AC 28/5/2026/Sci/01 ITEM NO: 1.2.1

Deccan Education Society's

Kirti M. Doongursee College of Arts, Science and Commerce (AUTONOMOUS)

Dadar (W), Mumbai -28

Affiliated to

UNIVERSITY OF MUMBAI

Title of the program

A- U.G. Certificate in **Physics**

B- U.G. Diploma in **Physics**

C- B.Sc **(Physics)**

Syllabus for

Semester – Sem I & II

Ref: GR dated 20th April, 2023 for Credit Structure of UG

(With effect from the academic year 2026-27 Progressively)

PROGRAM OUTCOMES

PO	Description
A student completing Bachelor's Degree in **Arts/Commerce/Science** Program will be able to	
PO1	**Disciplinary Knowledge:** Demonstrate comprehensive knowledge of the disciplines that form a part of a graduate Program. Execute strong theoretical and practical understanding generated from the specific graduate Program in the area of work.
PO2	**Critical Thinking and Problem solving:** Exhibit the skills of analysis, inference, interpretation and problem-solving by observing the situation closely and design the solutions.
PO3	**Social competence:** Display the understanding, behavioral skills needed for successful social adaptation, work in groups, exhibits thoughts and ideas effectively in writing and orally.
PO4	Research-related skills and Scientific temper: Develop the working knowledge and applications of instrumentation and laboratory techniques. Able to apply skills to design and conduct independent experiments, interpret, establish hypothesis and inquisitiveness towards research.
PO5	**Trans-disciplinary knowledge:** Integrate different disciplines to uplift the domains of cognitive abilities and transcend beyond discipline-specific approaches to address a common problem.
PO6	**Personal and professional competence:** Performing dependently and collaboratively as a part of team to meet defined objectives and carry out work across interdisciplinary fields. Execute interpersonal relationships, self-motivation and adaptability skills and commit to professional ethics.
PO7	**Effective Citizenship and Ethics:** Demonstrate empathetic social concern and equity centered national development and ability to act with an informed awareness of moral and ethical issues and commit to professional ethics and responsibility.
PO8	**Environment and Sustainability:** Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

PROGRAM SPECIFIC OUTCOMES

PSO	Description
PSO1	Understand basic mechanics and properties of matter.
PSO 2	Illustrate the principles of electricity, magnetism, thermodynamics, optics and spectroscopy.
PSO 3	Identify, formulate and analyze complex problems using basic principles of mathematics, physics and statistics.
PSO 4	Design, construct and analyze basic electronic and digital circuits.

Deccan Education Society's

Kirti M. Doongursee College of Arts, Science and Commerce
(AUTONOMOUS)

Sr. No.	Heading	Particulars	
1	**Title of program** **O: _____A**	**A**	**U.G. Certificate in Physics**
	O: _____B	**B**	**U.G. Diploma in Physics**
	O: _____C	**C**	**B.Sc. (Physics)**
2	**Eligibility** **O: _____A**	**A**	HSC (Science) **OR** Passed Equivalent Academic Level 4.0
	O: _____B	**B**	Under Graduate Certificate in **Physics** **OR** Passed Equivalent Academic Level 4.5
	O: _____C	**C**	Under Graduate Diploma in **Physics** **OR** Passed Equivalent Academic Level 5.0
3	**Duration of program R:**	**A**	One Year
		B	Two Years
		C	Three Years
4	**Intake Capacity** **R: _____**	**120**	

Sign of the HOD & Coordinator BOS in _____

Sign of the NEP Coordinator, DES's Kirti M. Doongursee College

Sign of Principal DES's Kirti M. Doongursee College, Mumbai 28.

Preamble

1) ***Introduction:***

The revised syllabus in Physics, as per credit based system for the First Year B. Sc. course will be implemented from the academic year 2026 – 2027.

2) *Aims and Objectives*

The systematic and planned curricula from these courses shall motivate and encourage learners to understand basic concepts of Physics.

Objectives:

- To develop analytical abilities towards real world problems
- To familiarize with current and recent scientific and technological developments
- To enrich knowledge through problem solving, hands on activities, study visits, projects etc.
- To acquire knowledge of fundamental optics

3) *Learning Outcomes*

On successful completion of this course students will be able to:

1. Understand the Newton's laws of motion, friction, work, energy and able to solve problems using them.
2. Understand the mechanics of multi-particle system using concepts of center of mass and conservation laws.
3. Study the mechanics of undamped/ (simple harmonic motion, uniform circular motion) and damped oscillations (Forced oscillations, two body oscillation) and their implementation in physical applications such as torsional, compound, and simple pendulums.
4. Understand AC circuit theory in case of pure resistance, inductance, capacitance and series combinations of LR, CR and LCR circuits, the working of AC bridges such as Maxwell’s Inductance bridge, De Sauty’s bridge, Wien bridge.
5. Comprehend circuit theorems (Ohm’s law, Kirchoff’s laws, Thevenin’s, Norton’s, and
6. Maximum Power Transfer theorems). Also, understand magnetic properties of matter,
7. Concepts of magnetic permeability, magnetic forces, magnetic field, magnetization,
8. Biot-Savart’s law.
9. Study the Lens maker's equation, Newton's lens equation and principal foci positions.
10. Understand Lateral, Longitudinal and Angular magnification, Equivalent focal length and power of two thin lenses, Concept of cardinal points and their significance.

11. Comprehend Spherical aberration & reduction, chromatic aberration & reduction.
12. Understand Fresnel and Fraunhoffer type of diffraction and Fraunhoffer diffraction pattern due to a single slit and double slit, Michelson's Interferometer and its Application, Polarization and types of Polarization.
13. Comprehend the concepts of DC power supply and familiarize with diode and Zener diode circuits and its applications, Methods of Transistor Biasing, Base Resistor or fixed bias, Emitter Bias and Voltage Divider Bias Methods.
14. Understand DC transistors Biasing and α, β (dc and ac) gain, Inherent Variations of transistor Parameters and Stabilization, Derived Gates NAND,NOR and Ex-OR gate, Including their symbols and truth table.
15. Apply the knowledge to design logical circuit using basic gates and its applications.
16. Students must be able to work through problems pertaining to the topics covered in the syllabus.

Deccan Education Society's

Kirti M. Doongursee College (Autonomous) Proposed Curriculum For

F.Y.B.Sc. as per NEP 2020

Year of implementation- 2026-27

Name of the Department: PHYSICS

Semester	Course Code	Course Title	Vertical	Credit
I	26PHYMJ111	Introduction to Mechanics	Major	2
	26PHYMJP11	Physics Major Practical	Major	2
	26PHYVC141	Laboratory Equipment Maintenance	VSC	2
	26PHYSC151	Basic Instrumentation skills and Basic Mathematical Skills for Physics	SEC	2
II	26PHYMJ211	Optics	Major	2
	26PHYMJP21	Physics Major Practical	Major	2
	26PHYOE231	Physics in Everyday Life-2	OE	2
	26PHYVC241	PCB Making	VSC	2
	26PHYSC251	Computer Simulation	SEC	2

Sem. - I

Syllabus B.Sc.
(Physics) (Sem.- I)

Name of the Course: F.Y.B.Sc. SEM-I - Paper I – Introduction to Mechanics Course code: 26PHYMJ111

Sr.No.	Heading	Particulars
1	**Description the course:** **Including but Not limited to:**	Introduction, relevance, Usefulness, Application, interest, connection with other courses, demand in the industry, job prospects etc.
2	**Vertical :**	**Major**
3	**Type :**	**Theory**
4	**Credits :**	2 credits
5	**Hours Allotted :**	30 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives (CO):** After successful completion of this course students will be able to: CO 1. Explain Newton's laws of motion, friction, work, energy and able to solve problems using them. CO 2. Learn the mechanics of multi-particle system using concepts of center of mass and conservation laws. CO 3. Study the mechanics of undamped/ (simple harmonic motion, uniform circular motion) and damped oscillations (Forced oscillations, two body oscillation) CO 4. Describe qualitatively how undamped and damped oscillations are implemented in physical problems such as torsional, compound, and simple pendulums. CO 5. Demonstrate quantitative problem solving skills in all the topics covered in the syllabus.	
8	**Course Outcomes (OC):** After successful completion of this course the learner will be able to: OC 1. Remember Newton’s laws for the calculations of the motion of simple systems.	

	OC 2. Understand Work and Energy equivalence and its applications through suitable numerical. OC 3. Apply Newton's laws and system of particals in daily life. OC 4. Analyse the problems and use skills in all the topics covered
9	**Modules:-Paper 1 – Introduction to Mechanics (30 Hours)**
	UNIT- I (15 Hours) **1. Newton's Laws of Motion:** Newton's first, second and third laws of motion, interpretation and applications, pseudo forces, inertial and non-inertial frames of reference Worked out examples (with friction present). **(HCV: 5.1 to 5.5)** **2. Friction:** Advantages & disadvantages of friction in daily life, Friction as the component of Contact force, Kinetic Friction, Static friction, laws of friction, Understanding friction at atomic level. **(HCV: 6.1 to 6.5)** **3. Work and Energy:** Kinetic Energy, Work and Work-energytheorem, Potential Energy, Conservative and Non-Conservative Forces, Different forms of Energy: Mass Energy Equivalence Worked out Examples. **(HCV: 8.1, 8.2, 8.5, 8.6, 8.11)** **UNIT- II (15 Hours)** **1. Many Particles System**, Centre of Mass of solid objects, Conservation of momentum in a system of particle, Angular momentum of a particle and system of particle, conservation of angular momentum. **(RH: 7.3, 7.4, 7.5, 10.1, 10.2, 10.4)** **2.Oscillations:** The Simple Harmonic Oscillator, Relation between Simple Harmonic Motion and Uniform Circular Motion, Damped Harmonic Motion, Forced Oscillations and Resonance, Two Body Oscillations. RH:17.2, 17.6, 17.7, 17.8, 17.9 Examples of Simple Harmonic oscillations: Simple Pendulum, Simple Pendulum, Torsional Pendulum and Compound pendulum **(**Qualitative study) HP: 9.1.1(1,3,4)

10	**Reference Books** 1. **HCV:** H.C. Verma, Concepts of Physics-Part I (Second Reprint of 2020) BharatiBhavan Publishers and Distributers 2. **RH:**Resnick and Halliday: Physics – I, 5^{th} Edition. 3. **Mechanics** – H. S. Hans and S. P. Puri, Tata McGraw Hill (2nd ED.).

SEMESTER I

PHYSICS PRACTICAL COURSE –26PHYMJP11

INSTRUCTIONS:

1) All the measurements and readings should be written with proper units in SI system only.
2) After completing all the required number of experiments in the semester and recording them in journal, student will have to get their journal certified and produce the certified journal at the time of practical examination.
3) While evaluating practical, weightage should be given to circuit/ray diagram, observations, tabular representation, experimental skills and procedure, graph, calculation and result.
4) Skill of doing the experiment and understanding physics concepts should be more important than the accuracy of final result.

Note: Exemption of two experiments from section A and / or B and / or C may be given if student carries out any one of the following activities.

- Collect the information of at least five Physicists with their work or any three events on physics, report that in journal.
- Execute a mini project to the satisfaction of teacher in-charge of practical.
- Participate in a study tour or visit & submit a study tour report.
- For practical examinations, the learner will be examined in **ONE** experiment (one from any group).
- A Minimum 4 from each group and in all minimum 8 experiments must be reported in journal.
- All the skill experiments are required to be completed compulsorily. Students are required to report all these experiments in the journal. Evaluation in viva voce will be based on regular experiments and skill experiments.

A learner will be allowed to appear for the semester and practical examination only if he submits a certified journal of Physics or a certificate that the learner has completed the practical course of Physics Semester I as per the minimum requirements.

Course Outcomes (OC):

After successful completion of this course students will be able to

OC1: Remember the skills while performing experiments.

OC2: Understand the use of apparatus and their use without fear & hesitation.

OC3: Apply the physics theory concepts to practical application.

OC4: Analysis the concept of errors and their estimation.

Sr No	Name of the Experiment
	GROUPA
1	Torsional Oscillation: To determine modulus of rigidity η of a material of wire by Torsional oscillations
2	Bifilar Pendulum: Determination of moment of inertia of rectangular and cylindrical bar about an axis passing through its centre of gravity
3	Moment of inertial of Flywheel
4	Young's Modulus of a wire material by method of vibrations
5	Constant volume air thermometer
6	Bifilar pendulum (moment of inertia of rectangular rod)
	GROUP B
7	Determination of diameter of thin wire using Wedge Shaped Film
8	Spectrometer: To determine of angle of Prism
9	Spectrometer: To determine refractive index of prism material
10	Newton’s Rings: To determine radius of curvature of a given convex lens using Newton's rings
11	Combination of Lenses: To determine equivalent focal length of a lens system by magnification method
12	Study of LASER Beam Divergence
	GROUP C:Skill Experiment
1	Use of Vernier Callipers, Micrometer Screw Gauge and Travelling Microscope

2	Graph plotting (Plot BE/A verses A graph for 30 atoms, Plot Packing Fraction graph for 30 atoms)
3	Spectrometer: Schuster's Method
4	To determine the Resistance & Capacitance using Color code/Number & verify using Multimeter (Analog/Digital).
5	Use of digital multimeter(To identify different types of Wires, power cables, probes, fuses used in the laboratory and check their continuity using DMM.)
6	Absolute and relative error calculation
	References: 1. Fundamentals of Optics by Jenkins and White. 2. Physics by Resnik and Hallday.

Note: Minimum **8** experiments (Four From each group) and **4** Skill experiments should be completed and reported in the journal, in the first semester. **Certified Journal is a must,** to be eligible to appear for the semester end practical

Physics (Vocational Skill Course)

Course code: 26PHYVC141

Title: - Laboratory Equipment Maintenance - 2 credits

Course Objectives

After successful completion of this course students will be able to:

1. learn to identify and testing of electronic components.
2. Detecting faults in circuits and troubleshooting them.
3. Repair of different types of laboratory power supplies.
4. Learn Maintenance of basic laboratory equipment's.

Course Objectives practical's:

After successful completion of this course students will be able to:

1. Identify different types of wires, power cables, probes, fuses etc.
2. Identify, measure and testing of various types passive components and semiconductor devices.
3. Understand Soldering and desoldering given circuit on PCB and testing
4. Learn about of A.C & D.C. power supply & troubleshooting

Course Outcomes

After successful completion of this course students will be able to:

OC1: Gain knowledge of the different electronic components

OC2: Establish a basis for honing their practical electronics skills

OC3: Develop a lucrative and advanced profession in electronics.

OC4: Understand maintenance of basic laboratory equipment's **Course Outcomes**

Practicals:

After successful completion of this course students will be able to:

OC1: Comprehend to identify and testing of electronic components.

OC2: Understand to identify faulty components and troubleshoot circuits

OC3: Acquire skills of circuit Soldering and desoldering of electronic components in a given circuit

OC4: Comprehend hands on experience in handling and maintaining laboratory/electronic equipment.

Unit-I (30 Hours)

Testing of Passive Electronic Components using Digital Multimeter (DMM) Passive components - resistors, capacitors, inductors, failures in fixed resistors, testing of resistors, variable resistors, variable resistor as potentiometer, measuring resistors using color codes. Testing of various types of capacitors & inductors.

Unit-II (30 Hours)

1. Testing of semiconductor devices, soldering and troubleshooting.
2. Semiconductor devices: diode, bipolar junction transistors etc, causes & types of failures in semiconductor devices.
3. Basics of soldering: soldering alloy, soldering iron, soldering & desoldering, dry soldering and good contact.
4. Laboratory Power supplies – basic testing and troubleshooting.

List of Experiment

1. Identification of various types passive components - resistors, capacitors and inductors used in laboratory.
2. Identification of various types of semiconductor devices: diode, bipolar junction transistors, Field effect transistors etc.
3. Testing of semiconductor devices: diode, bipolar junction transistors, Field effect transistors etc.
4. Soldering and desoldering of electronic components in a given circuit.
5. Mounting simple circuit on PCB and testing.
6. Troubleshooting a given circuit.
7. Study of a.c power supply & troubleshooting.
8. Study of d.c power supply and troubleshooting.
9. Display of internal parts of TV and its maintenance.
10. Introduction to internal parts of PC and its maintenance.
11. Working of Mixer/ Food processor and its maintenance.
12. Display of internal parts of Printers and its maintenance.

Reference Books

1. Text book of Electrical Technology, by B.L. Theraja and A.K. Theraja
2. Modern Electronic Equipment: Troubleshooting, Repair and Maintenance by Khandpur, TMH 2006 Electronic Instruments and Systems: Principles, Maintenance and Troubleshooting by R. G. Gupta Tata McGraw Hill Edition 2001
3. Student Reference Manual for Electronic Instrumentation Laboratories by Stanley Wolf, and Richard F. M. Smith, Prentice Hall of India Pvt. Ltd. New Delhi
4. Consumer Electronics by S. P. Bali, Pearson
5. Troubleshooting and Maintenance of Electronic Equipment by K. Sudeep Singh

Reference Books Practical's:

1. Modern Electronic Equipment: Troubleshooting, Repair and Maintenance by Khandpur, TMH 2006
2. Student Reference Manual for Electronic Instrumentation Laboratories by Stanley Wolf, and Richard F. M. Smith, Prentice Hall of India Pvt. Ltd. New Delhi

3. Consumer Electronics by S. P. Bali, Pearson
4. Troubleshooting and Maintenance of Electronic Equipment by K. Sudeep Singh

Physics (Skill Enhancement Course) - 2 credits Course code: 26PHYSC151

Title: - Basic Instrumentation skills and Basic Mathematical Skills for Physics

Course Objectives

1. Generate awareness among students about handling different laboratory instruments scientifically.
2. Develop concepts of accuracy precision, resolution, range and errors/uncertainty in measurement.
3. Understand various types of electronic components and devices so as to construct simple circuits
4. Expose students to systematic of scientific calculator.
5. Illustrate necessary mathematical concepts to develop corresponding skills
6. Develop the problem solving among learners

Course Outcomes

Course Outcomes

OC1: Accomplish desired skills to handle different laboratory instruments scientifically.

OC2: Acquire knowledge about precision and accuracy in measurements.

OC1: Develop basic electronic circuit using different techniques.

OC4: Apply mathematical tools to understand theoretical concepts of physics and emonstrate problem-solving skills for all the topics covered**.**

This course is designed for learners to get exposure with various aspects of instruments arnd their usage through hands-on mode.

Unit 1: Basic Instrumentation skills *(30* ***Hours****)*

1. Study and use of Vernier Callipers & Micrometer Screw Gauge
2. Study and use of Travelling Microscope.
3. Study and use of Spectrometer.
4. Study and determination of Focal length of a convex lens.
5. Fundamentals of Electronic Component- Resistor, potentiometer, Capacitor, Inductor, Diode, Transistor, LED, Zener diode.
6. Use of Multimeter (analog, Digital), Voltmeter, Ammeter.
7. Use of CRO - voltage (AC, DC), Frequency and Phase measurement.
8. Different types of power supplies.
9. Logic gate IC Testing.
10. Soldering electronic circuits.
11. Study and use of Thevenin's theorem.
12. Building Electronic Circuits using Breadboard.
13. Graph plotting - plotting of graphs and finding slope and intercept.
14. Graph plotting - semi log graph paper.
15. Theory of errors and Calculating-Error for given data

Unit 2: Basic Mathematical Skills *(30* ***Hours****)*

1. Use of scientific Calculator

2. Basic trigonometry and its applications in physics
3. Concept of logarithm and its application to Physics
4. Concept of derivatives and its application to Physics
5. Concept of integration and its application to Physics
6. Concept of differential equations (1^{st} order) and its application to Physics

Sem. – II

Syllabus B.Sc.
(Physics) (Sem.II)

Name of the Course: F.Y.B.Sc. SEM-II- Paper – I: Optics Course Code: 26PHYMJ211

Sr.No.	Heading	Particulars
1	**Description the course : Including but Not limited to:**	Introduction, relevance, Usefulness, Application, interest, connection with other courses, demand in the industry, job prospects etc
2	**Vertical :**	**Major**
3	**Type :**	Theory
4	**Credits :**	2 credits
5	**Hours Allotted :**	30 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives (CO):** After successful completion of this course students will be able to: CO 1. Explain the nomenclature used in lenses, lens equations for single convex lenses, and sign convention. lens maker's equation, Newton's lens equation and principal foci positions. CO 2. Describe Lateral, Longitudinal and Angular magnification, Equivalent focal length and power of two thin lenses, Concept of cardinal points and their significance CO 3. Explain qualitatively Spherical aberration & reduction, chromatic aberration & reduction. CO 4. Study of Fresnel and Fraunhoffer type of diffraction and Fraunhoffer diffraction pattern due to a single slit and double slit, CO 5. Learn Michelson's Interferometer and its Applications CO 6. Describe Polarization and types of Polarization CO 7. The students learn to apply their knowledge to solve problems that are covered in the all syllabus.	
8	**Course Outcomes (OC):** After successful completion of this course, students would be able to OC1: Remember the diffraction, polarization processes and applications of them in physical situations. OC 2: Understand the applications of interference in design and working of interferometers. OC 3: Apply concept of interference and diffraction in different optical instruments. OC 4: Analyze the diffraction and interference in day to day life	

9	**Paper – I: Optics** **(30 Hours)**
	UNIT-I (15 Hours) **1. Lenses and Lens Maker's Equation:** Introduction to lenses, Terminology and sign conventions, Introduction to Thin lenses and Lens equation for single convex lens, Lens maker's equation: Positions of the Principal Foci and Newton's Lens equation. **(SBA: 4.1, 4.2, 4.3, 4.7, 4.8, 4.9, 4.10, 4.10.1, 4.11)** **2. Magnification by a lens and power of lens:** Lateral, Longitudinal and Angular magnification, Deviation by a thin lens and its power, Equivalent focal length of two thin lenses, Focal length of the equivalent lens & power of two thin lenses, Concept of cardinal points and their significance **(SBA: 4.12, 4.12.1, 4.12.2, 4.12.3, 4.15, 4.16, 4.17, 4.17.1, 4.17.2, 4.17.3, 4.17.4, 5.2)** **3. Introduction to Aberration in lenses:** Spherical aberration & reduction, chromatic aberration & reduction (Qualitative). SBA: 9.2, 9.5, 9.5.1, 9.10 Suitable numerical with appropriate difficulty level. **UNIT-II (15 Hours)** **1. Fresnel diffraction:** Introduction, Huygens-Fresnel's theory, Fresnel's assumptions, Distinction between interference and diffraction, Fresnel and Fraunhoffer types of diffraction, (SBA: 17.1, **17.2, 17.3, 17.6, 17.7)** **2. Fraunhoffer diffraction:** Introduction, Fraunhoffer diffraction at a single slit, intensity distribution in diffraction pattern due to a single slit, Fraunhoffer diffraction at double slit (Qualitative), Distinction between single slit and double slit diffraction patterns. **(SBA: 18.1, 18.2, 18.2.1, 18.4, 18.4.2)** **3. Michelson's Interferometer:** Principle, construction, working, Applications of Michelson Interferometer: a) Measurement of wavelength b) Determination of the difference in the wavelength of two waves c) Determination of the refractive index of gases. **(SBA: 15.7, 15.7.1 to 15.7.3, 15.8, 15.8.1, 15.8.2, 15.8.4)** **4. Polarization:** Introduction, Polarization, Types of Polarization **(SBA: 20.1, 20.2, 20.5,20.5.1, 20.5.2, 20.5.3)**
10	**Text Books**
11	**Reference Books** 1. Dr. N. Subrhmanyam, Brijlal, and Dr. M. N. Avadhanulu, A Textbook of Optics, 25th Revised Edition (2012) S. Chand. 2. Fundamentals of Optics by Jenkins and White, fourth edition.

SEMESTER - II

PHYSICS PRACTICAL COURSE –26PHYMJP21

INSTRUCTIONS:

1) All the measurements and readings should be written with proper units in SI system only.

2) After completing all the required number of experiments in the semester and recording them in journal, student will have to get their journal certified and produce the certified journal at the time of practical examination.

3) While evaluating practical, weightage should be given to circuit/ray diagram, observations, tabular representation, experimental skills and procedure, graph, calculation and result.

4) Skill of doing the experiment and understanding physics concepts should be more important than the accuracy of final result.

Note: Exemption of two experiments from section A and / or B and / or C may be given if student carries out any one of the following activities.

- Collect the information of at least five Physicists with their work or any three events on physics, report that in journal.
- Execute a mini project to the satisfaction of teacher in-charge of practical.
- Participate in a study tour or visit & submit a study tour report.
- For practical examinations, the learner will be examined in **ONE** experiment (one from any group).
- A Minimum 4 from each group and in all minimum 8 experiments must be reported in journal.

All the skill experiments are required to be completed compulsorily. Students are required to report all these experiments in the journal. Evaluation in viva voce will be based on regular experiments and skill experiments.

A learner will be allowed to appear for the semester and practical examination only if he submits a certified journal of Physics or a certificate that the learner has completed the practical course of Physics Semester II as per the minimum requirements.

Course Outcomes (OC):

On successful completion of this course students will be able to:

OC 1: Remember the skills while performing experiments.

OC 2: Understand the use of apparatus and their use without fear & hesitation.

OC 3: Apply the physics theory concepts to practical application.

OC 4: Analyze the errors and their estimation.

Sr No	Name of the Experiments
	GROUPA
1	Frequency of AC Mains: To determine frequency of AC mains (Sonometer wire)
2	LDR Characteristics: To study the dependence of LDR resistance on intensity of light
3	Study of Logic gates & To verify De Morgan's Theorems
4	To study EX-OR Gate and verify its truth table
5	To study half adder and full adder and verify their truth table Ex-OR Gate
6	To study Zener Diode as Regulator
	GROUP B
7	To study NAND/NOR gates as Universal Building Blocks
8	LR Circuit: To determine the value of given inductance and phase angle
9	CR Circuit: To determine value of given capacitor and Phase angle
10	Transistor configurations : CB/CE/CC (study of input-output characteristics)
11	LCR series Resonance: To determine resonance frequency of LCR series circuit
12	To study Thermistor characteristics: Resistance vs. Temperature
	GROUP C: DEMONSTRATION EXPERIMENT
1	Radius of ball bearings (single pan balance)
2	Use of Oscilloscope: Wave forms at output of half wave , bridge rectifiers with and without Capacitor filter, Ripple

3	Use of PC for graph plotting
4	Conservation of angular momentum
5	Testing of components (Resistors , Diode , Transistor , capacitor)
6	Study of I-V characteristics of solar cell
	References: 1. Digital Principles by Malvino and Leach 2. Electricity and Magnetism by Brijlal and Subrahmanyan.

Note: Minimum **8** experiments (Four From each group) and **4** Demo experiments should be completed and reported in the journal, in the first semester. **Certified Journal is a must,** to be eligible to appear for the semester end practical examination.

Course Code	OPEN ELECTIVE (OE) SEM 2	Credits	Lectures/ Week
26PHYOE231	Physics in Everyday Life-2	2	2

Course Outcomes:

On successful completion of this course students will be able to:

OC 1: Remember the concept of heat engines, atomic excitation and LASER principles. .

OC 2: Understand working principle of refrigerators, heat pumps and electromagnetic waves and its spectrum.

OC 3: Apply the techniques to know coefficient of performance, the types of thermometers and their usage, types and sources of electromagnetic waves and applications.

OC 4: Analyze the defects in engines, lasers and electromagnetic waves.

Unit	Topics	No of Lectures
I	**1. Heat transfer mechanisms:** Heat Engines: Otto cycle and its efficiency ii. Diesel cycle and its efficiency. Refrigerators: General Principle and Coefficient of performance of refrigerator, simple structure of vapour compression refrigerator. Air conditioning: principle and its applications. Temperature Scales: Centigrade, Fahrenheit and Kelvin scale. **2. LASER:** Absorption, Spontaneous Emission, and Stimulated Emission, Population Inversion and Laser Action, Applications of Lasers.	15
II	**1. Electromagnetic Waves:** Historical Perspective of Electromagnetic Waves, electromagnetic spectrum, sources of electromagnetic waves: Radio waves, Microwaves, Infrared, Visible light, Ultraviolet, X-rays, Gamma rays, Production of electromagnetic waves (Hertz experiment), Plank hypothesis of photons (concept only). **2. Applications of electromagnetic waves:** Microwave oven, RADAR , Pyro electric thermometer, X-ray radiography and CT Scan, solar cell.	15

References:

1. Brijlal, N. Subramanyam, Heat and thermodynamics, S. Chand and company Ltd.
2. Mark, W.Zemensky, Richard H. Dittman, Heat and thermodynamics- 7 th edition, TMc Graw Hill international.

Additional references:

1.Thermodynamics and Statistical Physics: J.K. Sharma, K.K. Sarkar, Himalaya Publishing House

2. Thermal Physics (Heat & Thermodynamics): A.B. Gupta, H.P. Roy Books and Allied (P) Ltd, Calcutta.

3. Concepts of Modern Physics: A Beiser (6th ed., McGraw Hill, 2003.
Modern Physics: Raymond A. Serway, Clement J. Moses, Curt A. Moyer

SEMESTER-II

Physics (Vocational Skill Course)

Course code: 26PHYVC241

Title: - PCB Making

Learning Objectives:

1. Learn techniques required for soldering of electronic components.
2. Learn to create effective PCB layouts.

Learning Outcomes

On successful completion of this course students will be able to:

1. Recall the fundamental concepts of PCB design, including types of PCBs, materials, components, and basic fabrication processes.
2. Explain the working principles of PCB layout design, circuit schematics, and the role of different layers and components in PCB fabrication.
3. Apply PCB design tools and techniques to create circuit layouts, perform component placement, and carry out basic PCB fabrication processes.
4. Analyze PCB designs for errors, signal integrity issues, and layout optimization, and evaluate the performance of fabricated circuits.

Unit I: **Circuit Prototyping Skills** (30 Hours)

1. Soldering electronic components
2. Circuit assembly on general purpose board
   A. Bridge rectifier with capacitor filter and regulator
   B. Second order active Filter
   C. Wheatstone bridge for temperature measurement
   D. 555 based LED flasher
3. Testing
4. Soldering of surface mount devices

Unit II: **PCB Design Software** (30 Hours)

1. Schematic circuit entry software
2. PCB Layout
   A. Footprint assignment

   Creating board outlines for various layers: Bottom routing, Solder mask bottom, Legend or silk screen Top, Drill layer

   B. Placement on the board
   C. Routing
   D. Post processing, Assembly and testing

List of Experiments:

1. Single side PCB
2. Double side PCB
3. Multi-layer PCB
4. Schematic / Components design review.
5. Determine what footprints are required to be built, and build them incorporating.

6. Component placement.
7. Power and Ground Plane assignment.
8. Critical net routing.

Reference:

1. Electronic Product Design Vol. I Basic for PCB Design – by Er. Mehta S.D.
2. Printed circuit boards: Design fabrication, Assembly and testing – R S Khandpur.
3. PCB Design and Layout Fundamentals – by Roger Hu
4. PCB Design and Technology – by Walter C Bosehart

Physics (Skill Enhancement Course) - 2 credits

Course Code	SKILL ENHANCEMENT COURSES (SEC) SEM 2 (Practical Course)	Credits	Lectures/ Week
26PHYSC251	Computer Simulation	2	4

Course outcomes:

On successful completion of this course students will be able to:

OC 1: Remember basic concepts of simulation.

OC 2: Understand different ways and tools for simulation.

OC 3: Apply techniques of graph plotting and its analysis.

OC 4: Analyze and use simulation techniques for basic experimental data collection and measurements.

Unit	Topics	No of Lectures
	PRACTICALS 1. Input modeling and parameter estimation in Matlab 2. 2d, 3d graph plotting 3. Solving mathematical equations in matlab. 4. Solving matrix in matlab 5. Solving differential equations in matlab 6. Solving Integration in matlab 7. Creating simulated experimental models in Simphy/Matlab 8. Random number generation in Matlab. 9. Creating three dimensional plots. 10. Creating simple,multi bar graphs in Matlab. 11. Write a program to find factorial of a number. 12. Write a program to display first ten natural numbers	**60**

References:

1. Basics of modelling and simulation by Lari and Singh, S.K Kataria and sons Publications
2. Introduction to computer simulations for integrated stem college education by Mohamed M Hafez, William E Tavernetti.

Additional reference:

1. Computer simulations in science and engineering, J.M. Duran- Cham: Springer, 2018 - Springer.

Appendix B

Justification for B.Sc. (PHYSICS)

1.	Necessity for starting the course:	The necessityfor starting the B.Sc. (Physics) course lies in its role as a foundational, interdisciplinary, and practical program that prepares students for higher education, diverse career opportunities and active participation in addressing scientific and societal challenges.
2.	Whether the UGC has recommended the course:	Yes
3.	Whether all the courses have commenced from the academic year 2023-24	The course has already commenced in the universityand in the academic year 24-25, it is restructured under NEP 2020
4.	The courses started by the University are self-financed, whether adequate number of eligible permanent faculties are available:	This course is aided/self-financed based on sanction given by University of Mumbai to affiliated colleges time to time.
5.	To give details regarding the duration of the Course and is it possible to compress the course?	The duration of the program is three years (6 semesters). It is not possible to compress the course.
6.	The intake capacity of each course and no. of admissions given in the current academic year:	The intake capacity is variable from the college to college based on sections received from the University.
7.	Opportunities of Employability / Employment available after undertaking these courses:	B.Sc. (Physics) graduates are versatile and can adapt their skills to various industries, make them valuable assets in the workforce. Additionally, continuous learning and staying updated on industry trends can enhance career prospects and open up new opportunities.

Evaluation Scheme for First Year Physics (UG)

under NEP 2020 (2 credits)

I. Internal Evaluation for Theory Courses – 20 Marks

1) Continuous Internal Assessment (CIA) Assignment - Tutorial/ Case Study/ Project / Presentations/ Group Discussion / Ind. Visit. – 10 marks

2) Continuous Internal Assessment (CIA) ONLINE / OFFLINE Unit Test – 10 marks - 15 Minutes

II. External Examination for Theory Courses – 30 Marks

Duration: 1 Hour

Theory question paper pattern:

Question	Based on	Marks
Q.1	Unit I	15
Q.2	Unit II	15

- All questions shall be compulsory with internal choice within the questions.
- Each Question may be sub-divided into sub questions as a, b, c, d, etc. & the allocation of Marks depends on the weightage of the topic.

NOTE: To pass the examination, attendance is compulsory in both Internal & External Theory Examinations.

FY Physics Evaluation pattern and Question paper pattern for Semester End Practical Examination of Major Course

Internal Continuous Assessment: 40% (20 Marks)	**Semester End Examination: 60% (30 Marks)**	**Duration for End semester examination**
Viva/ assignment/ objective question test /Small experiments (15 Marks), Overall performance (5 Marks) = 20 Marks	As per paper pattern	1 hr 30 mins

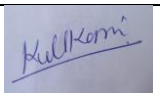
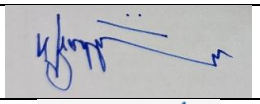
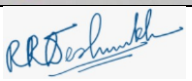
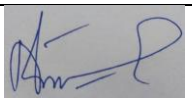
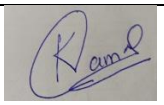
FY Physics Evaluation pattern and Question paper pattern for Semester End Practical Examination of Vocational Skill Courses and Skill Enhancement Courses

Internal Continuous Assessment: 40% (20 Marks)	**Semester End Examination: 60% (30 Marks)**	**Duration for End semester examination**
Viva/ assignment/ objective question test /Small experiments (15 Marks), Overall performance (5 Marks) = 20 Marks	As per paper pattern	1 hr 30 mins

Letter Grades and Grade Points:

Semester GPA/ Programme CGPA Semester/ Programme	**% of Marks**	**Alpha-Sign/ Letter Grade Result**	**Grading Point**
9.00 - 10.00	90.0 – 100	O (Outstanding)	10
8.00 - < 9.00	80.0 - < 90.0	A+ (Excellent)	9
7.00 - < 8.00	70.0 - < 80.0	A (Very Good)	8
6.00 - < 7.00	60.0 - < 70.0	B+ (Good)	7
5.50 - < 6.00	55.0 - < 60.0	B (Above Average)	6
5.00 - < 5.50	50.0 - < 55.0	C (Average)	5
4.00 - < 5.00	40.0 - < 50.0	P (Pass)	4
Below 4.00	Below 40.0	F (Fail)	0
Ab (Absent)	-	Ab (Absent)	0

Signatures of BOS Physics Members

SR.No.	Name	Signature
1.	Dr. J R Mahajan	
2.	Mr. K.V.Dagadkhair	
3.	Mr. Tejas Sawant	
4.	Dr.A.D.Kulkarni	
5.	Prof. Nana Pradan	
6.	Prof. Dr. R.R.Deshmukh	
7.	Dr. Ashish A. Nimbekar DES's	
8.	Mr Kamal Nayan Chauhan	
9.	Mr. Mayuresh Marathe	**AB**