

Punyashlok Ahilyadevi Holkar Solapur University, Solapur



Name of the Faculty: Science & Technology

(As per New Education Policy 2020)

Subject: Physics

Name of the Course: B.Sc. I(Sem. I &II)

(Syllabus to be implemented from June 2024)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Three Majors in First Year structure as per NEP-2020

4- Year Multidisciplinary UG Program with DSC as a Major

(4 -Year Bachelor of Science (Honors) / (Honors with Research)

B. Sc. I- Physics

Level	Sem.	Faculty	VSC/ SEC	OE/GE	AEC,IKS ,VEC	CC	Total Credits	Cumulative Credits
		Major						
		DSC						
4.5	I	DSC 1-1 (2+2)	SEC 1 (2)		IKS (2) L1-1(2) VEC 1(2) (Constitution of India)	CC 1(2)	22	44
		DSC 2-1(2+2)						
		DSC 3-1(2+2)						
	II	DSC 1-2 (2+2)	SEC 2(2)	OE 1 /GE1- (2)	L1-2 (2) VEC 2(2) (Environmental Studies)	CC 2 (2)	22	
		DSC 2-2(2+2)						
		DSC 3-2(2+2)						

SEM – I

S.No.	Course Type	Course Code	Paper Title	Credit
1.	DSC	DSC 1-1	Mechanics and Properties of Matter	2
2.	Practical based on DSC1-1	Practical Lab -I	Practical Lab – I	2
3.	DSC	DSC 2-1	Other than Physics	2+2
4.	DSC	DSC 3-1	Other than Physics	2+2
5.	SEC	SEC 1	Maintenance and Repairing of Household Electrical Appliances	2
6.	IKS	IKS	Indian Knowledge System	2
7.	AEC	L1-1	English	2
8.	VEC	VEC 1	Constitution of India	2
9.	CC1	CC1	Community Engagement & Services	2
			Total	22

SEM II				
10.	DSC	DSC 1-2	Electricity, Magnetism and Basic Electronics	2
11.	Practical based on DSC 1-2	Practical Lab - II	Practical Lab - II	2
12.	DSC	DSC 2-2	Other than Physics	2+2
13.	DSC	DSC 3-2	Other than Physics	2+2
14.	OE-I/GE-I	OE-I/GE-I	Solar Energy and Solar Technology	2
15.	SEC	SEC 2	Programming in python	2
16.	AEC	L1-2	English	2
17.	VEC	VEC 2	Environmental science	2
18.	CC2	CC2	Community Engagement & Services	2
			Total	22

Abbreviations:

OE: Generic/ Open Electives

VSEC: Vocational Skill and Skill Enhancement Courses

VSC: Vocational Skill Courses

SEC: Skill Enhancement Courses

AEC: Ability Enhancement Courses

OJT: On Job Training

FP: Field projects

CC: Co-curricular Courses

RP: Research Project

IKS: Indian Knowledge System

Semester I

DSC 1-1

Title of the paper: Mechanics and Properties of Matter

Credit: 02, Theory: 30 Periods

Course Objectives

- Learn about the rotational motion and Moment of Inertia of the body and evaluate Moment of Inertia of various bodies.
- Absorb knowledge about different types of pendulums and evaluate acceleration due to gravity.
- Gain knowledge about the elasticity of body and study the elastic properties of a the body.
- Acquire the knowledge of the mechanical properties of fluids and evaluate it.

Unit 1	Moment of Inertia	(5)
1.1	Review of Moment of Inertia	
1.2	Moment of Inertia of Circular disc	
1.3	Moment of Inertia of Rectangular lamina	
1.4	Moment of Inertia of Fly wheel	
1.5	Problems	
Unit 2	Pendulums and Oscillations	(5)
2.1	Introduction	
2.2	Theory of compound pendulum	
2.3	Bar pendulum.	
2.4	Kater's pendulum	
2.5	Bifilar pendulum (parallel suspensions of equal lengths)	
2.6	Torsional Pendulum	
2.7	Problems	
Unit 3	Elasticity	(7)
3.1	Review of Elasticity	
3.2	Poisson's ratio of rubber tube (Theory and experimental method)	
3.3	Equivalence of shear strain to compression and extension strains	

3.4	Determination of Y of rectangular thin bar loaded at the center
3.5	Rigidity of a wire by torsional oscillations
3.6	Problems
Unit 4	Surface Tension (7)
4.1	Review of Surface Tension
4.2	Angle of contact and wettability
4.3	Capillary rise method
4.4	Relation between excess pressure and surface tension
4.5	Excess pressure inside a liquid drop and soap bubble
4.6	Jaeger's method to determine Surface Tension
4.7	Factors affecting Surface Tension
4.8	Applications of Surface Tension
4.9	Problems
Unit 5	Viscosity (6)
5.1	Introduction
5.2	Newton's law of viscosity
5.3	Streamline and turbulent flow
5.4	Critical velocity and Reynolds number
5.5	Equation of continuity
5.6	Energy possessed by liquid
5.7	Poiseuille's equation,
5.8	Bernoulli's theorem and its applications to 1) Venturimeter 2) Automiser,
5.9	Factors affecting on viscosity
5.10	Problems
Course Outcomes	
On successful completion of this practical course student will be able to:	
•	Understood M. I. of the body and evaluate it.
•	To get knowledge about different types of the pendulums and evaluate acceleration due to gravity.
•	Gain knowledge about the elasticity of body and study the elastic properties of a body.
•	To gain the knowledge about the mechanical properties of fluids.

Reference books	
1.	Properties of matter- D.S. Mathur
2.	A Text book of properties of matter- N.S. Khare & S. Kumar
3.	Physics Vol.I –David & Robert Resnick
4.	University Physics-Mechanics of a particle- Anvar Kamal
5.	Mechanics Berkeley Physics course, V.1: Charles Kittel, et. Al. 2007, Tata McGraw Hill.
6.	Concepts of Physics: H.C. Varma, Bharati Bhavan Publishers

Semester I

Practical based on DSC1-1

Title of the paper: Physics Practical Lab I

Credit: 02, Practical: 60 Periods

Course Objectives

•	To develop practical skills in basic and conceptual Physics.
•	To gain practical knowledge by applying the experimental methods to correlate with the theory.
•	To prepare students to determine Moment of Inertia and acceleration due to gravity.
•	To develop students to learn measuring skills in practical.
•	To apply the analytical techniques and graphical analysis to the experimental data

List of Experiments

Sr. No.	Name of the Practical
1.	L. C. of various measuring instruments
2.	Bar pendulum
3.	Bifilar pendulum
4.	Torsional pendulum
5.	Moment of Inertia of disc by annular ring
6.	Surface Tension by liquid drop method
7.	Poisson's ratio
8.	Viscosity by Stoke's method
9.	Viscosity of water by Poiseuille's method
10.	Moment of Inertia of a Flywheel.

Course Outcomes

On successful completion of this practical course student will be able to:

•	Handle various instruments.
•	Correlate theoretical concepts with experiments.
•	Develop awareness of minimizing errors.
•	Develop basic skills of measurements
•	Gain knowledge about Surface Tension, Viscosity and Moment of Inertia
•	Understand the theoretical principles of basic Practical Physics.
Reference Books	
1.	Advanced Practical physics –Nelkon
2.	Practical physics - Rajopadhye and Purohit
3.	Practical Physics – P R Sasi Kumar

Semester I
Skill Enhancement Course (SEC 1) -Theory
Title of the paper: Maintenance and Repairing of Household Electrical Appliances
Credit: 01, Theory: 15 Periods

Learning Objectives	
•	Create awareness among students in understanding the working principle, maintenance & repairing of electric home appliances.
•	Ability to do maintenance of General Electric home appliances.
•	Encourage student for self-employment.
•	Ensure steady flow of skilled worker in different trades for the industries
Unit 1	Basic Electricity Principles (05)
1.1	Voltage, Current, Resistance, and Power
1.2	Ohm's law.
1.3	Series, parallel and series-parallel combinations.
1.4	AC and DC Electricity.
1.5	Symbols, specifications, types and applications: resistor, capacitor, inductor, fuse, switches, power supply.
Unit 2	Circuit Connections and measurements (05)
2.1	Introduction
2.2	Types of electrical connections
2.3	Wires and cables, earthing
2.4	Practical diagram of house wiring map.
2.5	Instruments to measure current, voltage, power in DC and AC circuits (use of ammeter, voltmeter, multimeter).
Unit 3	Home Appliances (05)
3.1	Testing and repairing: switch board, fuse, fan, mixer, iron, table lamp, induction coil, inverter & UPS, electric bell, torch. LED bulb.
Learning Outcomes	

After completion of the course, Student should be able to-	
•	Understand the working principle, maintenance and repairing of electric home appliances.
•	Able to do maintenance of General Electric home appliances.
•	Ensure student for Self-employment.
•	Enhance student's skill to do self-job.
Reference Books	
1.	Basic Electronics (Solid State)- B. L. Theraja, S. Chand Publication (Edition 2007)
2.	Electrician- K. Mehta, G. V. Ramana Murthy, Asian Publisher (Edition 2021)
3.	Electrical Measurements and Measuring Instruments- R. K. Rajput, S. Chand Publication, ISBN: 978-81-219-2963-9
4.	A Textbook of Electrical Technology- B. L. Theraja, Volume III, S. Chand Publication (Edition 2013).
5.	Electronic Measurements and Instrumentation- Dr. R. S. Sedha, S. Chand Publication

Skill Enhancement Course (SEC1) -Practical
Title of the paper: Maintenance and Repairing of Household Electrical Appliances
Credit: 01, Practical: 30 Periods

Learning Objectives	
●	To identify various electrical components.
●	Understand the measurement of electrical quantities by using Multimeter.
●	Ability to do maintenance of General Electric home appliances
Sr.No.	List of Experiments
1.	Identification of electrical components.
2.	Use of multimeter (testing of electronic components).
3.	Fuse checking and fault finding in electric circuits.
4.	Earthing preparation.
5.	Build and test switch board.
6.	Testing/fault finding in fans, mixer, iron, table lamps, induction coil.
7.	Testing/fault finding in UPS and inverter.
Learning Outcomes	
After completion of course students will-	
●	Handle various instruments.
●	Able to do maintenance of General Electric home appliances.
●	Ensure student for Self-employment.
●	Enhance student's skill to do self-job

Semester I

(CC1)

Title of the paper: Community Engagement & Services

Credit: 02, Theory: 30 Periods

NCC/NSS/Sports/Cultural/MOOCs/SWAYAM/YOGA/Health and Wellness

Semester-II

DSC 1-2

Title of the paper: Electricity, Magnetism and Basic Electronics

Credit: 02, Theory: 30 Periods

Learning Objectives

•	Understand the concept of Varying Current applying the charging and discharging of capacitor and time constant.
•	Understand the concept of AC circuits and different AC bridges.
•	Understand the concepts Magnetostatics and applying them to determine magnetic induction and also understand Ballistic Galvanometer theory and its constants.
•	Understand the rectifiers specially Bridge rectifier with filters and also different wave shaping circuits.
•	Understand BJT include its output characteristics under CE and CB mode with application of transistor amplifier.
Unit 1	Varying Current (6)
1.1	Introduction to Varying Current
1.2	Growth and decay of current in LR circuit
1.3	Time constant of the LR Circuit
1.4	Charging and discharging of capacitor through resistor
1.5	Time constant of the RC Circuit
1.6	Problems
Unit 2	A. C. Circuits (6)
2.1	Introduction
2.2	Reactance, Susceptance, Impedance, Admittance and Power factor
2.3	L-C-R series circuit
2.4	Series and parallel resonance circuits
2.5	Sharpness of resonance and quality factor in LCR Series resonance circuit
2.6	Owen's bridge
2.7	Problems
Unit 3	Ballistic Galvanometer (6)

3.1	Introduction
3.2	Ballistic Galvanometer: Construction, Theory and working of Ballistic Galvanometer, Damping in the BG, Constants of BG
3.3	Problems
Unit 4	Electronic Circuits (6)
4.1	Introduction
4.2	Bridge rectifier with π -filter
4.3	Clippers and Clampers
4.4	Zener diode and its application as a voltage regulator
4.5	Problems
Unit 5	Bi-Junction Transistor (BJT) (6)
5.1	Introduction
5.2	Construction and working of transistor
5.3	Input-output and transfer characteristics of CE & CB mode
5.4	Relation between α and β
5.5	Transistor as amplifier –CE mode
5.6	Problems
Course Outcomes	
After completion of course, students will	
•	Explain complex number with J-operator, LCR Circuits.
•	Understand magnetostatics and ballistic galvanometer.
•	Understand electromagnetic induction laws.
•	Explain various electronic components and devices.
•	Explain construction and working of transistor.
Reference books	
1.	Principles of electronics–V. K. Mehta
2.	Electronics principles-A. P. Malvino
3.	Basic electronics & linear circuits -Bhargav, Kulshrstha &Gupta
4.	Electricity and Magnetism–Khare &Shrivastav
5.	Foundations of electromagnetic theory – Reitz &Milford
6.	Electronic devices &circuits-Allen Mottershed

Semester II
Practical based on DSC1-2
Title of the paper: Practical Lab II
Credit: 02, Practical: 60 Periods

Course Objectives

•	To gain practical knowledge by applying the experimental methods to correlate with the theory.
•	To learn the usage of Multimeter for various measurements.
•	Apply the analytical techniques and graphical analysis to the experimental data.
•	To develop intellectual communication skills and discuss the basic principles of scientific concepts.

List of Experiments

Sr. No.	Name of the Practical
1.	Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2.	Color code of resistors and measurement of capacitors; identification of their values.
3.	Frequency of AC mains by magnetic wire
4.	Frequency of AC mains by non-magnetic wire
5.	Bridge rectifier and π filter
6.	Transistor characteristics in Common Emitter mode: determination of β
7.	Transistor characteristics in Common Base mode: determination of α
8.	Photo cell (verification of inverse square law)
9.	Zener diode as a voltage regulator (Knee Characteristic curve I – V and comments).
10.	Zener diode as a voltage regulator (Plot voltage resistance graph and comments).

Course Outcomes

On successful completion of this practical course student will be able to:

•	Understand the use of Multimeter.
•	Understand the principles of and applications of basic physical properties.
•	Understand concepts learnt in Basic electronics and devices also think beyond curriculum in the field of physics.
•	Understand the Transistor characteristics.
•	Plan to conduct simple experiments and give oral and presentation of the results

References Books

1.	B.Sc. Practical Physics C L Arora S. Chand & Co. Ltd., New Delhi (2018)
2.	Practical Physics (With Viva-Voce) Dr. S L Gupta and V Kumar Pragati Prakashan, Meerut (2014)
3.	Practical Physics (4th Edition) G. L. Squires Cambridge University Press (2014)
4.	B.Sc. Practical Physics Harnam Singh and Dr. P.S. Hemne S. Chand & Co. Ltd., New Delhi (2000)

Semester II

(OE-I/GE-I)

Title of the paper: Solar Energy and Solar Technology

Credit: 02, Theory: 30 Periods

Course Objectives:

●	To develop a comprehensive understanding of various energy sources, their characteristics, and their roles in the global and Indian energy landscapes.
●	To cover the principles, functioning and applications of photovoltaic cells and solar PV systems.
●	To analyze the advantages and disadvantages of solar PV systems.
●	To familiarize students with the practical applications of solar energy in areas like heating, electricity generation and cooking.
Unit 1	Introduction to Sources of energy (5)
1.1	Introduction
1.2	Common forms of energy
1.3	Energy chain
1.4	Classification of energy sources as primary and secondary sources
1.5	Renewable and non-renewable sources
Unit 2	Conventional and non-conventional energy sources (6)
2.1	Conventional energy sources
2.2	Non-conventional energy sources
2.3	Wind energy
2.4	Biomass energy
Unit 3	Photovoltaic Cell (7)
3.1	Introduction
3.2	Photovoltaic effect, generations of photovoltaic cell
3.3	Working principle of PN junction solar cell
3.4	Characteristics of solar cell, Efficiency and fill factor of solar cell

3.5	Applications of solar cell
Unit 4	Solar PV system (7)
4.1	Solar PV module and PV arrays
4.2	Power of solar panel, array and module
4.3	Solar PV systems
4.4	Advantages and disadvantages of solar PV systems
Unit 5	Applications of Solar Energy (5)
5.1	Solar water heater (Passive and Active)
5.2	Solar furnace
5.3	Solar dryer
5.4	Solar cooker
Course Outcomes	
On successful completion of this course:	
•	Students will be able to classify and differentiate between various forms of energy and energy sources.
•	Students will assess the environmental and ecological impacts of energy use, specifically global warming.
•	Students will explain the principles and functioning of photovoltaic cells, understand their efficiency, and identify their practical applications.
•	Students will analyze the advantages and disadvantages of grid-connected, off-grid, and hybrid solar PV systems.
•	Students will recognize and describe diverse applications of solar energy technologies, including solar water heating, furnaces, dryers, distillation, and cookers.
Reference books	
1.	Non-conventional Energy Resources; Ashish Chandra, Taru Chandra (2 nd Edition); Khanna Publishers
2.	Non-conventional Energy Sources; G. D. Rai Khanna Publishers (6 th Edition); Khanna Publishers
3.	Renewable Energy Sources and Emerging Technologies; D.P. Kothari, K.C. Singal, Rakesh Ranjan (3 rd Edition); PHI Publishers
4.	Energy Technology; S. Rao, B. B. Parulekar; Khanna Publishers
5.	Renewable Energy Engineering; B. L. Singhal; Tech Knowledge

	Publications
6.	Solar Energy Utilization; G. D. Rai; Khanna Publishers
7.	Solar Photovoltaics Fundamentals, Technologies and Applications; Chetan Singh Solanki (3 rd Edition); PHI Publishers.

Semester II

Skill Enhancement Course (SEC2)

Title of the paper: Programming in python

Credit: 02, Theory: 30 Periods

Learning Objectives

•	Computer programming/coding has arguably become one of the most important skills a researcher needs in science today.
•	Advances in tools and technology, researchers/post-graduate are now collecting and working with larger datasets.
•	These datasets require computing coding and machine learning steps for carrying out efficiently an unbiased and large-scale analysis.
•	To decide which computer language you are going to learn. A few of the bigger and recommended languages for science include Python.
•	Python being both open sources having so many packages in quilts is commonly preferred in the present scenario.
Unit 1	Introduction to Python (5)
1.1	Introduction
1.2	Using Code Examples How to Run Python Code
1.3	A Quick Tour of Python Language Syntax
Unit 2	Basic Semantics (7)
2.1	Basic Python Semantics: Variables and Objects
2.2	Basic Python Semantics: Operators
2.3	Built-In Types: Simple Values
2.4	Built-In Data Structures
2.5	Control Flow
Unit 3	Exceptions (5)

3.1	Defining and Using Functions Errors and Exceptions Iterators
3.2	List Comprehensions
3.3	Generators
Unit 4	Packages, String and Tools (5)
4.1	Modules and Packages
4.2	String Manipulation and Regular Expressions
4.3	A Preview of Data Science Tools.
Unit 5	Basic GUI programming (8)
5.1	GUI program in python
5.2	Working with containers- frame and Canvas
5.3	Widgets- label, button, check button, entry, listbox, message, radio button, text, spinbox, scrollbar
Learning Outcomes	
After completion of the course, Student should be able to-	
•	Understand the basic syntax of python
•	Use of importing library in python
•	Plotting techniques using the various python library
•	Python library for matrices operation
•	Learn to use the various routines in scientific projects consisting of various parameter optimizations techniques
Reference Books	
1.	A Whirl Wind Tour of Python, by Jake Vande Plas.
2.	Python program by Dr Manisha Bharambe (Online available)
3.	Core python program by Dr. R Nageshwar Rao

Semester II

(CC2)

**Title of the paper: Community Engagement &
Services**

Credit: 02, Theory: 30 Periods

NCC/NSS/Sports/Cultural/MOOCs/SWAYAM/YOGA/Health and Wellness

UA

Punyashlok Ahilyadevi Holkar Solapur University, Solapur.

Faculty of Science & Technology.

Nature of Question Paper for CBCS Pattern

B. Sc. / B.C.A (Part- I) w.e.f. AY 2024-25

Time:

Total Marks: 30

Instructions

- 1) All Questions are compulsory.
- 2) Figure to right indicate full marks.

Q.1	Choose correct alternative. (MCQ)	6 Marks
1)	a) b) c) d)	
2)		
3)		
4)		
5)		
6)		
Q.2.	Answer the following. (Any three)	6 Marks
A)		
B)		
C)		
D)		
E)		
Q.3.	Answer the following (Any two).	6 Marks
A)		
B)		
C		
Q.4.	Answer the following (Any two).	6 Marks
	Marks	
A)		
B)		
C)		

Q.5.	Answer the following (Any one). Marks	6 Marks
A)		
B)		

CA

Punyashlok Ahilyadevi Holkar Solapur University, Solapur.

Faculty of Science & Technology.

Nature of Question Paper for CBCS Pattern

B. Sc. / B.C.A. (Part- I) w.e.f. AY 2024-25

Time:

Total Marks: 20

- **Internal Evaluation System for 20 Marks**

- Choose any two of the following
- Home Assignment / Unit Test / Tutorial / Seminar

- **Pattern of Examination:**

- External Evaluation + Internal Evaluation
- 30 Marks + 20 Marks = 50 Marks

- **Passing Criteria:**

- Written Exam – 12 out of 30
 - Continuous Assessment (CA) – 08 out of 20
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