



VIVEKANAND COLLEGE, KOLHAPUR

(An Empowered Autonomous Institute)

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 2026-27 onwards)

VIVEKANAND COLLEGE, KOLHAPUR

(An Empowered Autonomous Institute)

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.

VIVEKANAND COLLEGE, KOLHAPUR
(An Empowered Autonomous Institute)

Department of Physics
Teaching and Evaluation scheme
Three/Four - Years UG Programme
Department/Subject Specific Core or Major (DSC)

B.Sc. Part – I, 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	
Semester-I										
1	DSC 1-I	3DSC03PHY11	Mechanics	2	-	30	20	-	50	2
2	DSC 1-II	3DSC03PHY12	Electricity and Magnetism - I	2	-	30	20	-	50	2
3	DSC 1-PR-I	3DSC03PHY19	Physics Lab-I	-	4	-	-	50	50	2
4	OEC-PR-I	3OEC03PHS19	गृहउपयोगी इलेक्ट्रॉनिक उपकरणे - I	-	4	-	-	100	100	4
Semester-II										
1	DSC 1-III	3DSC03PHY21	Properties of Matter	2	-	30	20	-	50	2
2	DSC 1-IV	3DSC03PHY22	Electricity and Magnetism - II	2	-	30	20	-	50	2
3	DSC 1-PR-II	3DSC03PHY29	Physics Lab-I	-	4	-	-	50	50	2
4	OEC- PR-II	3OEC03PHS29	गृहउपयोगी इलेक्ट्रॉनिक उपकरणे - II	-	4		-	100	100	4
	Total			8	16	120	80	300	500	20

Vivekanand College, Kolhapur (An Empowered Autonomous Institute)

B. Sc. Part – I, Semester -I
Physics
DSC 1-I: DSC03PHY11: Mechanics
Theory: 30 hr
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

Unit	Syllabus	Lectures
Unit I	Vectors: 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. Ordinary Differential Equations Introduction to differential equation, Ordinary and Partial differential Equations, 1 st order homogeneous differential equations, 2 nd order homogeneous differential equations with constants coefficients, examples Momentum and Energy 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.	15 Hours
Unit II	Laws of motion 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. Rotational motion 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.	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.

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	Vector analysis 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). Electrostatics 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.	15 Hours
Unit II	Dielectrics 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 Magnetostatics Introduction to magnetization and intensity of Magnetization, Biot-Savart's law & its applications- straight conductor, Circular coil, Solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law.	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: DSC03PHY19:

Physics Lab-I

Practical: Four lectures of 60 minutes per week per batch

Marks: 50 (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

विवेकानंद कॉलेज, कोल्हापूर

बी एस्सी. भाग - I (NEP 2020), जून, 202६ पासून लागू अभ्यासक्रम

बी एस्सी. भाग - I सेमिस्टर – I

भौतिकशास्त्र (Physics) विभाग

OE I: गृहउपयोगी इलेक्ट्रॉनिक उपकरणे - I (प्रात्यक्षिक)

OE-PR-I: 3OEC03PHS19

Credits: ०२, Marks: ५० (६० तास)

ग्रुप १

- 1) विविध इलेक्ट्रिकल कॉम्पोनंटची चिन्हे ओळखा आणि काढा
- 2) विविध इलेक्ट्रॉनिक कॉम्पोनंटची चिन्हे ओळखा आणि काढा
- 3) मल्टी-मीटर, कटर, वेगवेगळ्या प्रकारचे स्कूड्रायव्हर्स, टेस्टर्स, इलेक्ट्रॉनिक गन इत्यादी साधनांचा वापर
- 4) इलेक्ट्रिकल कॉम्पोनंट टेस्ट करणे
- 5) इलेक्ट्रॉनिक कॉम्पोनंट टेस्ट करणे
- 6) रेजिस्टन्सची सिरीज जोडणी करणे व प्रत्यक्षरित्या पडताळणे
- 7) रेजिस्टन्सची पॅरलल जोडणी करणे व प्रत्यक्षरित्या पडताळणे

ग्रुप २

- 1) विविध डी. सी. व्होल्टेज स्रोत ओळखणे व पडताळणे.
- 2) डी. सी. पॉवर सप्लायची सिरीज जोडणी करणे व प्रत्यक्षरित्या पडताळणे
- 3) डी. सी. पॉवर सप्लायची पॅरलल जोडणी करणे व प्रत्यक्षरित्या पडताळणे
- 4) 3 V आणि 5 V ए. सी. व्होल्टेज पॉवर सप्लाय तयार करणे आणि तपासून पाहणे.
- 5) व्हेरिएबल ए. सी. व्होल्टेज पॉवर सप्लाय तयार करणे आणि तपासून पाहणे.
- 6) 3 V आणि 6 V डी. सी. व्होल्टेज पॉवर सप्लाय तयार करणे आणि तपासून पाहणे.
- 7) व्हेरिएबल डी. सी. व्होल्टेज पॉवर सप्लाय तयार करणे आणि तपासून पाहणे.
- 8) रेग्युलेटेड पॉवर सप्लाय तयार करणे आणि तपासून पाहणे.

संदर्भपुस्तके:

- 1) इलेक्ट्रिकल वायरिंग - ओ. बी. चौधरी, निराली प्रकाशन, २०१६
- 2) इलेक्ट्रिकल वायरिंग आणि इलेक्ट्रिकल तंत्रज्ञान - ओ. बी. चौधरी, निराली प्रकाशन, २०१६

Evaluation Scheme

- The total marks for each paper will be 50.
- There will be semester end examination (SEE) of 30 marks for each paper.
- There will be continuous internal evaluation (CIE) like Home Assignment/Tutorial and Midterm test of 20 marks for each paper.
- There will be separate passing for 40% for SEE, CIE, Practical Examination

Paper No.	Semester End Examination (SEE)	Continuous Internal Evaluation (CIE)	Total
DSC 1 – I	30	20	50
DSC 1 – II	30	20	50

- There will be practical examination of 50 marks at the end of semester I for DSE
- There will be practical examination of 50 marks at the end of semester I for OE paper
- Distribution of 50 marks of practical is as below

Practical (SEE)	30
Practical CIE	20
Total	50

Note:

- Minimum passing for 20 marks Internal Evaluation = 08 marks
- Minimum passing for 30 marks Theory Paper = 12 marks
- Minimum passing for 50 marks Practical /VSC/FP/OJT = 20 marks

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 labelled diagrams wherever necessary.
- 4) Use of log table/calculator is allowed.

Time: 1 hours 30 minutes

Total Marks:30

Paper I

Q:1] Select correct alternative (One mark each):

04 Marks

i).....

a) b) c) d)

ii).....

a) b) c) d)

iii).....

a) b) c) d)

iv).....

a) b) c) d)

Q:2] Attempt any TWO (Seven marks each):

14 Marks

i).....

ii).....

iii).....

Q:3] Attempt any THREE (Four marks each):

12 Marks

i).....

ii)

iii)

iv)

v).....

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	Elasticity 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 - q , η and σ by Searle's method Surface tension 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.	15 Hours
Unit II	Fluid dynamics 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 Viscosity 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.	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) University Physics, Ronald Lane Reese, Thomson Brooks, 2003.
- 4) Concepts of Physics –Vol.1 H.C. Verma -Bharati Bhavan Publishers, 1999.

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

Unit	Syllabus	Lectures
Unit I	A.C. circuits 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). Electromagnetic induction 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	Ballistic galvanometer Construction and working of B. G., expression for charge flowing through ballistic galvanometer, Correction for damping in galvanometer, Constants of the ballistic galvanometer. Magnetic materials and their properties Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. diamagnetic, paramagnetic, ferromagnetic: Hysteresis and hysteresis curve, ferrimagnetic and antiferromagnetic materials.	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 -II
Physics**

DSC 1- PR-II: DSC03PHY29

Physics LAB-II

Practical: Four lectures of 60 minutes per week per batch

Marks: 50 (Credits 02)

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

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बी एस्सी. भाग - I (NEP 2020), जून, 202६ पासून लागू अभ्यासक्रम

बी एस्सी. भाग - I सेमिस्टर – II

भौतिकशास्त्र (Physics) विभाग

OE II: गृहउपयोगी इलेक्ट्रॉनिक उपकरणे - II (प्रात्यक्षिक)

OEC-PR-II: 3OEC03PHS29

Credits: ०२, Marks: ५० (६० तास)

ग्रुप १

- 1) डी. सी. पॉवर सप्लायची चाचणी आणि दुरुस्ती
- 2) ए. सी. पॉवर सप्लायची चाचणी आणि दुरुस्ती
- 3) टेबल लॅम्पची जोडणी आणि चाचणी
- 4) एक्स्टेंशन बॉक्सची जोडणी आणि चाचणी
- 5) फ्लोरोसेंट ट्यूबलाईटची चाचणी आणि दुरुस्ती
- 6) इलेक्ट्रॉनिक ट्यूबलाईटची चाचणी आणि दुरुस्ती
- 7) इलेक्ट्रिकल इस्त्री खोलने आणि जोडणे
- 8) इलेक्ट्रिकल इस्त्रीची चाचणी आणि दुरुस्ती

ग्रुप २

- 1) इलेक्ट्रिकल बेल खोलने आणि जोडणे
- 2) इलेक्ट्रिकल बेलची चाचणी आणि दुरुस्ती
- 3) सजावटीचे एल. ई. डी. दिवे/माळा यांची चाचणी आणि दुरुस्ती - I (सिरीज जोडणी)
- 4) सजावटीचे एल. ई. डी. दिवे/माळा यांची चाचणी आणि दुरुस्ती - II (पॅरलल जोडणी)
- 5) बॅटरी (ड्रायसेल) ची चाचणी आणि दुरुस्ती
- 6) आपत्कालीन टॉर्चची चाचणी आणि दुरुस्ती - I (सिंगल बल्ब)
- 7) आपत्कालीन टॉर्चची चाचणी आणि दुरुस्ती - II (मल्टी बल्ब)
- 8) इलेक्ट्रॉनिक खेळणी/इलेक्ट्रॉनिक घड्याळ/रिमोट यांची चाचणी आणि दुरुस्ती

संदर्भपुस्तके

- 1) इलेक्ट्रिकल वायरिंग - ओ. बी. चौधरी, निराली प्रकाशन, २०१६
- 2) इलेक्ट्रिकल वायरिंग आणि इलेक्ट्रिकल तंत्रज्ञान - ओ. बी. चौधरी, निराली प्रकाशन, २०१६

Evaluation Scheme

- The total marks for each paper will be 50.
- There will be semester end examination (SEE) of 30 marks for each paper.
- There will be continuous internal evaluation (CIE) like Home Assignment/Tutorial and Midterm test of 20 marks for each paper.
- There will be separate passing for 40% for SEE, CIE, Practical Examination

Paper No.	Semester End Examination (SEE)	Continuous Internal Evaluation (CIE)	Total
DSC 1 – III	30	20	50
DSC 1 – IV	30	20	50

- There will be practical examination of 50 marks at the end of semester I for DSE
- There will be practical examination of 50 marks at the end of semester I for OE paper
- Distribution of 50 marks of practical is as below

Practical (SEE)	30
Practical CIE	20
Total	50

Note:

- Minimum passing for 20 marks Internal Evaluation = 08 marks
- Minimum passing for 30 marks Theory Paper = 12 marks
- Minimum passing for 50 marks Practical /VSC/FP/OJT = 20 marks

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 labelled diagrams wherever necessary.
- 4) Use of log table/calculator is allowed.

Time: 1 hours 30 minutes

Total Marks:30

Paper I

Q:1] Select correct alternative (One mark each):

04 Marks

i).....

a) b) c) d)

ii).....

a) b) c) d)

iii).....

a) b) c) d)

iv).....

a) b) c) d)

Q:2] Attempt any TWO (Seven marks each):

14 Marks

i).....

ii).....

iii).....

Q.3] Attempt any THREE (Four marks each):

12 Marks

i).....

ii)

iii)

iv)

v).....