

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

**New Arts, Commerce and Science College**

**Ahmednagar (Autonomous)**

(Affiliated to Savitribai Phule Pune University, Pune)



**National Education Policy (NEP)**  
**Choice Based Credit System (CBCS)**

**Programme Framework**

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

**Implemented from**

**Academic Year 2024-25**

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's  
**New Arts, Commerce and Science College, Ahmednagar**  
**(Autonomous)**  
**Board of Studies in Physics**

Sr. No.	Name	Designation
1.	Prof. D.K. Sonawane	Chairman
2.	Dr. A.A. Jadhavar	Member
3.	Dr. A.A. Surse	Member
4.	Mr. P.P. Bhosale	Member
5.	Miss. R.H. Ranu	Member
6.	Miss. V.B. Sawane	Member
7.	Miss. A.A. Shirsat	Member
8.	Mr. V.V. Kapase	Member
9.	Dr. Appasaheb Torane	Academic Council Nominee
10.	Dr. Vijay M. Mayekar	Academic Council Nominee
11.	Prof. (Dr.) Arun G. Banpurkar	Vice-Chancellor Nominee
12.	Prof. (Dr.) Nandu B. Chaure	Alumni
13.	Dr. Vinay Hasabnis	Industry Expert
14.	Dr. Shrikrushna B. Gaikwad	Member (Co-opt)
15.	Dr. Dipak S. Shelar	Member (Co-opt)

## **1. Prologue/ Introduction of the programme:**

The curriculum for the B. Sc. in Physics designed for the requirement of National Education Policy - 2020 (NEP 2020) following the University Grants Commission (UGC) and Savitribai Phule Pune University guidelines. As per the guidelines, we proposed structure including Core courses, Discipline specific courses - Physics and Elective Courses, along with Indian Knowledge System, Skill Enhancement Courses, Covational Skill Courses, Open Elective Courses, Ability Enhancement and Skill based Courses. In the NEP-2020 pattern, continuous assessment of the students is an integral part. This continuous assessment carried out through systematic based on better understanding of the subject. During the curriculum designing, we have added the skill oriented courses to encourage students for achieving fruitful skills while completing their bachelor degree in Physics.

This programme also allow for the flexibility and innovation in the UG education. Syllabus for the programme is desgend and formulated with concentrating much on teaching learning process and the assessment procedures. The following steps define the process of learning. Which should form the basis of final assessment of the achievement at the end of the program.

- The accumulation of basic facts of nature and the ability to link the facts to observe and discover the laws of nature i.e. develop an understanding and knowledge of the basic Physics.
- The ability to use this knowledge to analyze new situations and learn skills and tools like mathematics, engineering and technology to find the solution, interpret the results and make predictions for the future developments.
- The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the physical problems in nature and to create new skills and tools for their possible solutions.

This programme strongly focused on the problems solving, project work, research project work, on job training, filed projects, etc. such way that students should acquire some the skills like demonstrate, problem solver, etc. While desiging this curriculum, we manily focused on the future ascepts of the Physics and society. Curriculum is designed to motivate students for the pursuing higher studies in Physics and inculcate enough skills for becoming an entrepreneur. By the completion of this course, student will acquire some skills which

will be helpful for future.

## **2. Programme Outcomes (POs)**

After successfully completing B.Sc. Honours degree, students should acquire following attributes.

### **1. Disciplinary knowledge and skills:**

Capable of demonstrating

(i) good knowledge and understanding of major concepts, theoretical principles and experimental findings in Physics including broader interdisciplinary subfields like Chemistry, Mathematics, Life sciences, Environmental sciences, Atmospheric Physics, Computer science, Information Technology etc.

(ii) Ability to use modern instrumentation and laboratory techniques to design and perform experiments is highly desirable in almost all the fields of Physics.

### **2. Skilled communicator:**

Ability to transmit complex technical information relating all areas in Physics in a clear and concise manner in writing and oral ability to present complex and technical concepts in a simple language for better understanding.

### **3. Critical thinker:**

Ability to employ critical thinking and efficient problem solving skills in all the basic areas of Physics.

### **4. Sense of inquiry:**

Capability for asking relevant/appropriate questions relating to the issues and problems in the field of Physics, and planning, executing and reporting the results of a theoretical or experimental investigation.

### **5. Team player/worker:**

Capable of working effectively in diverse teams in both classroom, laboratory, Physics workshop and in industry and field-based situations.

### **6. Skilled project manager:**

Capable of identifying/mobilizing appropriate resources required for a project, and manage a project through to completion, while observing responsible and ethical scientific conduct; and safety and laboratory hygiene regulations and practices.

### **7. Digitally Efficient:**

Capable of using computers for simulation studies in Physics and computation and appropriate software for numerical and statistical analysis of data, and employing modern e-library search tools like Inflibnet, Shodhganga, etc.

### **8. Ethical awareness / reasoning:**

The graduate should be capable of demonstrating ability to think and analyze rationally with modern and scientific outlook and identify ethical

issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights, and adopting objectives, unbiased and truthful actions in all aspects of work.

**9. National and international perspective:**

The graduates should be able to develop a national as well as international perspective for their career in the chosen field of the academic activities.

**10. Lifelong learners:**

Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling in all areas of Physics.e.

**B. Sc. Programme Framework: Credit Distribution**

Level / Difficulty	Sem	Subject-1 (Selected as Major)						Subject-2		Subject-3		(SEC)	GE/OE		IKS	AEC	VEC	CC	Total	
		T		P				T	P	P	T	P	T	P						
Certificate 4.5 / 100	I	02		02				02	02	02	02	-	02		02	02	02	02	22	
	II	02		02				02	02	02	02	02	-	02		--	02	02	02	22
		Credits Related to Major						Selected as Minor												
		Core		Elective		VSC	FP / OJT / CEP/RP													
		T	P	T	P	P	P	T	P	-	P	T	P	-	-	-	-	-	-	
Diploma 5.0 / 200	III	04	02	--		02	02	02	02	-	02	02		-	02	-	02	22		
	IV	04	02	--		02	02	02	02	-	02		02	--	02	-	02	22		
Degree 5.5 / 300	V	06	04	02	02	02	2	02	-	-	-	-	-	02	-	-	-	22		
	VI	06	04	02	02	02	4	02	-	-	-	-	-	-	-	-	-	22		
<b>Total</b>		<b>24</b>	<b>16</b>	<b>04</b>	<b>04</b>	<b>08</b>	<b>10</b>	<b>10</b>	<b>08</b>	<b>04</b>	<b>04</b>	<b>06</b>	<b>08</b>	<b>04</b>	<b>08</b>	<b>04</b>	<b>08</b>	<b>132</b>		
6.0/400 Honours	VII	08	06	02	02	-	RM-04											22		
	VIII	08	06	02	02		OJT-04											22		
6.0/400 Honours with Research	VII	06	04	02	02		RM-04 RM-04											22		
	VIII	06	04	02	02		RM-08											22		
<b>Total</b>		<b>40/36</b>	<b>28/24</b>	<b>08</b>	<b>08</b>	<b>08</b>	<b>18/26</b>	<b>10</b>	<b>08</b>	<b>04</b>	<b>04</b>	<b>06</b>	<b>04</b>	<b>04</b>	<b>04</b>	<b>08</b>	<b>04</b>	<b>08</b>	<b>176</b>	

**B.Sc. Programme Framework: Course Distribution**

Level / Difficulty	Sem	Subject-1 (Selected as Major)						Subject-2		Subject-3		(SEC)	GE/OE		IKS	AEC	VEC	CC	Total
		T		P				T	P	P	T	P	T	P					
Certificate 4.5 / 100	I	01		01				01	01	01	01	-	01		01	01	01	01	11
	II	01		01				01	01	01	01	01	-	01	--	01	01	01	11
		Credits Related to Major						Selected as Minor											
		Core		Elective		VSC	FP / OJT / CEP/ RP												
		T	P	T	P	P	P	T	P	-	P	T	P	-	-	-	-	-	
Diploma 5.0 / 200	III	02	01	--		01	FP-01	01	01	-	01	01		-	01	-	01	11	
	IV	02	01	--		01	CEP-01	01	01	-	01		01	--	01	-	01	11	
Degree 5.5 / 300	V	03	02	01	01	01	FP-01	01	-	-	-	-		01	-	-	-	11	
	VI	03	02	01	01	01	OJT-01	01	-	-	-	-		-	-	-	-	10	
<b>Total</b>		<b>12</b>	<b>08</b>	<b>02</b>	<b>02</b>	<b>04</b>	<b>04</b>	<b>06</b>	<b>04</b>	<b>02</b>	<b>02</b>	<b>03</b>	<b>04</b>	<b>02</b>	<b>04</b>	<b>02</b>	<b>04</b>	<b>65</b>	
6.0/400 Honours	VII	03	03	01	01	-	RM-01											09	
	VIII	03	03	01	01		OJT-01											09	
6.0/400 Honours with Research	VII	02	02	01	01		RM-01 RP-01											08	
	VIII	02	02	01	01		RM-01											07	
<b>Total</b>		<b>18/16</b>	<b>14/12</b>	<b>04</b>	<b>04</b>	<b>04</b>	<b>06/07</b>	<b>06</b>	<b>04</b>	<b>02</b>	<b>02</b>	<b>03</b>	<b>04</b>	<b>02</b>	<b>04</b>	<b>02</b>	<b>04</b>	<b>83/80</b>	

**B. Sc. -Physics: Credit and Course Distribution in Brackets**

Level / Difficulty	Sem	Subject-1							Total
		T		P					
4.5	I	02 (01)		02 (01)				04(02)	
	II	02 (01)		02 (01)				04(02)	
		Credits Related to Major							
		Core		Elective		VSC	FP / OJT/ CEP	IKS	
		T	P	T	P	P	P	T	
5.0	III	04(02)	02(01)	--		02(01)	FP-02(01)		10(05)
	IV	04(02)	02(01)	--		02(01)	CEP-02(01)		10(05)
5.5	V	06(03)	04(02)	02(01)	02(01)	02(01)	FP-02(01)	02(01)	20 (10)
	VI	06(03)	04(02)	02(01)	02(01)	02(01)	OJT-04(01)		20(09)
<b>Total</b>		<b>12</b>	<b>08</b>	<b>(02)</b>	<b>(02)</b>	<b>04</b>	<b>04</b>	<b>(01)</b>	<b>33</b>
6.0	VII	03	03	(01)	(01)	-	RM-04(01)		22(09)
	VIII	03	03	(01)	(01)		OJT-04(01)		22(09)
6.0	VII	(02)	(02)	(01)	(01)		RM-04(01) RP-04(01)		22(08)
	VIII	(02)	(02)	(01)	(01)		RM-08(01)		22(07)
		<b>18/16</b>	<b>14/12</b>	<b>04</b>	<b>04</b>	<b>04</b>	<b>06/07</b>	<b>(01)</b>	<b>51/48</b>



## Programme Framework (Courses and Credits): B. Sc. Physics

Sr. No.	Year	Semester	Level	Course Type	Course Code	Title	Credits
1.	I	I	4.5	DSC-01	BS-PH 111T	Mechanics and Properties of Matter	02
2.	I	I	4.5	DSC-02	BS-PH 112P	Introductory Physics Lab-I	02
3.	I	II	4.5	DSC-03	BS-PH 121T	Physics Principles and Electromagnetics	02
4.	I	II	4.5	DSC-04	BS-PH 122T	Introductory Physics Lab-II	02
5.	II	III	5.0	DSC-05	BS-PH 231T	Mathematical Methods in Physics - I	02
6.	II	III	5.0	DSC-06	BS-PH 232T	Analog and Digital Electronics	02
7.	II	III	5.0	DSC-07	BS-PH 233P	General Physics Lab-I	02
8.	II	III	5.0	VSC-01	BS-PH 234P	Data analysis using Microsoft Excel and Origin	02
9.	II	III	5.0	FP-01	BS-PH 235T	Field Project	02
10.	II	IV	5.0	DSC-08	BS-PH 241T	Sound and Waves	02
11.	II	IV	5.0	DSC-09	BS-PH 242T	Optics	02
12.	II	IV	5.0	DSC-10	BS-PH 243P	General Physics Lab - II	02
13.	II	IV	5.0	VSC-02	BS-PH 244P	Basic Electronics Lab	02
14.	II	IV	5.0	CEP-01	BS-PH 245P	Community Engagement Project	02
15.	III	V	5.5	DSC-11	BS-PH 351T	Mathematical Methods in Physics - II	02
16.	III	V	5.5	DSC-12	BS-PH 352T	Atomic and Molecular Physics	02
17.	III	V	5.5	DSC-13	BS-PH 353T	Computational Physics	02
18.	III	V	5.5	DSC-14	BS-PH 354P	Physics Lab I	02
19.	III	V	5.5	DSC-15	BS-PH 355P	Computational Physics Lab.	02
20.	III	V	5.5	DSE-01	BS-PH 356T	Renewable Energy Studies	02
21.	III	V	5.5	DSE-02	BS-PH 357P	Renewable Energy Studies Lab.	02
22.	III	V	5.5	VSC-03	BS-PH 358P	Electronic Instrumentation Lab	02
23.	III	V	5.5	FP-02	BS-PH 359P	Field Project	02
24.	III	V	5.5	IKS-02	BS-PH 360T	Astronomy in India-Historical Overview	02
25.	III	VI	5.5	DSC-16	BS-PH 361T	Classical Mechanics	02
26.	III	VI	5.5	DSC-17	BS-PH 362T	Electrodynamics	02
27.	III	VI	5.5	DSC-18	BS-PH 363T	Solid State Physics	02
28.	III	VI	5.5	DSC-19	BS-PH 364P	Physics Lab II	02
29.	III	VI	5.5	DSC-20	BS-PH 365P	Internet of Things Lab.	02
30.	III	VI	5.5	DSE-03	BS-PH 366T	Python Programming	02
31.	III	VI	5.5	DSE-04	BS-PH 367P	Python Programming Lab.	02
32.	III	VI	5.5	VSC-04	BS-PH 368P	Geospatial technology	02

33.	III	VI	5.5	OJT-01	BS-PH 369T	On Job Training	04
-----	-----	----	-----	--------	------------	-----------------	----

**B. Sc. Physics (Honours)**

34.	IV	VII	6.0	DSC-21	BS-PH 471T	Mathematical methods in Physics III	03
35.	IV	VII	6.0	DSC-22	BS-PH 472T	Quantum Mechanics I	03
36.	IV	VII	6.0	DSC-23	BS-PH 473T	Thermodynamics	02
37.	IV	VII	6.0	DSC-24	BS-PH 474P	Advanced Physics Lab. I	02
38.	IV	VII	6.0	DSC-25	BS-PH 475P	Advanced Electronic Lab	02
39.	IV	VII	6.0	DSC-26	BS-PH 476P	Project I	02
40.	IV	VII	6.0	DSE-05	BS-PH 477T	Nanotechnology	02
41.	IV	VII	6.0	DSE-06	BS-PH 478P	Nanotechnology Lab	02
42.	IV	VII	6.0	RM-01	BS-PH 479P	Research Methodology	04
43.	IV	VIII	6.0	DSC-27	BS-PH 481T	Quantum Mechanics II	03
44.	IV	VIII	6.0	DSC-28	BS-PH 482T	Statistical Mechanics	03
45.	IV	VIII	6.0	DSC-29	BS-PH 483T	Nuclear Physics	02
46.	IV	VIII	6.0	DSC-30	BS-PH 484P	Advanced Physics Lab. II	02
47.	IV	VIII	6.0	DSC-31	BS-PH 485P	Sensors and Transducers Lab.	02
48.	IV	VIII	6.0	DSC-32	BS-PH 486P	Project II	02
49.	IV	VIII	6.0	DSE-07	BS-PH 487T	Physics of Semiconductor Devices	02
50.	IV	VIII	6.0	DSE-08	BS-PH 488P	Physics of Semiconductor Devices Lab	02
51.	IV	VIII	6.0	OJT-02	BS-PH 489P	On Job Training	04

**B. Sc. Physics (Honours with Research)**

34.	IV	VII	6.0	DSC-21	BS-PH 471T	Mathematical methods in Physics III	03
35.	IV	VII	6.0	DSC-22	BS-PH 472T	Quantum Mechanics	03
36.	IV	VII	6.0	DSC-23	BS-PH 473P	Advanced Physics Lab. I	02
37.	IV	VII	6.0	DSC-24	BS-PH 474P	Advanced Electronic Lab	02
38.	IV	VII	6.0	DSE-05	BS-PH 473T	Nanotechnology	02
39.	IV	VII	6.0	DSE-06	BS-PH 474P	Nanotechnology Lab	02
40.	IV	VII	6.0	RM-01	BS-PH 476T	Research Methodology	04
41.	IV	VII	6.0	RP-01	BS-PH 477P	Research Project - I	04
42.	IV	VIII	6.0	DSC-19	BS-PH 481T	Statistical Mechanics	03
43.	IV	VIII	6.0	DSC-20	BS-PH 482T	Nuclear Physics	03
44.	IV	VIII	6.0	DSC-21	BS-PH 483P	Advanced Physics Lab. II	02
45.	IV	VIII	6.0	DSE-04	BS-PH 484P	Sensors and Transducers Lab	02
46.	IV	VIII	6.0	DSE-07	BS-PH 485T	Physics of Semiconductor Devices	02
47.	IV	VIII	6.0	DSE-08	BS-PH 486P	Physics of Semiconductor Devices Lab	02
48.	IV	VIII	6.0	RP-02	BS-PH 487T	Research Project - II	08

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's  
**New Arts, Commerce and Science College, Ahmednagar**  
**(Autonomous)**  
**Syllabus**  
**B. Sc. -I (Physics)**

Title of the Course: Mechanics and Properties of Matter								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-01	BS-PH 111T	02	00	02	30	15	35	50

**Learning Objectives:**

1. Explain the basics of Newtonian Mechanics.
2. Motivate students to use mechanics to the real life problems.
3. Explain terms like work, energy, power with the help of examples.
4. Explain various physical properties of the matter.
5. Inculcate numerical problem solving skills.

**Course Outcomes (Cos)**

1. Understand the mechanics of motion,
2. Understand the relation between the work, energy and power
3. Understand the mechanism of motion of system of particles.
4. Study various physical properties of the matter.
5. Demonstrate quantitative problem solving skills in all the topics covered

**Detailed Syllabus:**

**Unit I: Introduction to Mechanics**

**(07 Hrs.)**

Motion, Position and Displacement, Average Velocity and Average Speed, Instantaneous Velocity and Speed, Acceleration, Constant Acceleration, Graphical Representation of Motion, Newton's First Law, Newton's Second Law, Newton's Third Law, Applying Newton's Laws, Numerical Problems. (Ref. 1, Chapter 2, 4 and 5)

**Unit II: Work and Energy**

**(07 Hrs.)**

Energy, Work and Kinetic Energy Theorem, Work Done by the Gravitational Force, Work Done by a Spring Force, Work Done by a General Variable Force, Power, Work and Potential Energy, Conservative Forces, Conservation of Mechanical Energy, Potential Energy Curve, Work Done on a System by an External Force, Conservation of Energy, Numerical Problems. (Ref. 1, Chapter 7 and 8)

**Unit III: Center of Mass and Momentum****(07 Hrs.)**

The Center of Mass, Newton's Second Law for a System of Particles, Linear Momentum, Collision and Impulse, Conservation of Linear Momentum, Inelastic and Elastic Collisions, Collisions in Two Dimension, Systems with Varying Mass: A Rocket, Rotational Motion, Angular Acceleration, Rotational Inertia, Torque, Angular Momentum, Newton's Second Law in Angular Form, Angular Momentum of a Rigid Body Rotating About a Fixed Axis, Conservation of Angular Momentum, Numerical Problems. (Ref. 1, Chapter 9, 10 and 11).

**Unit IV: Properties of Matter****(09 Hrs.)**

Elasticity: Stress and Strain, Hook's Law, Young's Modulus, Bulk Modulus, Modulus of Rigidity, Fluid Mechanics: Pascal's Law and its applications, Viscosity, Reynold's Number, Equation of Continuity. Surface Tension, Factors affecting the surface tension of a liquid, Jaeger's method, Capillarity, Bernoulli's Theorem and its applications, Problems. (Ref. 2, Chapter 15, Ref. 1, Chapter 14).

**Suggested Readings:**

1. Fundamentals of Physics: Resnick, Halliday & Walker 9/e, Wiley, 2011.
2. Essential UNIVERSITY PHYSICS, 2ed, Richard Wolfson, Middlebury College, Addison Wesley, Pearson, 2012,
3. Mechanics: D. S. Mathur, S. Chand and Company, New Delhi.
4. Elements of Properties of Matter: D. S. Mathur, S. Chand, New Delhi.
5. Concepts of Physics: H. C. Verma, Bharati Bhavan Publisher.
6. Problems in Physics: P. K. Srivastava, Wiley Eastern Ltd.
7. Applied Fluid Mechanics: Mott Robert, Pearson Benjamin Cummir VI Edition. Pearson Education/Prentice Hall International, New Delhi.
8. Properties Of Materials (Nature And Properties Of Materials: III), Prof. Ashish Garg, Department of Materials Science and Engineering, IIT Kanpur, <https://nptel.ac.in/courses/113/104/113104096/>
9. Classical Physics, Prof. V. Balakrishnan, Department of Physics, Indian Institute of Technology, Madras, <https://nptel.ac.in/courses/122/106/122106027/>

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's  
**New Arts, Commerce and Science College, Ahmednagar**  
**(Autonomous)**  
**Syllabus**  
**B. Sc. -I (Physics)**

Title of the Course: Introductory Physics Lab-I								
Year: I					Semester: I			
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-02	BS-PH 112P	00	02	02	60	15	35	50

**Learning Objectives:**

1. Explain various measuring instruments with their applications in real life.
2. Explain the theoretical concept with the help of experiments.
3. Give hand on skills to conduct the practical.
4. Motivate and encourage students to solve real life problems through experiments.

**Course Outcomes (Cos):**

1. Handling of the various basic measuring instruments.
2. Experimentally analyzed the theory taught during lectures,
3. Hands on Experiments help students to learn various concepts of Physics.
4. Experimental tools helps to develop ability to address real world problems.

**Detailed Syllabus: Any 12 Experiments**

Sr. No	Title of the experiment
1.	Study and Use of Vernier caliper, Micrometer Screw Gauge to measure diameter of small spherical/cylindrical body, diameter of wire, thickness of sheet, etc.
2.	Study and use of Travelling Microscope to measure of diameter of wire, bore of capillary.
3.	Study and use of spherometer to determine the radius of curvature of a given spherical surface.
4.	Determination of Modulus of Rigidity " $\eta$ " of wire using Torsional Oscillations.
5.	Determination of Young's Modulus " $Y$ " of wire using flat spiral spring
6.	Determination of Modulus of Rigidity " $\eta$ " of wire using flat spiral spring
7.	Determination of " $Y$ " by bending method.
8.	Determination of surface tension by Jaeger's method
9.	Determination of Poisson's ratio of rubber using rubber tube /rubber chord
10.	Determination of surface tension of liquid using Fergusson Method
11.	Determine the surface tension of water by capillary rise method
12.	Verify the Hook's Law - study of the spring constant of a helical spring from its load-extension graph.

13.	Determination of Moment of Inertia of Flywheel.
14.	Determine Young's modulus of material of a given wire by using Searle's apparatus.

**Activity:** Study tour visit report / mini project / science exhibition participation or any other activity equivalent to **TWO** experiments.

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's  
**New Arts, Commerce and Science College, Ahmednagar**  
**(Autonomous)**  
**Syllabus**  
**B. Sc. -I (Physics)**

Title of the Course: Physics Principles and Electrostatics								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
<b>DSC-03</b>	BS-PH121T	00	02	02	30	15	35	50

**Learning Objectives:**

1. Explain historical development of the atomic models and corresponding theory.
2. Explain construction and working of the LASER with properties.
3. Explain the real life applications of the LASER in various fields.
4. Teach use of Coulomb's law and Gauss' law for the electrostatic force

**Course Outcomes (Cos):**

After going through the course, the student should be able to

1. Gets an idea about basics of the atoms using different atomic models?
2. Understand the types of LASER and their applications in real life.
3. Understand Fundamental laws and concepts in electricity.
4. Learn properties of static electric fields and how they arise.

**Detailed Syllabus:****Unit I: Particle Nature of Matter****(07 Hrs.)**

The Atomic Nature of Matter, The Composition of Atoms, Rutherford's Model of the Atom, Bohr Atom, Spectral Series, Bohr's Quantum Model of the Atom, Bohr's Correspondence Principle, Direct Confirmation of Atomic Energy, Levels: The Franck-Hertz Experiment. (Ref. 1, Chapter 4)

**Unit II: LASER and Applications****(08 Hrs.)**

Introduction to LASERS, Basic Principle of Lasers: Three Processes, Characteristics of Lasers: Boltzmann Distribution Law, Population Inversion and Pumping, Types of Lasers: He-Ne Laser, Ruby Laser, Applications of Lasers, Problems. (Ref. 2, Chapter 1, 10)

**Unit III: Electrostatics****(07 Hrs.)**

Coulomb's Law, Electric Field, Continuous Charge Distributions, Divergence and Curl of Electrostatic Fields, Field Lines, Flux, and Gauss's Law, Applications of Gauss's Law, Electric Potential, Conductors, Basic Properties, Induced Charges, Surface Charge and the Force on a Conductor, Capacitors, Numerical Problems. (Ref. 3, Chapter 2)

**Unit IV: Dielectrics****(08 Hrs.)**

Dielectrics, Electric Dipole, Induced Dipoles, Alignment of Polar Molecules, Polarization, Field Inside a Dielectric, Electric Displacement, Gauss's Law in the Presence of Dielectrics, Linear Dielectrics, Susceptibility, Permittivity, Dielectric Constant, Forces on Dielectrics, Applications of Gauss's Law (Ref.3, Chapter 4).

**Suggested Readings/Material:**

1. Raymond A. Serway, Clement J. Moses, Curt A. Moyer, Modern Physics, Thomson Learning Academic Resource Center, Third Edition, 2005.
2. K. Thyagarajan · Ajoy Ghatak, Lasers Fundamentals and Applications, Springer, 2<sup>nd</sup> Edition.
3. David J. Griffiths, Introduction to Electrodynamics, Pearson Education, 4<sup>th</sup> Edition, 2013.
4. Fundamental of Physics, J. Walker, D. Halliday, R. Resnick, 10th Ed. Wiley Publication, 2013.
5. Electromagnetics: B. B. Laud. Foundations of Electromagnetic theory: Reitz, Milford, Christey, 3rd Ed. New Age International Private Limited, 2011.
6. Electricity and Electronics: D.C. Tayal, Himalaya Publishing House, Mumbai, 2019.
7. Introduction to Electrodynamics: D.G. Griffith, 4th Ed., Pearson Education India Learning Private Limited, 2015.
8. Electricity and Magnetism: Brij Lal, Subramanyan, Ratan Prakashan (Revised edition, 1997).
9. Concepts of Modern Physics: Special Indian Edition, A Beiser (6th Ed., McGraw Hill, 2009
10. Modern Physics: 3rd Ed., Raymond A. Serway, Clement J. Moses, Curt A. Moyer, 2012.
11. Sears and Zemansky's University Physics: H.D. Young R. A. Freedman, Sandin, 14th Ed. Pearson Education, 2015.
12. NPTEL Video Lecture: Amal Kumar Das, Department Of Physics, Iit Kharagpur, Atomic And Molecular Physics,  
<https://archive.nptel.ac.in/courses/115/105/115105100/>
13. NPTEL Video Lecture: M. R. Shenoy, Department of Physics, IIT Delhi, Introduction to LASER,  
<https://archive.nptel.ac.in/courses/115/102/115102124/>
14. NPTEL Video Lecture: MANABENDRA CHANDRA, Department of Chemistry, IIT Kanpur, LASER: Fundamentals and Applications,  
<https://archive.nptel.ac.in/courses/104/104/104104085/>
15. NPTEL Video Lecture: MANOJ HARBOLA, Department of Physics, IIT Kanpur, Introduction to Electromagnetic Theory,  
<https://archive.nptel.ac.in/courses/115/104/115104088/>



Ahmednagar Jilha Maratha Vidya Prasarak Samaj's  
New Arts, Commerce and Science College, Ahmednagar  
(Autonomous)

## B. Sc. -I (Physics)

Title of the Course: Introductory Physics Lab-II								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-04	BS-PH122P	00	02	02	60	15	35	50

### Learning Objectives:

1. Explain various measuring instruments with their applications in real life.
2. Explain the theoretical concept with the help of experiments.
3. Give hand on skills to conduct the practical.
4. Motivate and encourage students to solve real life problems through experiments.

### Course Outcomes (Cos):

1. Handling of the various basic measuring instruments.
2. Experimentally analyzed the theory taught during lectures.
3. Hands on Experiments help students to learn various concepts of Physics.
4. Experimental tools help to develop ability to address real world problems.

### Detailed Syllabus: 12 Experiment

Sr. No.	Title of Experiment
1.	Study of Multimeter (analog and digital)
2.	Measure AC and DC Voltage using analog and digital multimeter
3.	Measure resistance using Digital and analog multimeter
4.	Determine angle of Prism using spectrometer
5.	Determination of angle of minimum deviation and find out wavelength of unknown light
6.	Determination of Refractive Index of glass with the help of Prism
7.	Determination of wavelength of Laser Light using different Grating element
8.	Characteristics of LASER Intensity and Divergence
9.	Determination of Cauchy's Constant
10.	Determine the Frequency of AC with sonometer
11.	Determine RC time constant by charging and discharging of capacitor
12.	Dispersive Power of Prism

<b>13.</b>	Determination of Planks Constant
<b>14.</b>	Measure the particle size of lycopodium powder using laser beam

**Activity:** Study Tour Visit Report / Mini Project / Science Exhibition Participation or any other activity equivalent to **TWO** experiments.