F.Y.B.Sc. (Physics)

Semester-I

&

Semester-II

Syllabus

2019 Pattern

Anekant Education Society's

Tuljaram Chaturchand College

of Arts, Science and Commerce, Baramati

(Autonomous Status)

(Affiliated to Savitribai Phule Pune University, Pune)

Course Structure for F.Y.B.Sc. Physics 2019 pattern

Semester	Paper Code	Title of Paper	No. of Credits
I	PHY1101	Mechanics & Properties of Matter	2
	PHY1102	Electromagnetics	2
	PHY1103	Practical-I	2
II	PHY1201	Heat and Thermodynamics	2
	PHY1202	Waves and Optics	2
	PHY1203	Practical-II	2

Program Outcomes

PO1: Disciplinary Knowledge

PO2: Critical Thinking and Problem solving

PO3: Social competence

PO4: Research-related skills and Scientific temper

PO5: Trans-disciplinary knowledge

PO6: Personal and professional competence

PO7: Effective Citizenship and Ethics

PO8: Environment and Sustainability

PO9: Self-directed and Life-long learning

SYLLABUS (CBCS) FOR F.Y.B.Sc. PHYSICS (W.E.F. June 2019)

Academic Year 2020-2021

Class : F.Y. B. Sc. (Semester- I)
Paper Code: PHY1101
Paper : I Title of Paper: Mechanics & Properties of Matter
Credit : 2 No. of lectures: 36

A) Learning Outcome:
On successful completion of this course students will be able to do the following:
CO1: Understand the concepts of energy, work, power, conservation of energy and be able to perform calculations using them.
CO2: Understand the concepts of elasticity and be able to perform calculations using them.

CO3: Understand the concepts of surface tension and viscosity and be able to perform calculations using them.

CO4: Apply the knowledge in construction of beams, bridges etc,

CO5: Use of Bernoulli's Principle in real life examples.

CO6: Demonstrate quantitative problem solving skills in all the topics covered.
CO7: Apply knowledge in understanding the flow of liquid and surface tension applied on the surface of liquid.

TOPICS/CONTENTS:

UNIT 1: Motion (6L)

1.1 Introduction (motion, displacement, velocity, acceleration, forces)
1.2 Newton's laws & its applications.
1.3 Limitation of Newton's laws of motion
1.4 Newton's law of gravitation.
1.5 Frame of reference: Inertial and non- inertial
1.6 Introduction to classical relativity
Problem Solving

UNIT 2: Work and Energy (8L)

2.1 Introduction (work, energy, power)
2.2 Work and Work-Energy theorem
2.3 Calculation of work done with constant force and variable force
2.4 Conservative and non-conservative forces
2.5 Potential energy and conservation of mechanical energy
2.6 Change in potential energy in rigid body motion
2.7 Mass-energy equivalence
Problem Solving

UNIT 3: Elasticity (8L)

3.1 Introduction
(Hook's law and coefficient of elasticity, Young's modulus,
Bulk modulus and Modulus of rigidity)

3.2 Work done during longitudinal strain, volume strain, and shearing strain
Poisson's ratio.

3.3 Relation between three elastic moduli (Y, η, K)

3.4 Determination of Y of rectangular thin bar loaded at the centre

3.5 Torsional oscillations

3.6 Determination of rigidity of a wire by torsional oscillations

Problem solving

UNIT 4: Surface Tension (6L)

4.1 Introduction: **(**surface tension, angle of contact)

4.2 Capillary rise method, rise of liquid in a conical capillary tube

4.3 Energy required to raise a liquid in capillary tube

4.4 Jaeger's method for determination of surface tension

4.5 Factors affecting surface tension

4.6 Applications of surface tension (washing of cloths with detergents, surfactants, capillary action)

Problem Solving

Unit 5: Viscosity (8L)

5.1 Introduction**: (**Concept of viscous force and viscosity, Pressure in a fluid, buoyancy, Pascal's law and Archimedes Principle)

5.2 Atmospheric Pressure and Barometer

5.3 Pressure difference in liquid accelerating vertically upward with an acceleration a_0

5.4 Pressure difference in liquid accelerating horizontally with an acceleration a_0

5.5 Steady and turbulent flow, Reynolds's number

5.6 Equation of continuity

5.7 Poiseuille's equation

5.8 Bernoulli's Principle and its application

Problem Solving

References:

1. University Physics: Sears and Zeemansky, XIth edition, Pearson education
2. Concepts of Physics: H.C. Varma, Bharati Bhavan Publishers
3. Problems in Physics: P.K. Srivastava, Wiley Eastern Ltd.
4. Applied Fluid Mechanics: Mott Robert, Pearson Benjamin Cummir, VI Edition,
5. Pearson Education/Prentice Hall International, New Delhi
6. Properties of Matter: D. S. Mathur, Shamlal Chritable Trust New Delhi
7. Mechanics: D.S Mathur, S Chand and Company New Delhi-5.

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)								
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	3								
CO 2	2								
CO 3				2					
CO 4					2				
CO 5				3				3	
CO 6		3				2			3
CO7			2				2		

Justification

PO1: Disciplinary Knowledge

CO1: Understand the concepts of energy, work, power, conservation of energy and be able to perform calculations using them. Weightage: 3

Disciplinary knowledge is directly aligned with understanding and applying fundamental concepts like energy, work, and conservation. A strong relation is evident.

CO2: Understand the concepts of elasticity and be able to perform calculations using them. Weightage: 2

Elasticity is part of disciplinary knowledge, but its direct relation to core physics concepts may not be as strong as energy and conservation.

PO2: Critical Thinking and Problem Solving

CO6: Demonstrate quantitative problem-solving skills in all the topics covered. Weightage: 3

Critical thinking and problem-solving skills are essential in physics, making this a strong relationship.

PO3: Social Competence

CO7: Apply knowledge in understanding the flow of liquid and surface tension applied on the surface of liquid. Weightage: 2

While the understanding of fluid dynamics and surface tension is part of social competence (e.g., in medical and environmental contexts), the direct link is moderate.

PO4: Research-related Skills and Scientific Temper

CO5: Use of Bernoulli’s Principle in real-life examples. Weightage: 3

Research-related skills and scientific temper are directly linked to applying principles like Bernoulli's in real-world scenarios. The relationship is strong.

CO3: Understand the concepts of surface tension and viscosity and be able to perform calculations using them. Weightage: 2

Research skills are involved in understanding surface tension and viscosity, but the direct link may not be as strong as with Bernoulli's Principle.

PO5: Trans-disciplinary Knowledge

CO4: Apply knowledge in the construction of beams, bridges, etc. Weightage: 2

While this involves applying physics knowledge in different contexts, the direct trans-disciplinary link may not be as strong.

PO6: Personal and Professional Competence

CO6: Demonstrate quantitative problem-solving skills in all the topics covered. Weightage: 2

Personal and professional competence can benefit from problem-solving skills, though the link may not be as direct.

PO7: Effective Citizenship and Ethics

CO7: Apply knowledge in understanding the flow of liquid and surface tension applied on the surface of liquid. Weightage: 2

The ethical application of physics knowledge in understanding fluid dynamics can contribute to effective citizenship, indicating a moderate relationship.

PO8: Environment and Sustainability

CO5: Use of Bernoulli’s Principle in real-life examples. Weightage: 3

Understanding and applying Bernoulli's Principle can directly contribute to environmental and sustainability considerations, indicating a strong relationship.

PO9: Self-directed and Life-long Learning

CO6: Demonstrate quantitative problem-solving skills in all the topics covered. Weightage: 3

Self-directed and life-long learning often involve strong problem-solving skills, making the relationship direct and strong.

Class : F.Y. B. Sc. (Semester- I)
Paper Code: PHY1102
Paper : II Title of Paper: Electromagnetics
Credit : 2 No. of lectures: 36

A) Learning Outcome:
On successful completion of this course students will be able to do the following:
CO1: Demonstrate and understand the electric force, field, potential and related Concepts for stationary charges.
CO2: Calculate electrostatic field and potential of simple charge distributions using Coulomb's law and Gauss's law.
CO3: Demonstrate and understand the dielectrics and effect of dielectric on electric field.
CO4: Demonstrate and understand the magnetic field for steady currents using Biot-Savart and Ampere's law.
CO5: Understand the concept of magnetization of materials.
CO**6:** Demonstrate quantitative problem solving skills in all the topics covered.
CO7: Apply knowledge in understanding the electromagnetism fundamentals in daily life.
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TOPICS/CONTENTS:

UNIT 1: Electrostatics (10L)

1.1 Introduction (Electric charge, Coulombs law, potential, electric field, electric flux)
1.2 Gauss's theorem of electrostatics.
1.3 Applications of Gauss theorem-
- **1.3.1** Electric field due to point charge
- **1.3.2** Infinite line of charge
- **1.3.3** Uniformly charged spherical shell
- **1.3.4** Solid sphere

1.4. Electric potential as line integral of electric field
1.5 Electric Potential due to
- **1.5.1** A point charge
- **1.5.2** Electric dipole
- **1.5.3** Uniformly charged non conducting spherical shell
- **1.5.4** Calculation of electric field from potential

Problem Solving

UNIT 2: Dielectrics (10L)

2.1 Introduction (Dielectric constant, Polar & non-polar molecule)
2.2 Polarization
2.3 Polar and non-polar dielectrics
2.4 Capacitance due to parallel plate capacitor
2.5 Capacitance due to spherical capacitor and cylindrical capacitor
2.6. Energy per unit volume in electrostatic field
2.7 Effect of dielectric medium on capacitance of parallel plate capacitor
2.8 Displacement vector.
2.10 Gauss's theorem in dielectrics.
Problem Solving

UNIT 3: Magnetism (10L)

3.1 Introduction (Lines of forces, Magnetization, Magnetic field)
3.2 Magnetostatics
3.3 Biot-Savart's law & its applications
3.3.1. Straight conductor
3.3.2. Circular coil
3.4 Ampere's circuital law and its applications
3.5 Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability,
Susceptibility, hysteresis
3.6. Magnetization of materials
3.7 Types of magnetic materials: dia, para, ferro, antiferro, and ferri magnetic
Problem Solving

UNIT 4: Electromagnetic Induction (10L)

4.1 Introduction
4.2 Faraday's laws of electromagnetic induction
4.3 Lenz's law
4.4 Self and mutual inductance
4.5 Self inductance of single coil
4.6 Mutual inductance between two coils
4.7 Maxwell's equations and their significance
Problem Solving

References:

1. Electricity and Magnetism, D. C. Tayal, 1988, Himalaya Publishing House.
2. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
3. Fundamentals of Physics: 8th Edition, Halliday Resnik and Walkar

	Programme Outcomes (POs)								
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	3								
CO 2	3								
CO 3									
CO 4				3					
CO 5					2				
CO 6		3				2			3
CO7			2				2	2	

Justification

PO1: Disciplinary Knowledge

CO1: Demonstrate and understand the electric force, field, potential, and related concepts for stationary charges. Weightage: 3

This directly aligns with the core disciplinary knowledge in the field of electrostatics, indicating a strong relation.

CO2: Calculate electrostatic field and potential of simple charge distributions using Coulomb's law and Gauss's law. Weightage: 3

Calculation of electric field and potential using fundamental laws is a direct application of disciplinary knowledge.

PO2: Critical Thinking and Problem Solving

CO6: Demonstrate quantitative problem-solving skills in all the topics covered. Weightage: 3

Critical thinking and problem-solving skills are crucial in solving quantitative problems, indicating a strong relationship.

PO3: Social Competence

CO7: Apply knowledge in understanding the electromagnetism fundamentals in daily life. Weightage: 2

While the understanding of electromagnetism has social applications, the direct link may not be as strong as in other cases.

PO4: Research-related Skills and Scientific Temper

CO4: Demonstrate and understand the magnetic field for steady currents using Biot-Savart and Ampere's law. Weightage: 3

Research-related skills are involved in understanding and applying complex laws like Biot-Savart and Ampere's law, indicating a strong relationship.

PO5: Trans-disciplinary Knowledge

CO5: Understand the concept of magnetization of materials. Weightage: 2

While the concept of magnetization has applications in different fields, the direct trans-disciplinary link may not be as strong.

PO6: Personal and Professional Competence

CO6: Demonstrate quantitative problem-solving skills in all the topics covered. Weightage: 2

Problem-solving skills contribute to personal and professional competence, though the link may not be as direct.

PO7: Effective Citizenship and Ethics

CO7: Apply knowledge in understanding the electromagnetism fundamentals in daily life. Weightage: 2

The ethical application of electromagnetism knowledge in daily life can contribute to effective citizenship, indicating a moderate relationship.

PO8: Environment and Sustainability

CO7: Apply knowledge in understanding the electromagnetism fundamentals in daily life. Weightage: 2

While electromagnetism has applications in various technologies with environmental implications, the direct link may not be as strong.

PO9: Self-directed and Life-long Learning

CO6: Demonstrate quantitative problem-solving skills in all the topics covered. Weightage: 3

Self-directed and life-long learning often involves strong problem-solving skills, making the relationship direct and strong.

Class : F.Y. B. Sc. (Semester- I)
Paper Code: PHY1103
Paper : III Title of Paper: Practical-I
Credit : 2 No. of Practicals: 10

A) Learning Outcome:
After successfully completing this laboratory course, the students will be able to do the following:
CO1: Acquire technical and manipulative skills in using laboratory equipment, tools, and materials.
CO2: Demonstrate an ability to collect data through observation and/or experimentation and interpreting data.
CO3: Demonstrate an understanding of laboratory procedures including safety and scientific methods.
CO4: Demonstrate a deeper understanding of abstract concepts and theories gained by experiencing and visualizing them as authentic phenomena.
CO5: Acquire the complementary skills of collaborative learning and teamwork in laboratory settings.
CO6: Apply knowledge in understanding the experimental Principles in Project work for demonstration.
CO7: Experimental Models for easy understanding and explanation Physics concepts.

Syllabus:

1. Mechanics (Any Four)

1. Use of tools and instruments as a measuring device
(Vernier caliper, micrometer screw gauge, travelling microscope, spectrometer etc.)
2. Determination MI of disc using ring
3. MI of Flywheel
4. Determination of coefficient of Viscosity by Poiseuille's method
5. Determination of Y and n by flat spiral spring
6. Determination of Y by method of bending
7**.** Surface Tension by Jaeger's method.
8. To study one-dimensional elastic collisions using two hanging spheres.
9. To determine poisons ratio for rubber.

2. Electricity and magnetism (Any Four)

1. Charging and discharging of a capacitor
2. Study of LR circuit
3. Study of LCR series circuit
4. Study of Kirchhoff's laws
5. Diode characteristics
6. Use of multimeter to measure DC and AC current, voltage and resistance

3. Additional Activities

1. Demonstrations (Any two demonstrations equivalent to two experiments)

1. Magnet –magnet interaction
2. Collision by using balls
3. Use of CRO (measurement of AC voltage, frequency)

4. Measurement of sound pressure level

2. Computer aided demonstrations using computer simulations or animations (Any one demonstrations equivalent to two experiments)

1. Coulomb's law
2. Visualization of vectors
3. Bohr's model

3. Student Involvement (Any one equivalent to two experiments)

1. Mini Projects

Group of 4 students should carry out mini project with the report.

Students have to perform at least one additional activities out of three activities in addition to eight experiments mentioned above. Total Laboratory work with additional activities should be equivalent to ten experiments.

	Programme Outcomes (POs)								
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1				3					
CO 2		3							
CO 3					2		2	2	
CO 4	3								
CO 5			3			2			
CO 6				2					2
CO7	3								

Justification

PO1: Disciplinary Knowledge

CO4: Demonstrate a deeper understanding of abstract concepts and theories gained by experiencing and visualizing them as authentic phenomena.Weightage: 3

Acquiring deeper understanding through hands-on experience in the laboratory aligns directly with disciplinary knowledge.

CO7: Experimental Models for easy understanding and explanation of Physics concepts. Weightage: 3

Creating experimental models for better understanding involves disciplinary knowledge and direct application, indicating a strong relationship.

PO2: Critical Thinking and Problem Solving

CO2: Demonstrate an ability to collect data through observation and/or experimentation and interpreting data. Weightage: 3

Critical thinking is involved in collecting and interpreting data, making this relationship strong.

PO3: Social Competence

CO5: Acquire the complementary skills of collaborative learning and teamwork in laboratory settings.

Weightage: 3

Collaborative learning and teamwork in a laboratory setting contribute to social competence.

PO4: Research-related Skills and Scientific Temper

CO1: Acquire technical and manipulative skills in using laboratory equipment, tools, and materials.

Weightage: 3

Acquiring technical and manipulative skills in a laboratory setting is a fundamental aspect of research-related skills.

CO6: Apply knowledge in understanding the experimental Principles in Project work for demonstration. Weightage: 2

Applying knowledge in a project setting is relevant to research-related skills, though the link may not be as direct as acquiring technical skills.

PO5: Trans-disciplinary Knowledge

CO3: Demonstrate an understanding of laboratory procedures including safety and scientific methods.

Weightage: 2

Understanding laboratory procedures has applications in various disciplines, but the link may not be as strong as in other cases.

PO6: Personal and Professional Competence

CO5: Acquire the complementary skills of collaborative learning and teamwork in laboratory settings.

Weightage: 2

Collaborative learning and teamwork contribute to personal and professional competence, though the link may not be as direct.

PO7: Effective Citizenship and Ethics

CO3: Demonstrate an understanding of laboratory procedures including safety and scientific methods.

Weightage: 2

Understanding laboratory procedures, especially safety and scientific methods, contributes to effective citizenship and ethics in scientific practice.

PO8: Environment and Sustainability

CO3: Demonstrate an understanding of laboratory procedures including safety and scientific methods.

Weightage: 2

Adhering to laboratory safety procedures can indirectly contribute to environmental and sustainability considerations.

PO9: Self-directed and Life-long Learning

CO6: Apply knowledge in understanding the experimental principles in Project work for demonstration. Weightage: 2

Applying knowledge in project work is relevant to self-directed and life-long learning, though the link may not be as direct.