Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022
'B++'Grade (CGPA2.96)

Name of the Faculty: Science &Technology

(As per New Education Policy 2020)

Syllabus: Physics

NAAC Accredited-2022
'B++' Grade (CGPA-2.96)

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

(Syllabus to be implemented from June 2025)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
NEP 2020
Compliant Curriculum
B. Sc. (Physics)
Program Preamble

The Bachelor of Science B. Sc. in Physics is a comprehensive and dynamic program designed to provide students with a deep understanding of the fundamental principles of physics, along with the practical skills required to apply this knowledge in various scientific and technological contexts. Aligned with the vision of the National Education Policy NEP 2020, the program offers a flexible, multidisciplinary, and learner-centric curriculum that encourages critical thinking, innovation, and holistic development. The B.Sc. Physics program spans four years, with each year offering a progressively advanced and skilling curriculum designed to build a strong foundation in physics while allowing for specialization and interdisciplinary learning. The curriculum is structured around several key components:

1. **Major Courses:** These core courses are the backbone of the program, providing in-depth knowledge and understanding of essential physics concepts, theories, and methodologies. Students will engage with topics ranging from classical mechanics, electromagnetism, and thermodynamics to quantum physics, relativity, and modern physics, ensuring a robust and comprehensive education in the discipline.

2. **Minor Courses:** Students have the opportunity to choose minor courses from related or distinct disciplines, promoting an interdisciplinary approach to learning. This flexibility allows students to complement their physics education with insights from fields such as mathematics, computer science, or engineering, enhancing their versatility and broadening their career prospects.

3. **Open Electives/General Electives:** The program encourages intellectual exploration beyond the core discipline by offering a wide range of elective courses. These electives enable students to pursue their interests in diverse subjects, fostering creativity, critical thinking, and a well-rounded educational experience.

4. **Vocational and Skill Enhancement Courses:** Practical skills and technical proficiency are integral to the program, with vocational and skill enhancement courses providing hands-on experience in areas such as computational physics, electronics, and instrumentation. These courses are designed to prepare students for immediate employment and equip them with the tools necessary for career advancement in various scientific and technological fields.
5. **Ability Enhancement Courses (AEC), Indian Knowledge System (IKS), and Value Education Courses (VEC):** In alignment with NEP 2020, the program integrates courses that emphasize the Indian Knowledge System, ethical values, and life skills. These courses foster a deep appreciation for India's rich cultural heritage, while also developing essential communication and ethical decision-making skills that are vital for personal and professional growth.
6. **Field Projects/Internships/Apprenticeships/Community Engagement Projects/On-Job Training:** To bridge the gap between theoretical knowledge and real-world applications, the program includes opportunities for field projects, internships, apprenticeships, and community engagement. These experiences provide students with practical insights, problem-solving abilities, and exposure to professional environments, enhancing their readiness for careers in physics and related fields.
7. **Research Methodology and Research Projects:** Research is a critical component of the B.Sc. Physics program, with students acquiring skills in research methodology, data collection, analysis, and scientific inquiry. Students are engaged in independent research projects and encouraged to develop innovative solutions to complex scientific problems, preparing them for advanced studies and research-oriented careers.

Multiple Entry and Multiple Exit Options

In accordance with the NEP 2020, the BSc Physics program incorporates a Multiple Entry and Multiple Exit framework, offering students the flexibility to enter or exit the program at various stages. This approach ensures that students can tailor their educational journey according to their personal and professional goals, with options to earn certificates, diplomas, or degrees

- **Year 1:** Upon completion of the first year, students may exit with a Certificate in Physics.
- **Year 2:** After two years, students may choose to exit with a Diploma in Physics.
- **Year 3:** Completion of the third year qualifies students for a B. Sc. Degree in Physics.
- **Year 4:** The fourth year offers an advanced curriculum with a focus on research,

allowing students to graduate with an Honors B.Sc. Degree in Physics.

Eligibility for B.Sc. Physics:

i. The candidate passing the higher secondary examination conducted by the Maharashtra State Board of Higher Secondary Education and CBSE Board, with science stream, MCVC with science subject, D. Pharm., Diploma Engineering, Agriculture Diploma, Diary Diploma shall be allowed to enter upon the B.Sc. I Course.

OR

ii. An examination of any other statutory University or an Examination Body recognized as equivalent for there. Repeater Students will be allowed to take fresh admission to the same class with same subjects or different.

Punyashlok Ahilyadevi Holkar Solapur University,
Solapur Faculty of Science & Technology
NEP 2020 Compliant Curriculum
B. Sc. (Physics)
Program Outcomes (PO)

Students graduating from the Bachelor of Science in Physics program will be able to:

Major Courses:

PO1: Demonstrate in-depth knowledge and understanding of core concepts, theories,

PO2: Apply disciplinary knowledge to solve complex problems, analyze data, and make informed decisions in professional and research contexts.

Minor Courses:

PO3: Acquire complementary knowledge and skills from a related or distinct discipline, enhancing interdisciplinary understanding and versatility.

Open Electives/General Electives:

PO4: Explore diverse subjects beyond the core discipline, fostering a broad-based education and cultivating critical thinking and creativity.

Vocational and Skill Enhancement Courses:

PO5: Gain hands-on experience and technical proficiency in specific vocational areas, preparing for immediate career opportunities

Ability Enhancement Courses (AEC), Indian Knowledge System (IKS), and Value Education Courses (VEC):

PO6: Understand and appreciate the rich heritage of the Indian Knowledge System, integrating traditional wisdom with modern education.

PO7: Develop ability enhancement skills like communication and life skills along with ethical values, social responsibility, and a strong sense of citizenship, contributing positively to society.

Field Projects/Internship/Apprenticeship/Community Engagement Projects/ On Job Training/ Internship/Apprenticeship:

PO8: Apply theoretical knowledge to real-world situations through field projects, internships, community engagement and On Job Training for gaining practical experience and problem-solving skills.

Research Methodology and Research Project:

PO9: Acquire research skills, including data collection, analysis, and interpretation, fostering a scientific approach to problem-solving to develop independent research projects handling capabilities.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology

NEP 2020 Compliant Curriculum

B. Sc. (Physics)

Program Specific Outcomes (PSOs)

Students graduating from B. Sc. (Physics) will be able to:

PSO1: Mastery of Core Physics Concepts: demonstrate understanding of fundamental physics principles, including classical mechanics, quantum mechanics, electromagnetism, thermodynamics, and statistical physics, allowing them to analyze and solve complex physical problems.

PSO2: Experimental and Analytical Skills: demonstrate proficiency in designing and conducting experiments, using modern laboratory equipment, and employing analytical techniques to interpret and present scientific data effectively.

PSO3: Application of Physics in Technology and Research: apply their physics knowledge to develop innovative solutions in technology, engineering, and applied sciences, contributing to research and development in both academic and industrial settings.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology

Three Majors in First Year structure as per NEP-2020 Approved in For AC Meeting on 18/04/2024

4- Year Multidisciplinary UG Program with DSC as a Major (4 -Year Bachelor of Science (Honors)/(Honors with Research)

Level/ Difficulty	Sem	Faculty			Generic/ Open Elective	Vocational and Skill Enhancement Courses (SEC/VSC)	Ability EnhancementCourse (AEC), IKS, VEC	Field Project/ RP/CC/Internship/Apprenticeship/ Community Engagement & Services	Credits	Cumulative Credits
		Major		Minor						
		DSC	DSE		GE/ OE					
4.5 100-200	I	DSC1-1 (2+2)#	--		GE1/ OE1(2)	SEC1 (2)	L1-1(2) IKS (2) VEC1(2) (Indian Constitution)	--	22	**44 UG Certificate (44)**
		DSC2-1 (2+2)#	--							
		DSC3-1 (2+2)#	--							
	II	DSC1-2 (2+2)#	--		GE2/ OE2(2)	SEC 2 (2)	L1-2(2) VEC2(2) (Environmental Studies)	CC1 (2)	22	
		DSC2-2 (2+2)#	--							
		DSC3-2 (2+2)#	--							
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor										
5.0/200	III	DSC1-3 (2+1)	---	DSC2-3 (2+1)	GE3 / OE3(2)	VSC1 (2) (DSC1)	L2-1 (2)	CC2 (2)	**22**	**44 UG**

		DSC1-4 (2+1)	---	DSC-2-4 (2+1)		VSC2(2) (DSC2)					**Diploma (88)**
	IV	DSC1-5 (2+1)	---	DSC2-5 (2+1)	GE4/ OE4 (2)	VSC3 (2) (DSC1)		L2 -2(2)	FP1/CEP1(2)	22	
		DSC1-6 (2+1)	--	DSC2-6 (2+1)		VSC4(2) (DSC2)					
Exit option: Award of UG Diploma in Major with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major											
5.5/300	V	DSC1-7 (3+2) DSC1-8 (3+2) DSC1-9 (3+2)	DSE1-1 (2+1) or DSE1-2 (2+1)	----	----	VSC3 (2) (Hands on Training related to DSE)	IKS 2 (2) (related to major subject)	--		22	**44 UG degree (132)**
	VI	DSC1-10 (3+2) DSC1-11 (3+2) DSC1-12 (3+2)	DSE1-3 (2+1) or DSE1-4 (2+1)	----	---	VSC4 (2) (Hands on Training related to DSE)		FP2/CEP2/OJT1 (2)		22	
	Total Credits 3 Yrs	**66-8#**	**6**	**12 +8# 20**	**8**	**16**	**16**	**8**		**132**	
Exit option: Award of UG degree in Major with 132 Credits OR Continue with Major											
6.0/400	VII	DSC1-13 (4+2) DSC1-14 (4+2)	DSE1-5 (4+2)	Research Methodology (4)	----	----	----	---		22	**44 UG Honours Degree in Main faculty (176)**
	VIII	DSC1-15 (4+2) DSC1-16 (4+2)	DSE1-6 (4+2)		----	-----	----	OJT/In-house Project/ Internship/ Apprenticeship (4)		22	
	Total 4 Yrs	**90-8#**	**18**	**16+8#**	**8**	**16**	**16**	**12**		**176**	
Award of Bachelor of Science Honors., (B.Sc. Honors.) degree with Major and Minor (176 credits)											

OR										
6.0/400	VII	DSC1-13 (4) DSC1-14 (4)	DSE1-5 (4)	Research Methodology (4)	------	----	----	Research Project (6)	22	**44 UG Honours with research Degree in Main faculty (176)**
	VIII	DSC1-15 (4+2) DSC1-16 (4+2)	DSE1-6 (4)		----	-----	----	Research Project (6)	22	
	Total	**86-8#**	**14**	**16+8#**	**8**	**16**	**16**	**20**	**176**	
	4 Yrs									
#Out of the three major courses in the first year, one major (comprising 4 credits for the 1st semester and 4 credits for the 2nd semester) will transition into a minor starting from the second year. Consequently, 8 credits will be reallocated from the major course credit count and added to the minor credit count, thereby meeting the requisite credit criteria for the minor as stipulated in the guidelines.										

Level/ Difficulty	Sem.	Faculty		GE/ OE	Vocational and Skill Enhancement Courses (SEC/VSC)	Name of the paper	Credits	Marks
		Major	Minor					
5.0/200	III	DSC1-3	-	-	-	General Physics	2	50
		DSC1-4	-		-	Electronic Devices and Applications	2	50
		Practical's related to DSC 1-3 and DSC 1-4	-			Physics Practical Lab. III	2	50
			DSC2-3			Thermal Physics and Sound	2	50
			DSC-2-4			Python programming	2	50
			Practical's related to DSC 2-3 and DSC 2-4			Physics Practical Lab. IV	2	50
				GE3 / OE3		Need of electricity in daily life	2	50
					VSC1 (DSC1)	Hands on Training related to DSC 1	2	50
					VSC2 (DSC2)	Hands on Training related to DSC 2	2	50
	IV	DSC1-5				Optics	2	50
		DSC1-6				Modern Physics	2	50
		Practical's related to DSC 1-5 and DSC 1-6				Physics Practical Lab. V	2	50
			DSC2-5			Ray and wave optics	2	50
			DSC-2-6			Physics of Scientific Instruments	2	50
			Practical's related to DSC 2-5 and DSC 2-6			Physics Practical Lab. VI	2	50

				GE4/ OE4		Physics in Everyday Life	2	50
					VSC3 (DSC1)	Hands on Training related to DSC 1	2	50
					VSC4 (DSC2)	Hands on Training related to DSC 2	2	50
		FP1					2	50

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

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B. Sc. II (Physics) Semester-III** **Vertical: DSC 1-3** **Course Code:** **Course Name: General Physics**

• **Teaching Scheme** Total Marks:50 Credit:02, Theory: 30 Periods Lectures:02 hours/week	• **Examination Scheme** Total Marks:50 UA:30 Marks, CA:20 Marks

Course Preamble

General Physics is one of the core courses in the B. Sc. (Physics) curriculum and one of the traditional courses, dating back from the last many centuries. This course provides an in-depth understanding of the fundamental laws of Mechanics and their application to real-world systems. Students will study the Vectors, Precessional Motion, Elasticity and Viscosity. By combining theoretical knowledge with numerical treatment, the course aims to develop practical skills in analyzing and optimizing General Physics for applications.

Course Objectives

•	Learn about the Vectors and Scalar and vector triple product and evaluate.
•	Absorb knowledge about Precessional Motion and Gyrostatic pendulum evaluate acceleration due to gravity.
•	Gain knowledge about the elasticity of the body and study the elastic properties of the body.
•	Acquire knowledge of the mechanical properties of fluids and evaluate it.
Unit 1	**Vectors** **Periods: 7, Weightage: 11 Marks (UA)**
1.1	Scalar and vector triple product
1.2	Scalar and vector fields
1.3	Del operator
1.4	Divergence of a vector
1.5	Problems
Unit 2	**Precessional Motion** **Periods: 9, Weightage: 13 Marks (UA)**
2.1	Precession
2.2	Gyroscope

2.3	Nutation
2.4	Lanchester's rule
2.5	Gyrostatic pendulum
2.6	Gyroscopic applications in brief
2.7	Problems
Unit 3	**Elasticity** **Periods: 7, Weightage: 11 Marks (UA)**
3.1	Bending of a beam
3.2	Bending moment
3.3	Centrally loaded beam
3.4	Y and η by Searle's method
3.5	Problems
Unit 4	**Viscosity** **Periods: 7, Weightage: 11Marks (UA)**
4.1	Introduction
4.2	Viscosity of liquid by rotating cylinder method
4.3	Searle's viscometer
4.4	Ostwald's viscometer
4.5	Problems
Course Outcomes	
On successful completion of this course student will be able to:	
□	Understood Vectors and Scalar and evaluation.
□	To get knowledge of Precessional motion and evaluate acceleration due to gravity.
□	Gain knowledge of elasticity of the body an study the elastic properties of a body.
□	To gain the knowledge about the mechanical properties of fluids.
Reference books	
1.	Elements of matter D.S. Mathur
2.	Physics for degree students C. L. Arora, P. S. Hemne.
3.	Text book of properties of matter N. S. Khare, S. K. Kumar
4.	Mathematical Physics Rajput & Gupta
5.	Engineering Physics Part I Selladurai PHI Learning Pvt. Ltd, New Delhi

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B. Sc. II (Physics) Semester-III** **Vertical: DSC1-4** **Course Code:** **Course Name: Electronic Devices and Applications**
• **Teaching Scheme** Credit:02, Theory:30 Periods Theory:02 hours/week	• **Examination Scheme** Total Marks:50 UA:30 Marks, CA:20 Marks

Course Preamble

Electronic Devices and Applications is one of the core courses in the B. Sc. (Physics) curriculum and one of the traditional courses, dating back from the last many centuries. This course provides an in- depth understanding of the semiconductor physics and their applications to real-world systems. Students will study the experiments of Transistor as an amplifier, oscillator, unipolar devices such as UJT and FET and some electronic instruments. By combining theoretical knowledge with practical treatment, the course aims to develop practical skills in analyzing and optimizing the properties of different applications.

Course Objectives

•	The objective of this course is to introduce students to the basic knowledge of semiconductor devices and their practical applications.
•	This course mainly introduces basic electronic devices and its applications namely Transistor's amplifiers, Oscillators, Cathode Ray Oscilloscope, Field effect transistors (FETs) and Unijunction transistor (UJT).
Unit 1	**Transistor amplifier** **Periods: 9, Weightage: 13 Marks (UA)**
1.1	Transistor biasing: voltage divider bias
1.2	Two stage R-C coupled transistor amplifier
1.3	Frequency response curve of an amplifier
1.4	Feedback
1.5	Effect of positive and negative feedback on the frequency response curve
1.6	Differential amplifier
1.7	Modes of operation
1.8	Common mode and differential mode signals
1.9	Comparison between normal amplifier and differential amplifier

1.10	Problems
Unit 2	**Oscillator** **Periods: 9, Weightage: 13 Marks (UA)**
2.1	Types of waveforms
2.2	Oscillations from tank circuit
2.3	Barkhausen criterion for sustained oscillations
2.4	Concept of AF and RF oscillator
2.5	Phase shift oscillator
2.6	Colpitt's oscillator
2.7	Hartley oscillator
2.8	Crystal oscillator
2.9	Problems
Unit 3	**Unipolar Device** **Periods: 6, Weightage: 9 Marks (UA)**
3.1	FET: Construction, operation, parameters and characteristics
3.2	Application of FET as VVR
3.3	UJT: Construction, operation and characteristics
3.4	UJT as voltage sweep generator
3.5	Problems
Unit 4	**Electronic Instruments** **Periods: 6, Weightage: 11 Marks (UA)**
4.1	Principle, construction and working of CRT
4.2	Block diagram of CRO
4.3	Uses of CRO
4.4	Digital multimeter (DMM) and its applications
4.5	Regulated power supply – 1. Transistor series voltage regulator 2. IC voltage regulator
4.6	Problems

Course Outcomes

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

- Understand the basic theory and operation of semiconductor devices used for its circuit applications.
- Understand the basic circuit concepts and responses.
- Get hands-on on various electronic circuits and instruments.
- Get expose to electronics technologies.

Reference Books	
1.	Principles of electronics by V.K. Mehta.
2.	Electronics principles by Malvino.
3.	Op-Amps and linear integrated circuits by Ramakant Gayakwad.
4.	A Text book of Electrical Technology Vol. IV by B.L. Theraja, A.K. Theraja
5.	An introduction Electronic Devices and Circuits by Allen Mottershed
6.	Basic Electronics & Linear Circuits by N.N. Bhargava, D.C. Kulshreshta, S.C. Gupta.
7.	Digital Principles and Applications by Malvino and Leach.
8.	Electronic Devices and Circuits by Jacob Milman &Chrstes S Halkias.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. II (Physics) Semester-III

Vertical: DSC 2-3

Course Code:

Course Name: Thermal Physics and Sound

• **Teaching Scheme** Credit:02, Theory:30 Periods Theory:02 hours/week	• **Examination Scheme** Total Marks:50 UA:30 Marks, CA:20Marks

	Learning Objectives	
•	To apply scientific and technical knowledge and skills of thermal physics and sound to other areas of a study.	
•	To realize basic concepts, principles, laws and the theories related to various scientific phenomena.	
•	To apply theories and solve problems faced in real life.	
Unit 1	**Basics of Thermodynamics**	**Periods: 8, Weightage: 12 Marks (UA)**
1.1	Laws of thermodynamics	
1.2	Reversible and Irreversible processes	
1.3	Isothermal and adiabatic process	
1.4	Adiabatic relations	
1.5	Work done during isothermal and adiabatic processes	
1.6	Problems	
Unit 2	**Heat**	**Periods: 7, Weightage: 11 Marks (UA)**
2.1	Entropy	
2.2	Change in entropy	
2.3	Physical concept and physical significance of entropy	
2.4	T – S diagram	
2.5	Entropy of a perfect gas	
2.6	Entropy of a steam	
Unit 3	**Sound**	**Periods: 7, Weightage: 11 Marks (UA)**
3.1	Transducers	
3.2	Pressure microphone	
3.3	Moving coil loudspeaker	

3.4	Intensity and loudness of sound
3.5	Decibels
Unit 4	**Acoustics of buildings** **Periods: 8, Weightage: 12 Marks (UA)**
4.1	Acoustics and its affecting factors
4.2	Reverberation time and its optimum value
4.3	Requirements of good Acoustics
4.4	Sabine's formula for reverberation time
4.5	Problems
	Learning Outcomes
On successful completion of this course student will be able to	
•	Understand thermodynamics
•	Apply the laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process
•	Understand the concept of Transducers, microphone & loudspeaker
•	Illustrate concept of acoustics and its applications.
Reference Books	
•	Treatise on Heat , Saha & Shrivastav
•	Kinetic Theory of Gases, V. N. Kelkar
•	Heat and Thermodynamics, Brijlal & Subrahmanyam
•	Text book of Sound, Brijlal and Subramanyam
•	Sound, Khanna and Bedi
•	Sound, Wood A. B

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B. Sc. II (Physics) Semester-III** **Vertical: DSC 2-4** **Course Code:** **Course Name: Python programming**

• **Teaching Scheme** Credit:02, Theory:30Periods Theory:02 hours/week	• **Examination Scheme** Total Marks:50 UA:30Marks, CA:20 Marks

Course Preamble

This course aims to introduce our B. Sc. II students to the basics of computer programming. As a starter course, we try to introduce students to an easily accessible common platform where open-source solutions are used. As OS, we choose python for its wide applications in academia (particularly where scientific computation is concerned). For the language, we choose python as it is one of the most preferred languages for programming (in academia and otherwise). For plotting, we use Gnu plot as an easily accessible yet powerful open-source solution.

Course Objectives

•	The objective of this course is to introduce students the knowledge of computer programming.
•	This course mainly introduces Python Programming.
Unit 1	**Introduction to Python Programming Periods: 9, Weightage: 13 Marks (UA)**
1.1	Features/characteristic of Python
1.2	Basic syntax
1.3	Writing and executing simple program
1.4	Basic Data Types
1.5	Declaring variables
1.6	Performing assignments, arithmetic operations
1.7	Simple input-output
1.8	Precedence of operators
1.9	Type conversion
1.10	Conditional Statements: if, if-else, nested if- else
1.11	Looping: for, while, nested loops
1.12	Terminating loops, skipping specific conditions

Unit 2	**String, Collection List and Tuples** **Periods: 7, Weightage: 11 Marks (UA)**
2.1	Declaring strings • String Manipulation using string functions • Introduction to Collection lists
2.2	Introduction to Collection list • Manipulating Collections Lists
2.3	Tuples- • Introduction to Tuples • Manipulating Tuples
Unit 3	**Dictionaries , Functions and Modules** **Periods: 7, Weightage: 11 Marks (UA)**
3.1	Concept of dictionary
3.2	Techniques to create, update & delete dictionary items
3.3	Functions • Defining a function • Calling a function • Advantages of functions • Types of functions • Function parameters • Formal parameters • Actual parameters • Anonymous functions • Global and Local variables
Unit 4	**Modules** **Periods: 7, Weightage: 11 Marks (UA)** • Importing module • Creating & exploring modules Math module, Random module, Time module
Course Outcomes	
On successful completion of this course student will be able to:	

•	Understand the basic theory and operation of Python Programming.
•	Understand the basic of String, Collection List and Tuples .
•	Understand the Dictionaries, Functions and Modules. .
References Books	
1.	Introduction to Computer Science using Python- Charles Dierbach
2.	Beginning Python: Using Python 2.6 and Python 3- James Payne
3.	Practical Programming: An Introduction to Computer Science Using Python 3- Paul Gries, Jennifer Campbell, Jason Montojo
4.	Programming Languages – Principles and Paradigms-Adesh Pandey
5.	My SQL for Python: Database Access Made Easy- A.Lukaszewski
6.	Core Python Programming: Dr .Nangeswara Rao

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B. Sc. II(Physics) Semester-III** **Vertical: GE3/OE3** **Course Code:** **Course Name: Need of electricity in daily life**

• **Teaching Scheme** Credit:02, Theory:30 Periods Lectures:02 hours/week	• **Examination Scheme** Total Marks: 50 UA:30 Marks, CA:20 Marks

Course Objectives

•	The course aims to introduce students to the key concepts and types/sources of generation of electricity and also to identify ways to reduce energy consumption and cost through electricity audit.
•	To identify ways to reduce energy consumption.
•	To identify ways to reduce energy cost through electricity audit.
Unit 1	**Electric energy** **Periods: 7, Weightage:11 Marks (UA)**
1.1	What is Electricity?
1.2	Need of electricity in daily life
1.3	Different source of electricity- conventional and non-conventional
1.4	Advantages and Disadvantages of electric energy
Unit 2	**Electricity generation** **Periods: 8, Weightage:12 Marks (UA)**
2.1	Methods to produce electricity: General aspects of electricity generation and transmission
2.2	Types of electricity production: (Coal, Solar, Wind, Natural Gas and Nuclear)
2.3	Uses and misuse of electricity
2.4	Advantages and disadvantages
Unit 3	**Electrical energy conservation** **Periods: 8, Weightage: 12 Marks (UA)**
3.1	Methods of electricity conservation: Energy conservation, Electric energy transformation to another energy.
3.2	Conservation electric energy in daily life
3.3	Saving electricity and its challenges
3.4	Benefits of electrical energy conservation
Unit 4	**Electricity Auditing** **Periods: 7, Weightage:11 Marks (UA)**
4.1	Need of energy audit

4.2	Types of energy audit, commercial and residential
4.3	Energy audit instruments – Procedure and techniques
Course Outcomes	
On successful completion of this course student will be able to	
•	Students will be able to understand the sources of electricity
•	Students will be able to explain the production of electricity.
•	Students will be able to understand ways to reduce energy consumption and operating cost.
•	Students will be able to understand the basic concepts of electricity auditing and its management.
Reference books	
1.	Basic electrical Engineering by V. K. Mehta and Rohit Mehta, S. Chand 2008
2.	Generation Electrical energy by B. R. Gupta 7th edition S, Chand 2017
3.	Transmission and distribution of electric power by J. B. Gupta, Katson Books, 2013
4.	Energy auditing in electrical utilities by Shankar Rajiv, Viva books 2010

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. II (Physics) Semester-III

Vertical: Practical based on DSC 1-3 and DSC 1-4

Course Code:

Course Name: Physics Practical Lab. III

• **Teaching Scheme** Credit: 02, Practical: 60 Periods Practical :04 hours/week	• **Examination Scheme** Total Marks:50 UA:30 Marks, CA:20 Marks

Learning Objectives

•	To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
•	To learn measuring skills in practical.
•	To perform calculations to obtain the experimental results.
•	To test whether the experimental results hold good with theoretical results.

Sr. No.	**List of Experiments**
1.	Young's Modulus (Y) by bending of the centrally loaded beam
2.	Y or η of the material of wire by Searle's method
3.	Young's modulus (Y) by Vibration of a bar
4.	Kater's Pendulum
5.	Surface tension by Quinke's method
6.	Viscosity of liquid by Searle's method
7.	Surface Tension of liquid by capillary rise method
8.	Transistor series voltage regulator
9.	Voltage divider bias
10.	Use of C.R.O. for measurement of unknown AC voltage, DC voltage and frequency
11.	Characteristics of FET
12.	Colpitt's Oscillator
13.	Phase shift Oscillator
14.	Two Stage RC Coupled Amplifier

15.	UJT as voltage sweep generator.
Course Outcomes	
On successful completion of this course student will be able to	
•	Understand the use of different instruments.
•	Understand the principles of and applications of basic physical properties.
•	Understand concepts learnt in General physics and Electronic devices also think beyond curriculum in the field of physics.
•	Plan to conduct simple experiments and give oral and presentation of the results.
Reference 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).

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur** **B. Sc. II (Physics) Semester-III** **Vertical: Practical based on DSC 2-3 and DSC 2-4** **Course Code:** **Course Name: Physics Practical Lab. IV**

• **Teaching Scheme** Credit: 02, Practical: 60 Periods Practical: 04 hours/week	• **Examination Scheme** Total Marks:50 UA:30 Marks, CA:20Marks

Learning Objectives

•	To gain practical knowledge by applying the experimental methods to correlate with the theory.
•	To acquire measuring skills in practical.
•	Python programming encompass a range of skills and knowledge that students or learners are expected to acquire upon completion of a Python programming course or program. This includes variables, data types, operators, control flow statements (like loops and conditional statements), and functions.
•	Develop problem-solving skills: Applying programming logic to analyze problems and develop algorithmic solutions.
•	Work with data structures: Using lists, tuples, dictionaries, and other data structures to efficiently store and manipulate data.
•	Understand the use of Python in various domains.

Sr. No.	List of Experiments
1.	Velocity of sound in air by Kundt's tube.
2.	Velocity of sound in air by resonating bottle.
3.	Thermal conductivity by Lees's method.
4.	To determine the temperature coefficient of resistance using post office box.
5.	Specific heat of graphite
6.	Study of Peltier effect
7.	Study of Solar constant
8.	Write a program to find square root of a given number.
9.	Write a program to find the maximum number of List.
10.	Write a program to find prime number.
11.	Write a program to find factorial of a number.

12.	Write a program to calculate Simple Interest.
13.	Write a program to find sum of first N natural numbers.
14.	Write a program to find sum of Array elements.
15.	Write a program to print even number from list.
Course Outcomes	
On successful completion of this course student will be able to	
•	Understands the methods of experimental physics.
•	Emphasis on different laboratory techniques specially the importance of accuracy of measurements.
•	Providing a hands-on learning experience in measuring the basic concepts of heat and sound.
•	Understand the Python programming encompass a range of skills and knowledge.
•	Develop problem-solving skills.
•	Work with data structures.
•	Understand the use of Python in various domains
•	Understand to build Web Services and introduction to Network and Database Programming in Python
Reference books	
1.	A Text Book of Experimental Physics, Dr. V.Y Rajopadhye, V.L. Purohit, Dr. U. K. Bhambure
2.	Practical Physics (With Viva-Voce) Dr. S L Gupta and V Kumar Pragati Prakashan,
3.	Basic Python Programming, K. Varda Raj Kumar
4.	Core Python Programming, Dr. R. Nageshwara Rao
5.	Python for beginners, Abhinav Ojha

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B.Sc. II(Physics)Semester-III** **Vertical: Hands on Training related to DSC 1** **Course Code:** **Course Name: VSC 1 (DSC 1)**

• **Teaching Scheme** Credit :02, Practical: 60 Periods Practical: 04hours /week	• **Examination Scheme** Total Marks: 50 UA:30 Marks, CA: 20 Marks

Learning Objectives

•	To study the use of virtual labs in science education by conducting a comparative study between traditional laboratory settings and virtual environments. In most cases simulation conditions showed improved learning outcomes.
•	To study simulation-based experiences begin with the development of measurable objectives designed to achieve expected outcomes.
•	To study the traditional science education be enhanced by the application of computer simulations.
Sr. No	**List of Practical's**
1.	Simulation experiments related to DSC 1

Learning Outcomes

On successful completion of this course student will be able to

•	Study the use of virtual labs in science education by conducting a comparative study between traditional laboratory settings and virtual environments.
•	Study simulation-based experiences begin with the development of measurable objectives designed to achieve expected outcomes.
•	Study the traditional science education be enhanced by the application of computer simulations.

Reference websites

1.	https://bop-iitk.vlabs.ac.in/List%20of%20experiments.html
2.	https://srmap.edu.in/seas/physics-virtual-lab/
3.	https://vlab.amrita.edu/index.php?sub=1
4.	https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. II(Physics) Semester-III

Vertical: Hands on Training related to DSC 2

Course Code:

Course Name: VSC 2 (DSC 2)

• **Teaching Scheme** Credit:02, Practical: 60Periods Practical :04 hours/week	• **Examination Scheme** Total Marks: 50 UA: 30 Marks, CA: 20Marks

Learning Objectives

•	To study the use of virtual labs in science education by conducting a comparative study between traditional laboratory settings and virtual environments. In most cases simulation conditions showed improved learning outcomes.
•	To study simulation-based experiences begin with the development of measurable objectives designed to achieve expected outcomes.
•	To study the traditional science education be enhanced by the application of computer simulations.
Sr. No	**List of Practical's**
1.	Simulation experiments related to DSC 2

Learning Outcomes

On successful completion of this course student will be able to

•	Study the use of virtual labs in science education by conducting a comparative study between traditional laboratory settings and virtual environments.
•	Study simulation-based experiences begin with the development of measurable objectives designed to achieve expected outcomes.
•	Study the traditional science education be enhanced by the application of computer simulations.

Reference websites

1.	https://bop-iitk.vlabs.ac.in/List%20of%20experiments.html
2.	https://srmap.edu.in/seas/physics-virtual-lab/
3.	https://vlab.amrita.edu/index.php?sub=1
4.	https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. II (Physics) Semester-IV

Vertical: DSC 1-5

Course Code:

Course Name: Optics

- **Teaching Scheme**
  Credit:02, Theory:30 Periods
  Lectures:02 hours/week

- **Examination Scheme**
  Total Marks: 50
  UA:30 Marks, CA:20 Marks

Course Preamble

Optics is one of the core courses in the B. Sc. (Physics) curriculum and one of the traditional courses, dating back from the last many centuries. This course provides an in- depth understanding of the fundamental laws of Optics and their applications to real-world systems. Students will study the Geometrical optics and different properties of optics. By combining theoretical knowledge with numerical treatment, the course aims to develop practical skills in analyzing and optimizing Optics for applications.

Course Objectives

•	To apply scientific and technical knowledge and skills of Optics to other areas of a study.
•	To realize basic concepts, principles, laws and the theories related to various scientific phenomena.
•	To apply theories and solve problems faced in real life.
Unit 1	**Geometrical optics** **Periods: 8, Weightage: 12 Marks (UA)**
1.1	Introduction
1.2	Fermat's principle, Reflection and refraction at plane interface
1.3	Cardinal points, Cardinal points of co axial system, Cardinal points of combination of two thin lenses and thick lenses
1.4	Chromatic and Spherical aberration and Methods for minimization of Chromatic and Spherical aberration
1.5	Problems
Unit 2	**Interference** **Periods: 7, Weightage: 11 Marks (UA)**
2.1	Introduction
2.2	Wave theory of light, Huygen's principle
2.3	Electromagnetic nature of light, conditions of interference, coherent sources, division of

	wave front
2.4	Interference by plane parallel thin film illuminated by a point source. Interference by Wedge shaped thin film
2.5	Newton's rings and its applications. Michelson's interferometer (Construction and Working).
2.6	Determination of wavelength of monochromatic light.
Unit 3	**Diffraction and Resolving power** **Periods: 8, Weightage: 12 Marks (UA)**
3.1	Introduction
3.2	Diffraction of light, Fresnel's and Fraunhoffer diffraction, Fresnel's half period zones.
3.3	Zone plate, its analogy with converging lens. Diffraction at straight edge, Fraunhoffer diffraction by single slit.
3.4	Geometrical and spectral resolution, Distinction between magnification and resolution
3.5	Rayleigh's criterion for the limit of resolution, Modified Rayleigh's criterion. R.P. of plane diffraction grating.
3.6	Problems
Unit 4	**Polarization of light** **Periods: 7, Weightage: 11 Marks (UA)**
4.1	Introduction
4.2	Polarized and un polarized light plane, circularly and elliptically polarized light, polarization by reflection and refraction.
4.3	Brewster's law, ordinary and extra ordinary rays,
4.4	Nicol prism and its construction, working and use as a polarizer and analyzer
4.5	Half wave plate and quarter wave plate.
Course Outcomes	
On successful completion of this course student will be able to:	
•	Understand Fermat's principle, Cardinal points and their use.
•	Understand the property of light -Interference and its applications.
•	Understand the concept of Diffraction and Resolving power**.**
•	Understand the concept of Polarization of light.
•	Develop problem solving skills and able to assess the results.
Reference books	
1.	Optics and Spectroscopy by R. Murigation

2.	Text book of optics (new edition) by Brijlal and Subramanyam
3.	Optics (Second edition) by Ajay Ghatak
4.	Geometrical and Physical optics by D. S. Mathur
5.	Optics and Atomic physics by Satya Prakash
6.	Engineering Physics by S. Selladurai
7.	Optical Communication by Jain, Mathur

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B. Sc. II (Physics) Semester-IV** **Vertical: DSC 1-6** **Course Code:** **Course Name: Modern Physics**

• **Teaching Scheme** Credit:02, Theory:30 Periods Theory: 02 hours/week	• **Examination Scheme** Total Marks: 50 UA:30 Marks, CA:20 Marks

Course Preamble

Modern Physicsis one of the core courses in the B. Sc. (Physics) curriculum and one of the traditional courses, dating back from the last many centuries. This course provides an in- depth understanding of the fundamental laws and their application to real-world systems. Students will study Theory of Relativity, Matter Waves, Vector Atom Model and Nuclear Energy Sources. By combining theoretical knowledge with practical treatment, the course aims to develop practical skills in analyzing and optimizing the properties of different applications.

Course Objectives

•	The course aims to introduce students to the key concepts of modern physics like relativity, quantum mechanics, and nuclear energy.
•	Explore wave-particle duality and atomic structure through experiments and theories
•	Develop problem-solving and analytical skills in modern physics applications
Unit 1	**Theory of Relativity** **Periods: 9, Weightage: 13 Marks (UA)**
1.1	Introduction
1.2	Inertial Frame of Reference
1.3	Non-Inertial Frame of Reference
1.4	Galilean Transformations
1.5	Ether Hypothesis
1.6	Michelson-Morley Experiment
1.7	Einstein's Postulates of the Special Theory of Relativity
1.8	Lorentz Transformation Equations
1.9	Velocity Addition Theorem
1.10	Mass-Energy Relation
Unit 2	**Matter Waves** **Periods: 8, Weightage: 12 Marks (UA)**
2.1	Introduction

2.2	de Broglie Hypothesis of Matter Waves
2.3	Wave Packets, Group Velocity, and Phase Velocity
2.4	Relation Between Group Velocity and Phase Velocity
2.5	Davisson and Germer Experiment
2.6	Compton Effect (Introduction and Experimental Verification)
2.7	Bohr's Quantum Condition and Matter Waves
2.8	Heisenberg's Uncertainty Principle
2.9	Experimental Evidences of Uncertainty Principle
Unit 3	**Vector Atom Model** **Periods: 7, Weightage: 11 Marks (UA)**
3.1	Introduction
3.2	Stern and Gerlach Experiment
3.3	Quantum Numbers
3.4	Pauli's Exclusion Principle
3.5	Hund's Rule
3.6	Total Angular Momentum
3.7	Normal and Anomalous Zeeman Effect
Unit 4	**Nuclear Energy Sources** **Periods: 6, Weightage: 10 Marks (UA)**
4.1	Introduction
4.2	Neutron-Induced Reactions
4.3	Nuclear Fission
4.4	Chain Reaction (Atomic Bomb)
4.5	Nuclear Reactor (Pile)
4.6	Atomic Energy in India

Course Outcomes

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

- Understand relativity and its applications in physics.
- Explain wave-particle duality and experimental validations.
- Analyze atomic models and quantum principles.
- Describe nuclear energy processes and applications.

Reference Books

1. Introduction to special relativity Robert Resnik.

2.	Concepts of Modern Physics by S.L. Gupta and S. Gupta.
3.	Modern Physics by R. Murugeshan and Kiruthiga Sivaprasath.
4.	Introduction to Modern Physics by Mani and Mehta.
5.	Modern Physics for Engineers by S.P. Taneja.
6.	Concepts of Modern Physics, Arthur Beiser
7.	Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles by Robert Eisberg and Robert Resnick.

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B. Sc. II (Physics)Semester-IV** **Vertical: DSC 2-5** **Course Code:** **Course Name: Ray and wave optics**

• **Teaching Scheme** Credit :02, Periods:30 Periods Lectures:02 hours/week	• **Examination Scheme** Total Marks:50 UA:30 Marks, CA:20 Marks

Course Preamble

Ray and wave opticsis one of the core courses in the B. Sc. (Physics) curriculum and one of the traditional courses, dating back from the last many centuries. This course provides an in- depth understanding of the fundamental laws of optics and their applications to real-world systems. Students will study the Ray Optics and Aberrations, Different properties of light and LASER**.** By combining theoretical knowledge with numerical treatment, the course aims to develop practical's kills in analyzing and optimizing Ray and wave opticsfor applications.

Learning Objectives

•	To apply scientific and technical knowledge and skills of physics to other areas of a study.
•	To realize basic concepts, principles, laws and the theories related to various scientific phenomena.
•	To apply theories and solve problems faced in real life.
•	To apply scientific and technical knowledge and skills of physics to other areas of a study.
Unit I	**Ray Optics and Aberrations** **Periods: 8, Weightage: 12Marks (UA)**
1.1	Introduction
1.2	Fermat's principle, Reflection and refraction at plane interface
1.3	Cardinal points, Cardinal points of co axial system, Cardinal points of combination of two thin lenses and thick lenses
1.4	Chromatic and Spherical aberration and Methods for minimization of Chromatic and Spherical aberration
Unit 2	**Interference** **Periods: 7, Weightage: 11Marks (UA)**
2.1	Introduction

2.2	Wave theory of light, Huygen's principle
2.3	Electromagnetic nature of light, conditions of interference, coherent sources, division of wave front.
2.4	Interference by plane parallel thin film illuminated by a point source. Interference by Wedge shaped thin film.
Unit 3	**Diffraction and Resolving power Periods: 8, Weightage: 12Marks (UA)**
3.1	Introduction
3.2	Diffraction of light, Fresnel's and Fraunhoffer diffraction, Fresnel's half period zones.
3.3	Zone plate, its analogy with converging lens.
3.4	Geometrical and spectral resolution, Distinction between magnification and resolution
3.5	Rayleigh's criterion for the limit of resolution, Modified Rayleigh's criterion.
Unit 4	**Laser Periods: 7, Weightage: 11Marks (UA)**
4.1	Introduction
4.2	Three quantum processes, Einstein Coefficients, Population inversion, Metastable state
4.3	Important components of laser, Types of laser, He-Ne and Ruby laser.
4.4	Properties and applications of laser.

Learning Outcomes

On successful completion of this course student will be able to

- Understand the Ray Optics and Aberrations with Fermat's principle, Cardinal points and aberrations.
- Understand the property of light -Interference and its applications.
- Understand the concept of Diffraction and Resolving power**.**
- Understand the Laser and physics related to it.
- Develop problem solving skills and able to assess the results.

Reference Books

1. Optics and Spectroscopy by R. Murigation

2.	Text book of optics (new edition) by Brijlal and Subramanyam
3.	Optics (Second edition) by Ajay Ghatak
4.	Geometrical and Physical optics by D. S. Mathur
5.	Optics and Atomic physics by Satya Prakash
6.	Engineering Physics by S. Selladurai
7.	Optical Communication by Jain, Mathur

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. II (Physics) Semester-IV

Vertical: Physics-DSC 2-6

Course Code:

Course Name: Physics of Scientific Instruments

• **Teaching Scheme**	• **Examination Scheme**
Credit:02, Theory:30 Periods	Total Marks:50
Theoru:02 hours/week	UA:30 Marks, CA:20 Marks

Course Preamble

Physics of Scientific Instruments is one of the core courses in the B. Sc. (Physics) curriculum and one of the traditional courses, dating back from the last many centuries. This course provides an in-depth understanding of the fundamental laws and their applications to real-world systems. Students will study the Physics instruments in Life sciences and Chemistry Laboratory also Display Devices Transducers and Sensors**.** By combining theoretical knowledge with numerical treatment, the course aims to develop practical skills in analyzing and optimizing Scientific Instruments for applications.

Learning Objectives

•	Understand concepts and its applications in physics.
•	Explain Physics behind scientific instruments.
•	Describe process behind working of instruments.
Unit 1	**Physics in Life sciences Laboratory Periods: 8, Weightage: 12 Marks (UA)**
1.1	Introduction
1.2	Working of Centrifuge
1.3	Homogenizer
1.4	Incubator
1.5	Microscope
1.6	Digital Balance
Unit 2	**Physics in Chemistry Laboratory Periods: 8, Weightage: 12 Marks (UA)**
2.1	Introduction
2.2	Water Distiller
2.3	Spectrophotometer
2.4	Ph Meter
2.5	Spectroscopy

2.6	Chromatography
Unit 3	**Display Devices** **Periods: 7, Weightage: 11 Marks (UA)**
3.1	Introduction
3.2	Classification of display devices
3.3	LED Display
3.4	LCD Display
3.5	Plasma Display
Unit 4	**Transducers and Sensors** **Periods: 7, Weightage: 11 Marks (UA)**
4.1	Introduction
4.2	Classification of transducers
4.3	Characteristics of transducers
4.4	Temperature transducers
4.5	Optical Transducers – LDR, Photodiode
4.6	Sensors
Learning Outcomes	
On successful completion of this course student will be able to	
•	Understand concepts and its applications in physics.
•	Explain concept behind instruments.
•	Analyze the data received from instruments.
•	Describe principle behind working of instruments.
Reference Books	
1.	“Electronic Instruments" by H. S. Kalsi
2.	"Spectroscopy" by Y. R. Sharma

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. II (Physics) Semester-IV

Vertical: Physics - GE4/OE4

Course Code:

Course Name: Physics in Everyday Life

• **Teaching Scheme** Credit:02, Theory:30 Periods Lectures:02 hours / week	• **Examination Scheme** Total Marks:50 UA:30 Marks, CA:20 Marks

Course Objectives

•	To improve our understating of the natural world.
•	Students can appreciate their surroundings by understanding the rules of Nature and able to connect some observations to physics principles

Unit 1	**Mechanical Objects**	**Periods: 8, Weightage:12Marks (UA)**
1.1	Introduction of mechanical work and its properties	
1.2	Guitar	
1.3	Bouncing balls	
1.4	Elevator	
1.5	Bicycles	
1.6	Fan	
1.7	Airplane flight	
1.8	Combustion engine	
1.9	Washing machine	
Unit 2	**Optical Instruments**	**Periods: 7, Weightage: 11Marks (UA)**
2.1	Introduction to visible range and colors	
2.2	Vision corrective lenses – polaroid glasses	
2.3	Types of lenses	
2.4	UV protective glass	
2.5	Polaroid camera	
2.6	Digital color photography	
2.7	Holography and laser (Principle, working applications)	
Unit 3	**Physics of Home Appliances**	**Periods: 8, Weightage: 12 Marks (UA)**
3.1	Electric bulb, iron, water heater and hair dryer	

3.2	Television
3.3	Microwave ovens
3.4	Induction stove
3.5	Mixer
3.6	Vacuum Cleaner
Unit 4	**Physics in Technology** **Periods: 7, Weightage: 11Marks (UA)**
4.1	Global Positioning System (GPS)
4.2	CCDs,
4.3	Displays- LCD, OLED, Plasma
4.4	Optical recording - CD, DVD Player, Blu-ray Disc
4.5	Photoelectric effect-recording of audio and video
Course Outcomes	
On successful completion of this course student will be able to	
•	Understand the physics behind human body.
•	Understand the functions of human body system.
•	Understand concepts of medical imaging.
•	Understand the basic concepts of medical instruments for diagnosis.
Reference books	
1.	Physics in the Kitchen, George Vekinis, Springer Nature Switzerland, 2023.
2.	The Physics in our Daily Lives, Umme Ammara, Gugucool Publishing, Hyderabad, 2019.
3.	For the love of physics, Walter Lawin, Free Press, New York, 2011.
4.	Fundamentals of Physics by D. Halliday, R. Resnick, J. Walker, John Wiley & Sons

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. II (Physics) Semester-IV

Vertical: Practical based on DSC 1-5 and DSC 1-6

Course Code:

Course Name: Physics Practical Lab. V

- **Teaching Scheme**
  Credit:02, Practical:60 Periods
  Practical:04 hours/week

- **Examination Scheme**
  Total Marks:50
  UA:30 Marks, CA:20 Marks

Learning Objectives

•	To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
•	To learn measuring skills in practical.
•	To perform calculations to obtain the experimental results.
•	To test whether the experimental results hold good with theoretical results.
Sr. No.	**List of Experiments**
1.	Goniometer: Equivalent focal length for different thick lenses.
2.	Goniometer: Cardinal points.
3.	Use of Spectrometer to determine angle of prism.
4.	Dispersive power of prism
5.	Diffraction grating to determine grating element.
6.	To determine wavelength of Laser using diffraction grating.
7.	Newton's ring.
8.	Liquid Lens to determine the refractive index.
9.	Determination of Cauchy's Constants.
10.	Double refracting prism.
11.	Diffraction at single slit .
12.	Resolving power of grating.
13.	Wedge shaped film: Measurement of thickness.
14.	Constants of B.G.
15.	Mutual Inductance of coils.
16.	Low resistance by Carry Foster method.
17.	High resistance by nearly equal deflection method.

18.	Solar cell characteristics to determine fill factor and efficiency.
Course Outcomes	
On successful completion of this course student will be able to	
•	Understand the use of different instruments.
•	Understand the principles of and applications of basic physical properties.
•	Understand concepts learnt in light and electricity devices also think beyond curriculum in the field of physics.
•	Plan to conduct simple experiments and give oral and presentation of the results.
Reference 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,
3.	Meerut (2014).
4.	Practical Physics (4th Edition) G. L. Squires Cambridge University Press (2014).
5.	B.Sc. Practical Physics Harnam Singh and Dr. P.S. Hemne S. Chand & Co. Ltd., New Delhi (2000).

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. II (Physics) Semester-IV

Vertical: Practical based on DSC 2-5 and DSC 2-6

Course Code:

Course Name: Physics Practical Lab. VI

• **Teaching Scheme**	• **Examination Scheme**
Credit:02, Practical:60Periods Practical: 04 hours/week	Total Marks:50 UA:30Marks, CA:20Marks

Course Objectives

•	To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
•	To learn measuring skills in practical.
•	To perform calculations to obtain the experimental results.
•	To test whether the experimental results hold good with theoretical results.

List of Experiments

Sr. No.	Name of the Experiment
1.	Use of Spectrometer to determine angle of prism.
2.	Dispersive power of prism
3.	Diffraction grating to determine grating element.
4.	To determine wavelength of Laser using diffraction grating.
5.	Liquid Lens to determine the refractive index
6.	Determination of Cauchy's Constants
7.	Diffraction at single slit
8.	Resolving power of grating
9.	Wedge shaped film: Measurement of thickness
10.	Constants of B.G.
11.	Low resistance by Carry Foster method
12.	High resistance by nearly equal deflection method
13.	Solar cell characteristics to determine fill factor.

Course Outcomes

On successful completion of this practical course student will be able to:	
•	Understand the use of different instruments.
•	Understand the principles of and applications of basic physical properties.
•	Understand concepts learnt in light and electricity devices also think beyond curriculum in the field of physics.
•	Plan to conduct simple experiments and give oral and presentation of the results.
References Books	
1.	B.Sc. Practical Physics CL Arora S. Chand & Co. Ltd., New Delhi(2018).
2.	Practical Physics (With Viva-Voce) Dr. S L Gupta and V Kumar Pragat 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).

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **B. Sc. II (Physics) Semester-IV** **Vertical: Hands on Training related to DSC 1** **Course Code:** **Course Name: VSC 3(DSC 1)**

• **Teaching Scheme** Credit:02, Practical: 60 Periods Practical:04 hours/week	• **Examination Scheme** Total Marks:50 UA:30 Marks, CA:20Marks

Learning Objectives

•	To study the use of virtual labs in science education by conducting a comparative study between traditional laboratory settings and virtual environments. In most cases simulation conditions showed improved learning outcomes.
•	To study simulation-based experiences begin with the development of measurable objectives designed to achieve expected outcomes.
•	To study the traditional science education be enhanced by the application of computer simulations.

Sr.No	**List of Practical**
1.	Simulation experiments related to DSC 1

Learning Outcomes

On successful completion of this course student will be able to

•	Study the use of virtual labs in science education by conducting a comparative study between traditional laboratory settings and virtual environments.
•	Study simulation-based experiences begin with the development of measurable objectives designed to achieve expected outcomes.
•	Study the traditional science education be enhanced by the application of computer simulations.

Reference Websites

1.	https://bop-iitk.vlabs.ac.in/List%20of%20experiments.html
2.	https://srmap.edu.in/seas/physics-virtual-lab/
3.	https://vlab.amrita.edu/index.php?sub=1
4.	https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. II (Physics)Semester-IV

Vertical: Hands on Training related to DSC 2

Course Code:

Course Name: VSC 4 (DSC 2)

• **Teaching Scheme** Credit:02, Practical:60 Periods Practical: 04 hours /week	• **Examination Scheme** Total Marks:50 UA:30 Marks, CA:20 Marks

Learning Objectives

•	To study the use of virtual labs in science education by conducting a comparative study between traditional laboratory settings and virtual environments. In most cases simulation conditions showed improved learning outcomes.
•	To study simulation-based experiences begin with the development of measurable objectives designed to achieve expected outcomes.
•	To study the traditional science education be enhanced by the application of computer simulations.
Sr. No	**List of Practical**
1.	Simulation experiments related to DSC 2

Learning Outcomes

On successful completion of this course student will be able to

•	Study the use of virtual labs in science education by conducting a comparative study between traditional laboratory settings and virtual environments.
•	Study simulation-based experiences begin with the development of measurable objectives designed to achieve expected outcomes.
•	Study the traditional science education be enhanced by the application of computer simulations.

Reference Websites

1.	https://bop-iitk.vlabs.ac.in/List%20of%20experiments.html
2.	https://srmap.edu.in/seas/physics-virtual-lab/
3.	https://vlab.amrita.edu/index.php?sub=1
4.	https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology.

Nature of Question Paper

B. Sc. (Part-II) w.e.f. Year 2025-26

University Assessment (UA)

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

A)		
B)		
C)		
Q.5.	Answer the following (Anyone)	6 Mark
A)		
B)		

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।। NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur** **Faculty of Science & Technology** **Nature of Question Paper** **B.Sc.(Part-II)w. e. f. Year 2025-26** **College Assessment (CA)**

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
- 30Marks+ 20 Marks=50 Marks

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

****