



**VIVEKANAND COLLEGE, KOLHAPUR  
(EMPOWERED AUTONOMOUS)**

**DEPARTMENT OF PHYSICS  
Three/Four- Years UG Programme  
Department/Subject Specific Core or Major (DSC)**

**Curriculum, Teaching and  
Evaluation Structure**

**for**

**B.Sc.-I Physics**

**Semester-I & II**

**(Implemented from academic year 2024-25 onwards)**

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**VIVEKANAND COLLEGE, KOLHAPUR**

**(Empowered Autonomous)**

**Department of Physics**

**B.Sc. I**

**Program Outcomes (POs):**

PO1	To develop fundamental scientific knowledge
PO2	To develop basic scientific and mathematical skills
PO3	Students should progress their vertical mobility
PO4	To develop required technical skills
PO5	Develop moral, social and ethical values
PO6	Able to survive in society

**Program Specific Outcomes (PSOs):**

PSO1	Students should understand mathematical concepts needed for understanding Physics
PSO2	Students should understand fundamental basic theories of General Physics, Classical Mechanics, Quantum mechanics, Electricity and magnetism, Modern Physics and able to apply this knowledge to analyze the verity of physics phenomenon
PSO3	Students should learn laboratory skills; students should take measurements in Physics laboratory and analyze the measurements to draw valid conclusions
PSO4	Students will be capable of oral and written scientific communication and will prove that they can think critically and work independently.

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**VIVEKANAND COLLEGE, KOLHAPUR  
(Empowered Autonomous)**

**Department of Physics  
Teaching and Evaluation scheme  
Three/Four - Years UG Programme  
Department/Subject Specific Core or Major (DSC)  
First Year Semester- I & II**

Sr. No.	Course Abbr.	Course code	Course Name	Teaching Scheme Hours/week		Examination Scheme and Marks				Course Credits
				TH	PR	SEE	CIE	PR	Marks	
<b>Semester-I</b>										
1	DSC 1-I	DSC03PHY11	Mechanics	2	-	40	10	-	50	2
2	DSC 1-II	DSC03PHY12	Electricity and Magnetism - I	2	-	40	10	-	50	2
3	DSC 1-PR-I	DSC 1-PR-I	Physics Lab-I	-	4	-	-	25	25	2
4	OEC-PR-I	OEC03PHS19	Physics in Home Appliances-I	-	4	-	-	25	25	2
<b>Semester-II</b>										
1	DSC 1-III	DSC03PHY21	Properties of Matter	2	-	40	10	-	50	2
2	DSC 1-IV	DSC03PHY22	Electricity and Magnetism - II	2	-	40	10	-	50	2
3	DSC 1-PR-II	DSC 1-PR-II	Physics Lab-II	-	4	-	-	25	25	2
4	OEC- PR-II	OEC03PHS29	Physics in Home Appliances-II	-	4	-	-	25	25	2
<b>Total</b>				<b>8</b>	<b>16</b>	<b>160</b>	<b>40</b>	<b>100</b>	<b>300</b>	<b>16</b>

Vivekanand College, Kolhapur (Empowered Autonomous)

**B. Sc. Part – I Semester -I**  
**PHYSICS**  
**DSC 1-I: DSC03PHY11: MECHANICS**  
**Theory: 30 hrs.**  
**Marks-50 (Credits: 02)**

**Course Outcomes: Mechanics**

CO1	To demonstrate and understand the basic primary knowledge of Mechanician theories
CO2	Students will demonstrate a proficiency in solving problems in Vectors, Ordinary Differential Equations etc.
CO3	To understand the basic concepts of dot product, cross product, Ordinary Differential Equations, laws of motion, rotational motion, momentum and energy etc.
CO4	To develop the critical skill in students to understand laws of motion

**MECHANICS**

<b>Unit</b>	<b>Syllabus</b>	<b>Lectures</b>
Unit I	<p><b>Vectors:</b> Vector algebra: Definition of vector, Polar vectors and axial vectors, Addition of vectors, Rectangular resolution of vectors, Unit vector (definition), Position vector of a point, Product of two vector, Scalar and vector products- scalar or dot products and its geometrical interpretation, Work done as a scalar product, Vector or cross product and their useful results, Area of parallelogram, Scalar triple product, Vector triple product, Problems.</p> <p><b>Ordinary Differential Equations</b> Introduction to differential equation, Ordinary and Partial differential Equations, 1<sup>st</sup> order homogeneous differential equations, 2<sup>nd</sup> order homogeneous differential equations with constants coefficients, examples</p> <p><b>Momentum and Energy</b> Introduction to mechanics, Mechanics of a particle: Conservation theorem of linear momentum, angular momentum, energy, Concept of Centre of Mass, Mechanics of system of particles: Conservation theorem of linear momentum, angular momentum, energy.</p>	15 Hours
Unit II	<p><b>Laws of motion</b> Introduction of coordinate systems (Cartesian, Polar, Cylindrical, and Spherical), Definition of translational and rotational motion, force and torque, Frames of reference - Inertial and Non-inertial frames with examples, Newton's laws of motion (first, second and third) and their proofs.</p> <p><b>Rotational motion</b> Rotational variables - Angular position, Angular displacement, Angular velocity, Angular acceleration, Moment of inertia – definition, M.I. of a spherical shell about its axis of symmetry, M.I. of solid cylinder about its symmetry axis, Motion of spherical shell and solid cylinder rolling down an inclined plane.</p>	15 Hours

**Reference Books:**

- 1) Elements of properties of matter – D.S. Mathur, Shamlal Charitable trust New Delhi, 2008.
- 2) Physics – Resnick, Halliday & Walker, Wiley eastern Ltd, New Delhi, 2010
- 3) Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., Oxford University Press, 2015
- 4) University Physics, Ronald Lane Reese, Thomson Brooks, 2003.
- 5) Concepts of Physics –Vol.1 H.C. Verma -Bharati Bhavan Publishers, 1999.

Vivekanand College, Kolhapur (Empowered Autonomous)

B. Sc. Part – I Semester -I

Physics

DSC1-II: DSC03PHY12: Electricity and Magnetism – I

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes: ELECTRICITY AND MAGNETISM – I

CO1	To demonstrate and understand the applied knowledge of electricity, Magnetism
CO2	Students will demonstrate a proficiency in solving problems in gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields.
CO3	To understand the basic concepts of dielectric, polarization, electric vector, electric susceptibility.
CO4	To develop the critical skill in students to understand applied knowledge of Electricity, Magnetism and Electromagnetic Theory.

ELECTRICITY AND MAGNETISM – I

Unit	Syllabus	Lectures
Unit I	<p><b>Vector analysis</b> Del operator, Gradient of a scalar field and its physical significance, Divergence of vector field and its physical significance, Curl of vector field, Line, Surface and volume integral (definitions only), Gauss divergence theorem and Stoke's theorem (statements only).</p> <p><b>Electrostatics</b> Coulomb's law, Electrostatic field, Electric flux, Gauss's theorem of electrostatics, Electric potential as line integral of electric field, Potential due to a point charge, Electric dipole, Uniformly charged spherical shell and solid sphere, Calculation of electric field from potential.</p>	15 Hours
Unit II	<p><b>Dielectrics</b> Introduction to Dielectrics, Polar and Non polar molecules, Dielectric medium, Polarization vector, Displacement vector, Electric vector, Relation between E, P and D vectors, Electric susceptibility of dielectrics</p> <p><b>Magnetostatics</b> Introduction to magnetization and intensity of Magnetization, Biot-Savart's law &amp; its applications- straight conductor, Circular coil, Solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law.</p>	15 Hours

**Reference Books:**

1. Electricity and Magnetism, D C Tayal, Himalaya Publishing House, 1998.
2. University Physics, Ronald Lane Reese, Thomson Brooks, 2003.
3. D.J. Griffiths, Introduction to Electrodynamics, 3rd Edition, Cambridge University Press, 1998
4. Electricity and Magnetism – Khare and Shrivastav, L. B. S. Publications, 1966.

**B. Sc. Part – I Semester -I**

**Physics**

**DSC 1- PR-I: DSC03PHY29:**

**PHYSICS LAB (I)**

**Practical: Four lectures of 60 minutes per week per batch**

**Marks: 25 (Credits 02)**

**Group – I**

**(Mechanics)**

- 1) Measuring dimensions of object by using a Vernier caliper and screw gauge.
- 2) Estimation of Errors
- 3) To determine the MI of the disc using an annular ring.
- 4) To determine the MI of the flywheel.
- 5) To study the motion of a spring and calculate (a) spring constant (b) value of g.
- 6) To determine 'g' by Kater's Pendulum.
- 7) To determine 'g' by Bar Pendulum.
- 8) Exponential decay of amplitude of simple pendulum.

**Group – II**

**(Electricity and Magnetism – I)**

- 1) Use of Multimeter
- 2) Verification of Kirchhoff's current law.
- 3) Verification of Kirchhoff's voltage law.
- 4) Verification of Ohm's law.
- 5) To determine the resistance of the galvanometer using PO box.
- 6) Measurement of field strength B and its variation in a solenoid (Determine dB/dx).
- 7) To determine the frequency of A. C. mains by sonometer (magnetic wire).
- 8) To determine the frequency of A. C. mains by sonometer (non-magnetic material).

**Reference Books**

- 1) Advanced Practical Physics for students, B.L. Flint & H. T. Worsnop, Asia Publishing House, 1997
- 2) College Practical Physics – Khanna and Gulati, S. Chand and Co. Ltd, Delhi, 1997
- 3) Practical Physics – Gupta and Kumar, Pragati Prakashan Meerat, 2017
- 4) Engineering Practical Physics- S. Panigrahi & B. Mallick, Cengage Learning India Pvt. Ltd., 2015



**B. Sc. Part – I Semester -I**  
**Physics**  
**OEC- PR I: OEC03PHS19**  
**Physics in Home Appliances-I (Practical)**  
**Marks-25 (Credits: 02)**

**Group I**

- 1) Identify and draw the symbols of various electrical components.
- 2) Identify and draw the symbols of various electronic components.
- 3) Use of various tools –multi-meter, cutter, different screwdrivers, testers, electronic gun
- 4) Testing of electrical components.
- 5) Testing of electronic components.
- 6) Make series connections of resistances validate via experimental proof.
- 7) Make parallel connections of resistances validate via experimental proof.

**Group II**

- 1) Identify and verify - various DC voltage sources
- 2) Make series connections for D. C. power supply and validate via experimental proof.
- 3) Make parallel connections for D. C. power supply and validate via experimental proof.
- 4) Fabricate and test 3V and 5V AC voltages power supply.
- 5) Fabricate and test variable AC voltage power supply
- 6) Fabricate and test 3V and 6V DC voltage power supply
- 7) Fabricate and test variable DC voltage power supply
- 8) Fabricate and test regulated power supply.

**References**

1. Electrical Wiring, O. B. Choudhari, Nirali Prakashan, 2014
2. Electrical Materials and Wiring Practice, S.M. Choudhari, Techknowledge Publications, 2022

## Evaluation Scheme

- The total marks for each paper will be 50.
- There will be semester end examination (SEE) of 40 marks for each paper.
- There will be continuous internal evaluation (CIE) of 10 marks for each paper.
- There will be separate passing for SEE, CIE, practical examination

<b>Paper No.</b>	<b>Semester End Examination (SEE)</b>	<b>Continuous Internal Evaluation (CIE)</b>	<b>Total</b>
DSI-I	40	10	50
DSI-II	40	10	50

- There will be practical examination of 25 marks at the end of semester I for DSE
- There will be practical examination of 25 marks at the end of semester I for OE paper
- Distribution of 25 marks of practical is as below

Practical	22
Journal	03
<b>Total</b>	<b>25</b>

**Nature of Question Paper (Semester End Examination)**

**Instructions**

- 1) All the questions are **compulsory**.
- 2). Figures to the right indicate **full** marks.
- 3) Draw neat labeled diagrams **wherever** necessary.

**Time : 2 Hour**

**Total Marks:40**

**Paper I**

**Q:1] Chose correct alternative**

**8 Marks**

- 1).....  
a)                    b)                    c)                    d)
- 2).....  
a)                    b)                    c)                    d)
- 3).....  
a)                    b)                    c)                    d)
- 4).....  
a)                    b)                    c)                    d)
- 5).....  
a)                    b)                    c)                    d)
- 6).....  
a)                    b)                    c)                    d)
- 7).....  
a)                    b)                    c)                    d)
- 8).....  
a)                    b)                    c)                    d)

**Q:2] Long Answer questions (Attempt any TWO)**

**16 Marks**

- 1).....
- 2).....
- 3).....

**Q.3] Short Answer questions (Attempt any FOUR)**

**16 Marks**

- 1).....
- 2).....
- 3).....
- 4).....
- 5).....
- 6).....

**B. Sc. Part – I Semester -II**  
**Physics**  
**DSC 1-III: DSC03PHY21: Properties of Matter**  
**Theory: 30 hrs.**  
**Marks-50 (Credits: 02)**

**Course Outcomes: Properties of Matter**

CO1	To demonstrate and understand the basic primary knowledge of Mechanician theories in Physics.
CO2	To understand the basic concepts of elastic constants, surface tension, fluid dynamics, viscosity, etc.
CO3	Students will demonstrate a proficiency in solving problems law of hydrostatic, pressure, filter pump, flow oof efflux, venturi pump, etc.
CO4	To develop the critical skill in students to understand Ideal and viscous fluids, Flow of liquid, Poiseuille’s method, etc.

**Properties of Matter**

Unit	Syllabus	Lectures
Unit I	<p><b>Elasticity</b> Introduction to elasticity, Stress, Strain, Hooke’s law, Elastic moduli, Relation between elastic constants, Poisson’s Ratio-Expression for Poisson’s ratio in terms of elastic constants, Bending of beam, Bending moment, Cantilever (without considering weight of cantilever), Beam supported at both the ends (without considering weight of beam). Torsional oscillation, Determination of Rigidity modulus and moment of inertia - <math>q</math>, <math>\eta</math> and <math>\sigma</math> by Searle’s method</p> <p><b>Surface tension</b> Surface tension (definition), Angle of contact and wettability, Relation between surface tension, excess of pressure and radius of curvature, Experimental determination of surface tension by Jaeger’s method, Applications of surface tension.</p>	15 Hours
Unit II	<p><b>Fluid dynamics</b> Introduction, Concept of viscous force and viscosity, Coefficient of viscosity, Steady and Turbulent flow, Reynolds number, Equation of continuity, Bernoulli’s Theorem, practical applications: (i) Law of hydrostatic pressure (ii) Filter pump (iii) Speed of efflux (iv) Venturi tube</p> <p><b>Viscosity</b> Introduction, Ideal and viscous fluids, Flow of liquid through capillary tube, Poiseuille’s equation, Experimental determination of coefficient of viscosity of liquid by Poiseuille’s method, effect of temperature and pressure on viscosity of liquid.</p>	15 Hours

**Reference Books:**

- 1) Elements of properties of matter – D.S. Mathur, Shamlal Charitable trust New Delhi, 2008.
- 2) Physics – Resnick, Halliday & Walker, Wiley eastern Ltd, New Delhi, 2010
- 3) Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., Oxford University Press, 2015
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**B. Sc. Part – I Semester -II**  
**Physics**  
**DSC 1-IV: DSC03PHY22**  
**Electricity and Magnetism – II**  
**Theory: 30 hrs.**  
**Marks-50 (Credits: 02)**

**Course Outcomes: ELECTRICITY AND MAGNETISM – II**

CO1	To demonstrate and understand the basic primary knowledge of Electricity, Magnetism and Electromagnetic Theory.
CO2	Students will demonstrate a proficiency in solving problems in magnetism, series circuit, impedance etc.
CO3	To understand the basic concepts of Ballistic galvanometer, magnetic materials and electromagnetic induction etc.
CO4	To develop the critical skill in students to understand magnetic materials, hysteresis curve.

**ELECTRICITY AND MAGNETISM – II**

<b>Unit</b>	<b>Syllabus</b>	<b>Lectures</b>
Unit I	<b>A.C. circuits</b> Complex numbers and their application in solving a. c. series LCR circuit using $j$ operator and phasor diagram, Resonance in LCR series circuit, Sharpness of resonance (qualitative treatment only), Resonance in LCR Parallel circuit, complex Impedance, Reactance, Admittance, and Susceptance, Examples of series and parallel resonance, A.C. Bridge - Owen's Bridge Q-factor (definition only). <b>Electromagnetic induction</b> Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, $L$ of single coil, $M$ of two coils, Energy stored in magnetic field.	15 Hours
Unit II	<b>Ballistic galvanometer</b> Construction and working of B. G., expression for charge flowing through ballistic galvanometer, Correction for damping in galvanometer, Constants of the ballistic galvanometer. <b>Magnetic materials and their properties</b> Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. diamagnetic, paramagnetic, ferromagnetic: Hysteresis and hysteresis curve, ferrimagnetic and antiferromagnetic materials.	15 Hours

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### Reference Books:

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2. University Physics, Ronald Lane Reese, Thomson Brooks, 2003.
3. D.J. Griffiths, Introduction to Electrodynamics, 3rd Edition, Cambridge University Press, 1998
4. Electricity and Magnetism – Khare and Shrivastav, L. B. S. Publications, 1966.

**B. Sc. Part – I Semester -II**

**Physics**

**DSC 1- PR-II: DSC03PHY29**

**Physics LAB-II**

**Practical: Four lectures of 60 minutes per week per batchMarks: 25**

**(Credits 02)**

**PHYSICS LAB (II)**

**Group - I**

1. To determine the coefficient of viscosity by Poiseuille's method.
2. Use of Spherometer and Travelling Microscope.
3. Surface tension by Jaeger's method.
4. To determine the viscosity of viscous liquid by the Stokes method.
5. To determine Poisson's ratio of rubber (rubber tube).
6. To determine  $Y$  by Searle's method.
7. Young's modulus of the material of bar by vibration.
8. To determine the modulus of rigidity by dynamic method.

**Group – II**

1. To determine the impedance of the series LCR circuit.
2. To study the series LCR circuit.
3. To study a parallel LCR circuit.
4. Owen's Bridge- To determine the resistance of a coil by DC balance.
5. Verification of Thevenin's Theorem
6. Verification of Norton's Theorem
7. To determine constants of B. G.
8. Comparison of capacitance using DeSauty's Method

**Reference Books**

- 1) Advanced Practical Physics for students, B.L.Flint & H. T. Worsnop, Asia Publishing House, 1997
- 2) College Practical Physics – Khanna and Gulati, S. Chand and Co. Ltd, Delhi, 1997
- 3) Practical Physics – Gupta and Kumar, Pragati Prakashan Meerat, 2017
- 4) Engineering Practical Physics- S. Panigrahi & B.Mallick, Cengage Learning India Pvt. Ltd., 2015



**B. Sc. Part – I Semester -II**  
**Physics**  
**OEC- PR II: OEC03PHS29**  
**Physics in Home Appliances-II (Practical)**  
**Marks-25 (Credits: 02)**  
**Group I**

- 1) Test and repair DC power supply
- 2) Test and repair AC power supply.
- 3) Make and test the connection of the table lamp.
- 4) Make and test the connections of the extension box.
- 5) Test and repair basic fluorescent tube lights.
- 6) Test and repair the electronic tube light system.
- 7) Testing and repairing of electrical Irons.
- 8) Testing and repairing of electronic Irons.

**Group II**

- 1) Testing and repairing of electrical Bell
- 2) Testing and repairing of decoration LED lamps and strings - I. (Series connection)
- 3) Testing and repairing of decoration LED lamps and strings - II (Parallel connection)
- 4) Testing and repairing battery (cell) torch.
- 5) Testing and repairing of emergency torch - I (Single light)
- 6) Testing and Repairing of an emergency torch - II (multilight)
- 7) Testing and repairing electronic toys/ electronic watch/remote
- 8) Testing and repairing D.C motor working on Solar Cell/battery

**References**

1. Electrical Wiring, O. B. Choudhari, Nirali Prakashan, 2014
2. Electrical Materials and Wiring Practice, S.M. Choudhari, Tech knowledge Publications, 2022

## Evaluation Scheme

- The total marks for each paper will be 50.
- There will be semester end examination (SEE) of 40 marks for each paper.
- There will be continuous internal evaluation (CIE) of 10 marks for each paper.
- There will be separate passing for SEE, CIE, practical examination

<b>Paper No.</b>	<b>Semester End Examination (SEE)</b>	<b>Continuous Internal Evaluation (CIE)</b>	<b>Total</b>
DSE 1-III	40	10	50
DSE 1-IV	40	10	50

- There will be practical examination of 25 marks at the end of semester II DSE paper
- There will be practical examination of 25 marks at the end of semester II for OE paper
- Distribution of 25 marks of practical is as below

Practical	22
Journal	03
<b>Total</b>	<b>25</b>

## Nature of Question Paper (Semester End Examination)

### Instructions

- 2) All the questions are **compulsory**.
- 2). Figures to the right indicate **full** marks.
- 3) Draw neat labeled diagrams **wherever** necessary.

**Time : 2 Hour**

**Total Marks:40**

### Paper I

#### Q:1] Chose correct alternative

**8 Marks**

- 1).....  
a)                    b)                    c)                    d)
- 2).....  
a)                    b)                    c)                    d)
- 3).....  
a)                    b)                    c)                    d)
- 4).....  
a)                    b)                    c)                    d)
- 5).....  
a)                    b)                    c)                    d)
- 6).....  
a)                    b)                    c)                    d)
- 7).....  
a)                    b)                    c)                    d)
- 8).....  
a)                    b)                    c)                    d)

#### Q:2] Long Answer questions (Attempt any TWO)

**16 Marks**

- 1).....
- 2).....
- 3).....

#### Q:3] Short Answer questions (Attempt any FOUR)

**16 Marks**

- 1).....
- 2).....
- 3).....
- 4).....
- 5).....
- 6).....