: BrijLal, Subramanyan, Ratan Prakashan (Revised edition, 1997).

DISCIPLINE SPECIFIC CORE COURSE (PH-MJ-123P):**Physics Laboratory –IB**

Course Code & Title	Credits	Credit Distribution of the Course	
		Theory	Practical
PH-MJ-123P - Physics Laboratory -IB	2	--	2

❖ LEARNING OBJECTIVES:

The learning objectives of this course are as follows:

1. To develop experimental skills, such as the ability to set up and operate equipment, collect and analyze data, and report results.
2. To apply the principles of physics to solve experimental problems.
3. To communicate effectively about physics concepts.
4. To work collaboratively in a team environment.

❖ COURSE OUTCOMES:

On successful completion of this course students should be able to do the following:

CO1. Apply the laws of thermodynamics to analyze and solve practical problems related to energy transfer and transformation.

CO2. Acquire skills in recognition and use of electronic components like resistor, capacitor.

CO3. Apply scientific procedures for performing experiments based on basic concepts of heat, electricity and magnetism.

CO4. Gain the knowledge about heat and radiation, thermodynamics.

CO5. Study of Carnot's cycle through graph plotting.

SYLLABUS OF PH-MJ-123P: Physics Laboratory –IB**Lab Experiment List**

1. Study of temperature coefficient of Thermistor.
2. Study of Thermocouple and determination of inversion temperature.
3. Study of thermal conductivity by Lee's method.
4. Study of specific heat of Graphite.
5. Study of platinum resistance thermometer.
6. Study of Solar constant.
7. Determination of calorific values of different fuels.
8. Study of charging and discharging of capacitor.
9. Study of LR circuit.
10. Study of LCR circuit.
11. Study of Kirchhoff's Laws.
12. Study of Diode characteristics.
13. Study of Voltmeter, Ammeter and Multimeter (AC, DC, ranges and least count).

14. Determination of frequency of AC mains.
15. Comparison of capacitor using DeSauty's method.
16. Interpretation of Isothermal and Adiabatic curve on P-V diagram and theoretical study of Carnot's cycle by drawing graphs of Isothermal and Adiabatic curves.

❖ **ESSENTIAL/RECOMMENDED READINGS:**

1. Advanced Practical Physics for Students: B.L. Worshop and H.T. Flint, Little Hampton Book Services Ltd.
2. Practical Physics: R.K. Shukla, A. Srivastava, New Age International (P) Ltd.

VOCATIONAL SKILL COURSE (PH-VSC-124P):
Data Handling and Analysis using MS-Office Practical

Course Code & Title	Credits	Credit Distribution of the Course	
		Theory	Practical
PH-VSC-124P - Data Handling and Analysis using MS-Office Practical	2	--	2

❖ **LEARNING OBJECTIVES:**

The learning objectives of this course are as follows:

1. Perform basic operations on MS-office.
2. Creating and formatting of data using MS-Word, MS- Excel, etc. and Data handling like sorting, filtering.
3. Use of MS- Office functions to smoother the work

❖ **COURSE OUTCOMES:**

On successful completion of this course students should be able to do the following:

CO1. Create and manage professional documents using word.

CO2. Analyze, manage and present data using excel. Create and manage presentation using power point.

CO3. Can design and develop professional documents using MS-Office.

SYLLABUS OF PH-VSC-124P: Data Handling and Analysis using MS-Office Practical

List of Practicals:

1. Create a document and apply different formatting options.
2. Design a Greeting Card using Word Art for different festivals.
3. Create your Bio-data and use page borders and shading.
4. Create a document and insert header and footer, page title etc.
5. To create a document, set the margins, orientation, size, column, water mark, page color and page borders.
6. Insert a table into the document.
7. Apply the creating, editing, saving, printing securing & protecting operations to an excel spread sheets.
8. Prepare a bar chart & pie chart for analysis of five year results of your institute.
9. Work on the following exercise on a Workbook:
 - a. Copy an existing Sheet
 - b. Rename the old Sheet
 - c. Insert a new Sheet into an existing Workbook
 - d. Delete the renamed Sheet.
10. Prepare an Attendance sheet of 10 students for any 6 subjects of your syllabus.
11. Calculate their total attendance, total percentage of attendance 4 of each student & average of attendance.

12. Apply themes and layouts to power point slides and insert pictures, graphics, shapes, and tables into presentations.
13. In power point slide make use of adding transitions and animation & Working with master slides.
14. Create an excel worksheet and perform computations using available data and using mathematical, functions chosen from menus.

SKILL ENHANCEMENT COURSE (PH-SEC-125P):**Photography**

Course Code & Title	Credits	Credit Distribution of the Course	
		Theory	Practical
PH-SEC-125P - Photography	2	--	2

❖ LEARNING OBJECTIVES:

The learning objectives of this course are as follows:

1. To create general awareness and interest in photography process.
2. To make students familiar with the Photographic equipment and handling techniques.
3. To help students to learn basic photographic and image processing skills.

❖ COURSE OUTCOMES:

On successful completion of this course students should be able to do the following:

CO1. Understand the basic principle, structure and handling techniques in digital photography.

CO2. Develop and apply photographic skills using digital photography tools including digital editing, saving, sizing, and posting of the images.

CO3. Proficient at the technical aspect of photographing with a digital camera.

CO4. Identify and apply appropriate business practices specific to the self-employed professional photographer.

SYLLABUS OF PH-SEC-125P: Photography**List of Practicals:**

1. To study the effect of aperture on depth of field
2. To study and recognize the use of slow and fast shutter speed
3. To study the effect of Exposure for different colour temperatures
4. To identify and determine the focal length of the different types of lenses
5. To study the Image Mixing, Image Cutting and Text Building Effect
6. To study Blurr Effect and Transformation Tools
7. To understand the effect of clip mask, photo filter and stamping Tool
8. To study the effect of natural light, tungsten light and fluorescent light on Photograph.
9. Lighting for still life (Earthen ware, Metal ware, Glass ware, Fruits, Crockery, Jewelry, Flowers, Food etc.)
11. Indoor shooting using three point lighting set up
12. Image processing 1: (Light room techniques 1): Brightness, saturation etc.
13. Image processing 2: (Light room techniques 2): Exporting, contact sheet, print
14. Nature photography
15. Wild life photography
16. Night photography

17. Event Photography
18. News photography and preparing a photo story
19. Cover page design for a magazine

