



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Affiliated to the University of Mumbai

Programme: Sciences

Physics (Minor)

Syllabus for the Academic Year 2023-2024
based on the National Education Policy 2020



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

DEPARTMENT OF PHYSICS

COURSE DETAILS FOR MINOR:

	SEMESTER 1	SEMESTER 2
TITLE	Everyday Physics	Fundamentals of Electronics, Electricity and Applied Physics
TYPE OF COURSE - DSC	Minor	Minor
CREDITS	4	4

Preamble:

The systematic and planned curricula from these courses shall motivate and encourage learners to understand basic concepts of Physics. Physics, a First-Year program, embarks on a journey of discovery through the fundamental principles of physics. Throughout this program, we will explore the diverse and fascinating realms of classical mechanics, optics, thermodynamics, modern physics, and electronics. From the laws of motion to the mysteries of quantum theory, our aim is to cultivate a deep understanding of the natural world and its underlying principles. Through experimentation, analysis, and critical thinking, we will strive to unravel the complexities of the universe and lay the groundwork for further exploration and innovation. Join us as we embark on this exciting intellectual adventure, where curiosity and inquiry are the guiding lights on our path to knowledge and understanding.



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS) PROGRAMME OBJECTIVES

PO 1	This program aims to provide students with a deep understanding of fundamental and modern physics concepts, preparing them for advanced studies and careers in scientific research and technology.
PO 2	This program seeks to contribute to the advancement of knowledge of materials science, and energy production.
PO 3	This program aims to foster collaboration between physicists, chemists, and biologists, among researchers and students from diverse scientific backgrounds.

PROGRAMME SPECIFIC OUTCOMES

PSO 1	Students will develop a comprehensive understanding of classical mechanics, including Newton's Laws and fluid dynamics, as well as modern physics concepts such as the behavior of real gases, thermodynamics, and the interaction of gamma rays with matter
PSO 2	The learners will also gain knowledge of modern physics theories such as quantum mechanics and the origin of quantum theory, providing them with a strong foundation in both classical and contemporary physics principles.
PSO 3	Through interdisciplinary approaches, the learners will be empowered to address complex challenges related to energy, the environment, and public health.



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme: Sciences Physics Minor		Semester – 1	
Course Title: Everyday Physics		Course Code: SPHY111MN	
<u>COURSE OBJECTIVES:</u> <ol style="list-style-type: none">1. To introduce students to the foundational concepts of physics, focusing on the World of Physics and Measurements, Mechanics, and Optics.2. To develop students' understanding of fundamental physical principles and their application in solving real-world problems.3. To foster critical thinking, analytical skills, and scientific inquiry through hands-on experiments, demonstrations, and problem-solving exercises.			
<u>COURSE OUTCOMES:</u> <p>The learner will be able to:</p> <ol style="list-style-type: none">1. The Learner will demonstrate a comprehensive understanding of the principles of physics, including the concepts of measurement, motion, forces, and optics.2. The Learner will be able demonstrate a comprehensive understanding of the principles of physics, including the concepts of measurement, motion, forces, and optics.3. The Learner will develop practical skills in experimental design, and laboratory techniques through hands-on experiments and demonstrations in the areas of mechanics and optics.			
Lectures per week (1 Lecture is 60 minutes)		3	
Total number of Hours in a Semester		45	
Credits		3	
Evaluation System	Semester End Examination	2 Hours	50 marks
	Internal Assessment	--	50 marks



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UNIT 1 World of Physics and Measurements (1 Credit)	Salient features up to phylum level of:		15 hours
	1.1	Laws of nature	
	1.2	Units and Measurements	
UNIT 2 Mechanics (1 Credit)	2.1	Newton's law	15 hours
	2.2	Fluid dynamics	
	2.3	Elasticity	
UNIT 3 Wonders of Animal Kingdom (1 Credit)	3.1	Lens	15 hours
	3.2	Aberration	
	3.3	Interference	

PRACTICAL Course Title: Everyday Physics Practical	Course Code: SPHY111MNP
<p><u>COURSE OUTCOMES:</u> The learner will be able to:</p> <ol style="list-style-type: none"> 1. Students will be able to conduct experiments to determine the modulus of rigidity, moment of inertia, and Young's modulus of materials using torsional oscillations, bifilar pendulum, and vibration methods, respectively. 2. Students will gain proficiency in experimental techniques for measuring physical properties such as viscosity, surface tension, and refractive index using appropriate experimental setups and methods. 3. Students will develop analytical skills in interpreting experimental results, including the calculation of uncertainties, error analysis, and comparison with theoretical predictions, enhancing their understanding of the principles of physics and their practical applications. 	



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Lectures per week (1 Lecture is 120 minutes)	1		
Total number of Hours in a Semester	30		
Credits	1		
Evaluation System	Semester End Examination	2 Hours	50 marks
	Internal Assessment	--	

	1	Torsional Oscillation: To determine modulus of rigidity η of a material of wire by torsional oscillations/Biological Fibre.	30 hours
	2	Bifilar Pendulum: To determine moment of inertia of a bifilar pendulum	
	3	Flywheel: To determine moment of inertia of flywheel	
	4	Spectrometer: To determine the angle of Prism.	
	5	Y by vibrations: To determine Y Young's Modulus of a wire material by method of vibrations- Flat spiral spring	
	6	To determine Coefficient of Viscosity (η) of a given liquid by Poisseuli's Method/ Biological Fluid	
	7	Surface Tension/ Angle of contact: To determine the surface tension of water by capillary rise method.	
	8	Combination of Lenses to determine the equivalent focal length of a lens system by magnification method.	
	9	Spectrometer: To determine the refractive index μ of the material of the prism	
	10	Newton's Rings: To determine the radius of curvature of a given convex lens using Newton's rings.	
	11	Wedge Shaped Film: To determine the thickness of wire by obtaining fringes in wedge shaped air film.	



**SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)
ASSESSMENT DETAILS:**

- I. Internal Assessment (IA): 50 marks**
- II. Semester End Examination (SEE): 50 marks**

REFERENCES:

1. Applied Fluid Mechanics: Mott Robert, Pearson Benjamin Cummir, VIth Edition. Pearson Education /Prentice Hall International, New Delhi.
2. How Things Work The physics of everyday life by Louis A Bloomfield, Wiley publication.
3. Concepts of Physics – (Part–I) by H. C. Verma, 2002 Ed. Bharati Bhavan Publishers.<https://bookwindow.in/product.php/concepts-of-physics-i-h-c-verma> (Kindle Edition)
4. Brijlal, Subramanyam and Avadhanulu a Textbook of Optics, 25th revised ed. (2012) S. Chand



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme: Sciences Physics Minor		Semester – 2	
Course Title: Fundamentals of Electronics, Electricity and Applied Physics		Course Code: SPHY122MN	
<u>COURSE OBJECTIVES:</u> <ol style="list-style-type: none">1. Provide the fundamental skills to understand the basics of semiconductor components like diodes, transistors, relations between current amplification factors, the importance of biasing, and feedback circuit.2. Analyse the relation between conductors, insulators, and in-depth knowledge of material science.3. Learn the basic laws of electrostatics and magnetostatics			
<u>COURSE OUTCOMES:</u> The learner will be able to: <ol style="list-style-type: none">1. Understand different biasing techniques to operate the transistor and analyze its stability.2. Applying basic laws of electrostatics and magnetostatics to demonstrate quantitative problem-solving skills.3. Understand the basics of crystallography, electrical properties of metals, band theory of solids, types of materials, and superconductivity.			
Lectures per week (1 Lecture is 60 minutes)		3	
Total number of Hours in a Semester		45	
Credits		3	
Evaluation System	Semester End Examination	2 Hours	50 marks
	Internal Assessment	--	50 marks



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UNIT 1 Analog Electronics (1 Credit)	1.1	Transistor Biasing	15 hours
	1.2	General amplifier characteristics	
UNIT 2 Electricity (1 Credit)	2.1	Electrostatics	15 hours
	2.2	Magnetostatic	
UNIT 3 Applied Physics (1 Credit)	3.1	Introduction to Materials	15 hours
	3.2	Types of Materials	
	3.3	Properties & Applications of materials	

Programme: Sciences		Semester – 2	
Physics Minor			
PRACTICAL COURSE		Course Code: SPHY122MNP	
<u>COURSE OUTCOMES:</u>			
The learner will be able to:			
<ol style="list-style-type: none"> 1. The knowledge of basic principles and applications of Electronics. 2. Understand the working & properties of Zener diode, transistor and LDR 3. Understand the De-Morgan's theorems, binary arithmetic, logics, and Boolean functions. Understand rectifiers and filter circuits. 			
Lectures per week (1 Lecture is 60 minutes)		2	
Total number of Hours in a Semester		30	
Credits		1	
Evaluation System	Summative Assessment	2 Hours	50 marks
	Continuous Assessment	--	



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1	Flywheel: To determine the moment of inertia of a flywheel	30 hou
2	To study Zener Diode as voltage Regulator	
3	LR Circuit: To determine the value of given inductance and phase angle	
4	CR Circuit: To determine value of given capacitor and Phase angle	
5	Frequency of AC Mains: To determine frequency of AC mains.	
6	LCR series Resonance: To determine resonance frequency of LCR series circuit.	
7	To study NAND and NOR gates as Universal Building Blocks	
8	To study EX-OR Gate, half adder and full adder and verify their truth table	
9	To verify De Morgan's Theorems	
10	Thevenin's Theorem: To verify Thevenin's theorem for DC circuits	
11	Norton's Theorem: To verify Norton's Theorem for DC circuits	
12	LDR Characteristics: To study the dependence of LDR resistance on intensity of light	

ASSESSMENT DETAILS:

I. Internal Assessment (IA): 50 marks

II. Semester End Examination (SEE): 50 marks



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REFERENCES:

1. D. Chattopadhyay, P C Rakshit, Electricity and Magnetism 7th Ed. New Central Book agency.
2. B.L. Theraja and A.K. Theraja, A Textbook of Electrical Technology Vol. I , S. Chand Publication
3. Boylestad and Nashelsky, Electronic devices and Circuit Theory: 7th edition, Prentice Hall of India.
4. V K Mehta and R Mehta Electronics Principals, Multi coloured Revised 11th Ed. reprint in 2012 S Chand.
5. David J. Griffiths: Introduction to Electrodynamics, Prentice Hall India (EEE) 3rdEd.
6. A B Bhattacharya, Electronics Principles and Applications, Central publisher.
7. A P Malvino, Digital Principles and Applications: Tata McGraw Hill Tokhiem, Digital electronics, 4thed, McGraw Hill International Edition