M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to Savitribai Phule Pune University
NAAC accredited 'A' Grade

(CBCS – Autonomy 23 Pattern)

Course/ Paper Title	**Mechanics and Properties of Matter**
Course offered as	**Minor**
Course Code	**23SBPH21MN**
Semester	**II**
No. of Credits	**2**
No. of Hours	**30**

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand the basic terms like displacement, velocity, acceleration etc. associated with motion.
2.	To demonstrate an understanding of Newton's laws and applying them in calculations of the motion of simple systems
3.	To Understand the concept of energy, work, power and conservation of energy and perform calculations.
4.	To understand the concept of viscosity and Bernoulli's theorem and its real-life applications
5.	To understand the concept of surface tension and elasticity and its applications
6.	To demonstrate quantitative problem-solving skills in all the topics covered.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will understand the basic terms like displacement, velocity, acceleration etc. associated with motion.
2.	Students will apply Newton's laws in calculations of the motion of simple systems
3.	Students will understand the concept of energy, work, power and conservation of energy and perform calculations.
4.	Students will understand the concept of viscosity and Bernoulli's theorem and its real-life applications
5.	Students will understand the concept of surface tension and elasticity and its applications
6.	Students will acquire quantitative problem-solving skills in all the topics covered.

Syllabus

Sr. No.	Title with Contents	No. of Lectures
Unit I	**Motion:**	**7**
	1. Introduction to motion	2
	i. Types of motion	
	ii. Displacement	
	iii. Velocity	
	iv. Acceleration	
	v. Inertia	
	2. Newton's laws of motion with their explanations	3
	i. Various types of forces in nature	
	ii. Frames of reference (Inertial and Non inertial)	
	iii. Laws of motion and its real-life applications	
	iv. 3. Problems	2

Unit II	**Work and Energy**	**7**
	1. Kinetic energy	2
	i. Work Energy Theorem	
	ii. Work done with constant force	
	iii. Work done with varying force (spring force)	
	2. Conservative and non-conservative forces	3
	i. Potential energy	
	ii. Law of energy conservation	
	iii. Gravitational potential energy	
	3. Problems	2
Unit III	**Fluid Mechanics**	**6**
	1. Concept of viscous force and viscosity	2
	i. Coefficient of viscosity	
	ii. Steady and Turbulent flow	
	iii. Reynolds number	
	2. Bernoulli's Theorem	2
	i. Equation of continuity	
	ii. Bernoulli's Principle	
	iii. Application of Bernoulli's Principle: Venturi meter, Pitot tube	
	iv. Applications of viscous fluids	2
	3. Problems	
Unit IV	**Surface Tension and Elasticity**	**10**
	1. Surface tension	1
	i. Angle of contact	
	ii. Factors affecting surface tension	
	2. Jaeger's method for determination of surface tension	1
	i. Applications of surface tension	
	3. Concept of elasticity	2
	i. Stress and Strain	

	ii. Young's modulus iii. Bulk modulus iv. Modulus of rigidity v. Hooke's law **4. Work done during longitudinal strain** i. Volume strain ii. Shearing strain iii. Poisson's ratio **5. Relation between three elastic moduli, (Y, η, K)** i. Applications of elasticity **6. Problems**	2 2 2

References:

1. Resnick, Halliday & Walker, Physics Wiley.
2. Sears and Zemanski, University Physics, Pearson Education.
3. D. S. Mathur, Mechanics, S. Chand and Company, NewDelhi.
4. D. S. Mathur, Elements of Properties of Matter, S. Chand, NewDelhi.
5. H. C. Verma, Concepts of Physics, Bharati Bhavan Publisher.
6. P. K. Srivastava , Problems in Physics , Wiley Eastern Ltd.
7. Mott Robert Applied Fluid Mechanics, Pearson Education/Prentice Hall International, New Delhi.
8. J C Upadhyaya, Fundamentals of Mechanics, Himalaya Publishing House.
9. D. S. Mathur, Revised by P. S. Hemne, Mechanics, S. Chand and Company, NewDelhi.
10. D H Bergey; John G Holt, Bergey's manual of determinative Bacteriology, 9th Edition. , Baltimore: Williams & Wilkins, 1994.

M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to Savitribai Phule Pune University
NAAC accredited 'A' Grade

(CBCS – Autonomy 23 Pattern)

Syllabus Course/ Paper Title	**Electricity and Magnetism**
Course offered as	**Minor**
Course Code	**23SBPH22MN**
Semester	**II**
No. of Credits	**2**
No. of Hours	**30**

Aims and Objectives of the Course

Sr. No.	Objectives
1.	To understand the concept of the electric force, electric field and electric potential for stationary charges.
2.	Able to calculate electrostatic field and potential of charge distributions using Coulomb's law and Gauss's law.
3.	To understand the dielectric phenomenon and effect of electric field on dielectric.
4.	To Study magnetic field for steady currents using Biot-Savart and Ampere's Circuital laws.
5.	To study magnetic materials and its properties.
6.	Demonstrate quantitative problem-solving skills in all the topics covered.

Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will understand the concept of the electric force, electric field and electric potential for stationary charges.
2.	Students will be able to calculate electrostatic field and potential of charge distributions using Coulomb's law and Gauss's law.
3.	Students will understand the dielectric phenomenon and effect of electric field on dielectric.

4.	Students will understand magnetic field for steady currents using Biot-Savart and Ampere's Circuital laws.
5.	Students will understand magnetic materials and its properties.
6.	Students will be able to demonstrate quantitative problem-solving skills in all the topics covered.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	**Electrostatics**	**8**
	1. Revision of Coulomb's law Equation of state	1
	i. Statement	
	ii. Variation of forces with distances	
	1. Superposition principle	1
	i. Statement	
	ii. Explanation with illustration	
	2. Energy of system of charges	1
	3. Concept of electric field	1
	i. Due to point charge	
	ii. Due to group charges	
	4. Concept of electric flux	1
	6. Gauss's law in electrostatics	1
	7. Problems	2
Unit II	**Dielectrics**	**7**
	1. Introduction to dielectric materials	2
	2. Electric Dipole	
	i. Electric dipole	
	ii. Dipole moment	
	3. Electric potential and intensity at any point due to dipole	2
	i. Torque on a dipole placed in an electric field	
	4. Polar and non-polar molecules	1
	i. Electric polarization of dielectric material	

	ii. Gauss' law in dielectric **5. Electric vectors and its relation** **6. Problems**	 1 1
Unit III	**Electrical Circuits**	**5**
	1. Concept of Current Density i. Resistance ii. Resistivity iii. Kirchhoff's laws **2. Oscilloscopes** i. Block diagram of Oscilloscopes ii. Working of Oscilloscopes **3. Problems**	2 2 1
Unit IV	**Magnetostatics**	**5**
	1. Introduction to magnetization i. Magnetic Induction and Intensity of magnetization **2. Biot-Savart's law** i. Statement ii. Long straight conductor iii. Circular Coil **3. Ampere's circuital law** i. Statement ii. Field of Solenoid iii. Field of Toroid **4. Gauss' law for magnetism** **5. Problems**	1 1 1 1 1
Unit V	**Magnetic Properties of Materials**	**5**
	1. Definition of magnetic parameters i. Magnetization (M) ii. Magnetic Intensity (H) iii. Magnetic Induction (B)	2

	iv. Magnetic Susceptibility v. Magnetic Permeability vi. Relation between B, H and M **2. Ferrite materials, Hysteresis applications** **3. Problems**	 2 1

References:

1. HallidayResnik and Walkar , Fundamentals of Physics
2. B. B. Laud, Electromagnetics
3. Reitz,Milford, Christey, Foundations of Electromagnetic theory
4. D.C.Tayal, Electricity and Electronics,Himalaya Publishing House, Mumbai.
5. D.G. Griffith., Introduction to Electrodynamics
6. BrijLal, Subramanyan ,Electricity and Magnetism, Ratan Prakashan
7. Khare, Shrivastav , Electricity and Magnetism

M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to Savitribai Phule Pune University
NAAC accredited 'A' Grade

(CBCS – Autonomy 23 Pattern)

Course Offered as	**Vocational Skill Course (VSC)**
Course/ Paper Title	**Measurement Techniques and Mechanics**
Course Code	**23SBPH21VS**
Semester	II
No. of Credits	2
No of Hours	60

Aims & Objectives of the Course:

Sr. No.	Objectives
1	To get hands on training of measuring instruments
2	To understand concept of errors and least count.
3	To understand the use of basic instruments for measuring fundamental quantities.
4	To apply the techniques for basic measurements in experiments

Expected Course Specific Learning Outcome:

Sr. No.	Learning Outcome
1.	To acquire skills of measuring fundamental quantities of simple objects
2.	To find the most accurate values of quantities
3.	To understand the importance of errors.

List of Practicals (Minimum 15 Practicals to be conducted)	
1.	Concept of Least count, Range
2.	Types of errors
3.	Use of Vernier Calliper
4.	Use of Screw Gauge
5.	Use of Travelling Microscope
6.	Use of Analog and Digital Multimeter
7.	Measurement of AC/DC voltage, current.
8.	Use of CRO (front panel controls)
9.	Calibration of voltmeter
10.	Calibration of Ammeter
11.	Time period of Simple Pendulum
12.	Measurement of Power – DC circuits
13.	Moment of Inertia of Disc and Ring
14.	Measurement of Viscosity
15.	Use of manometer for pressure measurement
16.	Measurement of Elastic constant "Y"
17.	Measurement of Elastic constant "η"
18.	Poisson's Ratio
19.	Use of Spectrometer
20.	Use of Function Generator
21.	Demonstration of weather monitoring devices

Reference Books:

1. G. L. Squires Practical Physics, Third edition, Cambridge editions
2. Practical Physics for Engineers, V. Rajendran,, A. Marikani, J. Poongodi, Second Edition, Tata McGraw-Hill Publishing Company.

M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to Savitribai Phule Pune University
NAAC accredited 'A' Grade

(CBCS – Autonomy 23 Pattern)

Course Offered as	**Skill Enhancement Course (SEC)**
Course/ Paper Title	**Introduction to Digital Electronics**
Course Code	**23SBPH11SE**
Semester	**I**
No. of Credits	**2**
No of Hours	**30**

Course Objectives	
1.	To understand the general theory of numbers.
2.	To get familiar with concepts of digital electronics.
3.	To understand basic logic gates and basic electronic circuits.
4.	To demonstrate the logic of arithmetic operations using logic gates.
5.	To learn number systems and their representation.

Course Outcome **After completion of this course students will be able**	
1.	To simplify arithmetic operations
2.	To design basic logic circuits using gates
3.	To understand conversion from one system to another

Sr No.	Title with Contents	No. of Lectures
Unit I	**Number System and Logic Gates**	**10**
	1. Binary Number System	
	2. Conversion from BIN to DEC	
	3. Hexadecimal Number System	
	4. Hex to Decimal to Bin conversion	
	5. Positive and Negative Logic	
	6. Basic Logic gates (Universal and Derived)	
	7. De Morgan's Theorem	
	8. Boolean Algebra problems	
Unit II	**Arithmetic Operations and Circuits**	**10**
	1. Binary addition and subtraction	
	2. Subtraction using 1's compliment method	
	3. Subtraction using 2's compliment method	
	4. Half addition and subtraction	
	5. Full addition and subtraction	
	6. Half adder	
	7. Full adder	
	8. Application of Full adder	
	9. Problems	
Unit III	**Flip Flops**	**10**
	1. Clock Signal	
	2. 1-bit memory cell	
	3. RS flip flop	
	4. D flip flop	
	5. T flip flop	
	6. JK flip flop	
	7. Comparison of D and T flip flop	
	8. Comparison of RS and JK flip flop	
	9. Introduction of Multiplexers (Block Diagrams)	
	10. Introduction of Demultiplexers (Block Diagrams)	

Reference Books:

1) Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education.
2) Digital Electronics: Jain R.P., Tata McGraw Hill.
3) Digital Principles and Applications: Malvino Leach, Tata McGraw-Hill.
4) M. Morris Mano, " Digital Design " 3rdEdition, PHI, NewDelhi.
5) Ronald J. Tocci. "Digital Systems-Principles and Applications" 6/e. PHI. New Delhi. 1999.(UNITS Ito IV).
6) G. K. Kharate-Digital electronics-oxford university press.
7) S. Salivahana & S. Arivazhagan-Digital circuits and design.

M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to Savitribai Phule Pune University
NAAC accredited 'A' Grade

(CBCS – Autonomy 23 Pattern)

Course/ Paper Title	**Renewable Energy Resources and Harvesting**
Course offered as	**Skill Enhancement Course (SEC)**
Course Code	**23SBPH21SE**
Semester	**I**
No. of Credits	**2**
No of Hours	**30**

Aims and Objectives

Sr. No.	Objectives
1.	Impart theoretical knowledge about renewable energy resources.
2.	Provide them with exposure and hands-on learning

Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will learn theories of the renewable sources of energy, and also have hands-on experiences on them wherever possible.
2.	Students will learn about: (i) off-shore wind energy, (ii) tidal energy, (iii) solar energy, (iv) biogas energy and (v) hydroelectricity.
3.	Students will learn about Piezoelectricity, carbon- captured technologies like cells, batteries.

4.	The students will observe practical demonstrations of (i) training modules of solar energy, wind energy etc., (ii) Conversion of vibration into voltage using piezoelectric materials, (iv) conversion of thermal energy into voltage using thermoelectric modules.

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	**Fossil fuels and Alternate Sources of energy**	**3**
	1. Fossil fuels and nuclear energy, their limitation, need of renewable energy, non-conventional energy sources. 2. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean energy 3. Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.	1 1 1
Unit II	**Solar energy**	**6**
	1. Solar energy, its importance, storage of solar energy, solar pond, non-convective solar pond, applications of solar pond and solar energy, 2. Solar Water Heater, Flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. 3. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits and sun tracking systems.	2 2 2
Unit III	**Wind Energy harvesting**	**5**
	1. Fundamentals of Wind energy 2. Wind Turbines and Different Electrical Machines in Wind Turbines	1 2 2

	3. Power Electronic Interfaces, and Grid Interconnection Topologies	
Unit IV	**Ocean Energy**	**8**
	1. Ocean Energy Potential against Wind and Solar 2. Wave Characteristics and Statistics, Wave Energy Devices 3. Tide characteristics and Statistics, Tide Energy Technologies 4. Ocean Thermal Energy, Osmotic Power, 5. Ocean Bio-mass.	1 1 2 2 2
Unit V	**Geothermal Energy**	**4**
	1. Geothermal Resources 2. Geothermal Technologies	2 2
Unit VI	**Hydro Energy**	**4**
	1. Hydropower resources, Hydropower Technologies 2. Environmental Impact of Hydro Power sources	2 2

Demonstrations and Experiments

1) Demonstration of Training modules on Solar energy, wind energy, etc.
2) Conversion of vibration to voltage using piezoelectric materials
3) Conversion of thermal energy into voltage using thermoelectric modules.

Reference Books:

1. Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi
2. Solar energy - M P Agarwal - S Chand and Co. Ltd.
3. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd.
4. Godfrey Boyle, “Renewable Energy, Power for a sustainable future”, 2004, Oxford University Press, in association with The Open University.
5. Dr. P Jayakumar, Solar Energy: Resource Assesment Handbook, 2009
6. Balfour, M. Shaw and S. Jarosek , Photovoltaics, Lawrence J Goodrich (USA)
7. http://en.wikipedia.org/wiki/Renewable_energy

M. C. E. Society's

Abeda Inamdar Senior College

Of Arts, Science and Commerce, Camp, Pune-1

(Autonomous) Affiliated to Savitribai Phule Pune University

NAAC accredited 'A' Grade

(CBCS – Autonomy 23 Pattern)

Course Offered as	**Indian Knowledge System (IKS)**
Course/ Paper Title	**Contribution of Indian Scientists in Physics**
Course Code	**23SBPH11IK**
Semester	**I**
No. of Credits	**2**
No of Hours	**30**

Course Objectives	
1	To acknowledge about the scientific efforts of Indian Scientists.
2	To inculcate their values for betterment of the society and the country.
3.	To study the ideas of Physics formulated by Indian Scientists

Sr. No	**Name of Scientists**
1.	C. V. Raman
2.	Satyendranath Bose
3.	Homi J. Bhabha
4.	Subrahmanyam Chandrashekhar
5.	G. N. Ramachandran
6.	Harish Chandra
7.	Meghnad Saha
8.	Srinivasa Ramanujam
9.	APJ Abdul Kalam
10.	Mohammed Sami

11.	Vikram Sarabhai
12.	Raja Ramanna

Reference Books:

1. www.tifr.res.in
2. www.famousscientists.org
3. en.wikipedia.org
4. www.claerias.com

M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to Savitribai Phule Pune University
NAAC accredited 'A' Grade

(CBCS – Autonomy 23 Pattern)

Course Offered as	**Open Elective (OE)**
Course/ Paper Title	**Introduction to Numbers system**
Course Code	**23SBPH11OE**
Semester	**II**
No. of Credits	**2**
No of Hours	**30**

Aims & Objectives of the Course:

Sr. No.	Objectives
1	To learn number systems and their representation
2	To learn conversion between different number systems.

Expected Course Specific Learning Outcome:

Sr. No.	Learning Outcome
1	To reduce the fear of numbers amongst students
2	To get some insight of the digital world.

Sr.No.	Title with Contents	No. of Lectures
Unit I	**Number System**	15
	1. Decimal , Binary and Hexadecimal numbers	
	2. Characteristic of Decimal System	

	3. Binary Number system	
	4. Binary numbers from $(0)_{10}$ to $(15)_{10}$	
	5. Disadvantages of binary number system	
	6. Conversion from Binary to Decimal	
	7. Conversion from Decimal to Binary	
	8. Number in general Radix (Base)	
	9. Hexadecimal number system	
	10. Conversion from Hexadecimal to decimal	
	11. Conversion from Hexadecimal to Binary	
	12. Conversion from Binary to Hexadecimal	
	13. Conversion from Decimal to Hexadecimal	
Unit II	**Arithmetic Operations**	**15**
	1. 2.1Binary addition	
	2. Binary Subtraction	
	3. 1's compliment	
	4. 2' compliment	
	5. 9's compliment	
	6. 10's compliment	
	7. Fractional binary numbers	
	8. Conversion from fractional binary to decimal	
	9. Conversion from fractional decimal to binary	

Reference Books:

1. Floyd T.M., Jain R.P Digital Fundamentals Pearson Education
2. Malvino and Leach Digital Principles and Applications Tata McGraw-Hill
3. M. Morris Mano Digital Design -3rd Edition Prentice-Hall of India Pvt. Ltd
4. Ronald J. Tocci Digital Systems-Principles and Applications Prentice-Hall of India Pvt. Ltd
5. Anand Kumar Fundamentals of Digital Circuits Prentice-Hall of India Pvt. Ltd