

**FOUR YEAR UNDERGRADUATE PROGRAM (NEP- 2020)**  
**PROGRAM: BACHELOR IN SCIENCE (2024 – 28)**  
**DISCIPLINE – PHYSICS**  
**SESSION - 2024 – 25**

DSC- 01 to 08		DSE- 01 to 12		DGE- 01 to 02		
Code	Course Title	Code	Course Title	Code	Course Title	
PHSC- 01 T	Mechanics	PHSE- 01	Introduction to Statistical Mechanics	PHGE- 01 T	Mechanics	
PHSC- 01P	Lab Course			PHGE- 01 P	Lab Course	
PHSC- 02 T	Electricity & Magnetism	PHSE- 02	Mathematical Physics-I	PHGE- 02 T	Electricity & Magnetism	
PHSC- 02 P	Lab Course			PHGE- 02 P	Lab Course	
PHSC- 03 T	Heat & Thermodynamics	PHSE- 03	Nuclear Physics	VAC		
PHSC- 03 P	Lab Course					
PHSC- 04 T	Waves & Optics	PHSE- 04 T	Numerical Methods & C Programming	VAC		
PHSC- 04 P	Lab Course	PHSE- 04 P	Lab Course			
PHSC- 05 T	Introduction to Quantum Mechanics	PHSE- 05	Mathematical Physics-II	PHVAC- 01	Renewable Energy and Energy Harvesting	
PHSC- 05 P	Lab Course					
PHSC- 06 T	Solid State Physics & Solid State Devices	PHSE- 06	Classical Electrodynamics & Electromagnetic theory	SEC		
PHSC- 06 P	Lab Course					
PHSC- 07	Classical Mechanics	PHSE- 07 T	Digital Electronics	PHSEC- 01		Basic Electrical Skill
		PHSE- 07 P	Lab Course			
PHSC- 08	Quantum Mechanics	PHSE- 08 T	Operational Amplifier & Its Applications	PHSEC- 01		Basic Electrical Skill
		PHSE- 08 P	Lab Course			
		PHSE- 09 T	Solid State Physics			
		PHSE- 09 P	Lab Course			
		PHSE- 10	Atomic and Molecular Physics			
		PHSE- 11	Statistical Mechanics			
		PHSE- 12 T	Microprocessor			
		PHSE- 12 P	Lab Course			

Signature of Convener & Members (CBoS):

Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

Officer-in-Charge (Academic)  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

### Program Outcomes (PO):

The learning outcomes of the undergraduate degree course in physics are as follows:

- **In-depth disciplinary knowledge:** The student will acquire comprehensive knowledge and understanding of the fundamental concepts, theoretical principles and processes in the main and allied branches of physics.
- **Hands-on/ Laboratory Skills:** Comprehensive hands-on/ laboratory exercises will impart analytical, computational and instrumentation skills. The students will be able to demonstrate mature skills for the collation, evaluation, analysis and presentation of information, ideas, concepts as well as quantitative and/or qualitative data.
- **Role of Physics:** The students will develop awareness and appreciation for the significant role played by physics in current societal and global issues. They will be able to address and contribute to such issues through the skills and knowledge acquired during the programme
- **Communication and Skills:** Various DSCs, DSEs, SECs, and GEs have been designed to enhance student's ability to write methodical, logical and precise reports. The courses will, in addition, guide the student to communicate effectively through presentations, writing laboratory/ project reports and dissertations.
- **Critical and Lateral Thinking:** The programme will develop the ability to apply the underlying concepts and principles of physics and allied fields beyond the classrooms to real life applications, innovation and creativity.
- **Research skills:** The course provides an opportunity to students to hone their research and innovation skills through assignment/internship/dissertation. It will enable the students to demonstrate mature skills in literature survey, information management skills, data analysis and research ethics.

### Signature of Convener & Members (CBoS):

Handwritten signatures of the Convener and Members of the Council of Board of Studies (CBoS). The signatures are arranged in two rows. The top row contains five signatures, and the bottom row contains four signatures. The signatures are written in black ink on a white background.

Handwritten signature of Shaheed Nandkumar Patel in black ink.  
Shaheed Nandkumar Patel  
Wishwavidyalaya, Raigarh (C.G.)

**Officer-In-Charge (Academic)**  
Shaheed Nandkumar Patel  
Wishwavidyalaya, Raigarh (C.G.)

**FOUR YEARS UNDERGRADUATE PROGRAM (2024-28)**  
**DEPARTMENT OF PHYSICS**  
**COURSE CURRICULUM**

<b>PART – A: INTRODUCTION</b>			
<b>Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)</b>		<b>Semester: I</b>	<b>Session: 2024-25</b>
1	Course Code	PHSC-01T	
2	Course Title	Mechanics	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	<p>After going through the course, the student should be able to:</p> <ul style="list-style-type: none"> <li>➤ Analyze and apply the laws of motion to various dynamical situations.</li> <li>➤ Explain and demonstrate the principle of conservation of momentum and energy including their application in real-world scenario such as collision and energy transformation.</li> <li>➤ Evaluate and calculate moment of inertia for objects of different shapes and analyze how these properties affect the motion of rotating bodies.</li> <li>➤ Analyze flow of fluids.</li> <li>➤ Describe special relativistic effects and their effects on the mass and energy of a moving object.</li> </ul>	
6	Credit Value	03 Credits	1 Credit= 15 Hours for Learning & Observation
7	Total Marks	Maximum Marks: 100	Minimum Pass Marks: 40

**PART – B: CONTENT OF THE COURSE**

Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)		
Unit	Topics (Course contents)	No. of Periods
I	<b>Historical Background:</b> Contribution of Aryabhatta and Varahmihir to science and society, Brief biography of Vikram Sarabhai with his contribution. <b>Vectors:</b> Scalar and vector quantities & fields, Scalar & Vector products of two vectors, Derivatives of a vector, Gradient of scalar field and its physical significance. <b>Laws of Motion:</b> Review of Newton's Laws of motion, Dynamics of a system of particles, Concept of Center of Mass, Motion of center of mass, Conservation of linear momentum, Motion of Rocket. <b>Work and Energy:</b> Work-Energy theorem for conservative forces, Force as a gradient of Potential Energy, Conservation of energy, Elastic and in-elastic Collisions	12
II	<b>Rotational Dynamics:</b> Angular momentum, Torque, Conservation of angular momentum, Moment of Inertia, Theorem of parallel and perpendicular axes (statements only), Calculation of Moment of Inertia of discrete and continuous objects (Rectangular lamina, disc, solid cylinder, solid sphere). <b>Elasticity:</b> Stress & Strain, Hooke's law, Elastic constants, Poisson's Ratio, Relationship between various elastic moduli (without derivation), Work done in twisting a cylinder. <b>Fluid Dynamics:</b> Flow of fluids, Coefficient of viscosity, Derivation of Poiseuille's formula, Motion of a spherical body falling in a viscous fluid, Stoke's law, Expression for terminal velocity.	12
III	<b>Gravitation:</b> Newton's Law of Gravitation, Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant), Kepler's Laws (statements only), Satellite in circular orbit and applications, Geosynchronous orbits. <b>Oscillations:</b> Simple harmonic motion, Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Compound pendulum, Differential equations of damped oscillations and forced oscillations (Conceptual only).	11
IV	<b>Special Theory of Relativity:</b> Frame of reference, Galilean Transformations, Inertial and Non-inertial frames, Outcomes of Michelson Morley's Experiment, Postulates of Special Theory of Relativity, Lorentz Transformation, Length contraction, Time dilation, Relativistic transformation of velocity, Relativistic variation of mass, Mass-energy equivalence, Transformation of Energy and Momentum.	10

**Keywords:** Aryabhatta, Vectors, Newton's Laws, Angular Momentum, Elasticity, Gravitation, Oscillations, Relativity

**Signature of Convener & Members (CBOS):**

**Chairman**  
 of Studies .....  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

**Officer-In-Charge (Academics)**  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

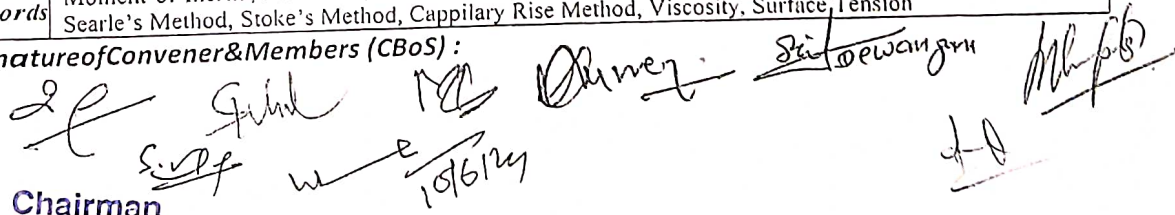
**FOUR YEARS UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF PHYSICS**  
**COURSE CURRICULUM**

<b>PART – A: INTRODUCTION</b>			
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: I	Session: 2024-25
1	Course Code	PHSC-01P	
2	Course Title	Mechanics	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	After the completion of the course, Students are expected to understand working mechanism and laws of classical mechanics. The Students will be able to <ul style="list-style-type: none"> <li>➤ Assemble required parts/devices and arrange them to perform experiments.</li> <li>➤ Record/ observe data as required by the experimental objectives.</li> <li>➤ Analyze recorded data and formulate it to get desired results.</li> <li>➤ Interpret results and check for attainment of proposed objectives related to laws of mechanics and its applications</li> </ul>	
6	Credit Value	01 Credit	1 Credit = 30 Hours Laboratory Work
7	Total Marks	Maximum Marks: 50	Minimum Pass Marks: 20

**PART – B: CONTENT OF THE COURSE**

Total No. of learning-Training/performance Periods-30 Periods (30 Hours)		
Sr. No.	Objects (At least 10 of the following or related Experiments)	No. of Period
1	Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.	30
2	To study the random error in observations.	
3	To study the motion of the spring and calculate (a) Spring constant and, (b) g.	
4	To determine the Moment of Inertia of a Flywheel.	
5	To determine g and velocity for a freely falling body using Digital Timing Technique.	
6	To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).	
7	To determine the Young's Modulus of a Wire by Optical Lever Method.	
8	To determine the Modulus of Rigidity of a Wire by Maxwell's needle.	
9	To determine the elastic constants of a wire by Searle's method	
10	To determine the value of g using Bar Pendulum.	
11	To determine the value of g using Kater's Pendulum.	
12	Study of bending of a beam/ cantilever	
13	To determine Moment of Inertia of an irregular body by Inertia Table	
<i>Keywords</i>	Moment of Inertia, Pendulum, Vernier Callipers, Screw Gauge, Travelling microscope, Elastic Constant, Searle's Method, Stoke's Method, Cappillary Rise Method, Viscosity, Surface Tension	

Signature of Convener & Members (CBOS):



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 Vishwavidyalaya, Raigarh (C.G.)

**Officer-In-Charge**  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

## PART – C: LEARNING RESOURCES

### Text Books, Reference Books Recommended and Others

#### Text Books Recommended-

1. Mechanics & Properties of matter, D.C. Tayal & P. Tayal, 2023, Pub. By Authors.
2. Unified Physics I –R.P.Goyal, Shivalal Agrawal Publication
3. Unified Physics I, Navbodh Publication

#### Reference Books Recommended-

1. Mechanics, Berkeley Physics, vol.1, C.Kittel, W.Knight, et.al. 2007, Tata McGraw-Hill.
2. Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
3. Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons.

#### Online Resources (e-books/ learning portals/ other e-resources)

1. All e-books of physics <https://www.e-booksdirectory.com/listing.php?category=2>
2. Free physics text book in PDF
3. [https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB\\_EiwAjkNDp5v8Yy6xK1s0Kma0VR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD\\_BwE](https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yy6xK1s0Kma0VR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD_BwE)
4. Cambridge University Books for Physics <https://www.cambridgeindia.org/>
5. Books for solving physics problems <https://bookboon.com/en/physics-ebooks>
6. NPTEL Online courses <https://nptel.ac.in/courses/115105098>;  
<https://archive.nptel.ac.in/courses/115/106/115106123/>;
7. BSc Lectures by Prof. H C Verma: <https://bsc.hcverma.in/index.php/course/relativity>;  
<https://bsc.hcverma.in/index.php/course/cml>

## PART – D: ASSESSMENT AND EVALUATION

### Suggested Continuous Evaluation Methods:


Maximum Marks: 100Marks

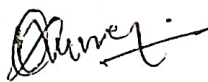
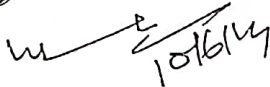
Continuous Internal Assessment (CIA):30 Marks

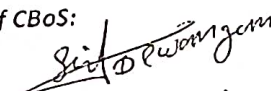
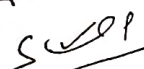
End Semester Examination (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By course teacher)	Internal Test/ Quiz (2): 20 Assignment/ Seminar (1):10 Total Marks: 30	Better marks out of the two Test / Quiz + marks obtained in Assignment shall be considered against 30 Marks
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20Marks Section B: Descriptive answer type, 1out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:

  
Chairman  
of Studies  
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Officer-In-Charge (Academic)  
Shaheed Nandkumar Patel  
Vishwavidyalaya, Raigarh (C.G.)

## PART – C: Learning Resources

### Text Books, Reference Books and others

#### Text Books Recommended-

1. Advanced Practical Physics for students, B.L.Flint&H.T.Worsnop, 1971, Asia Publishing House.
2. Engineering Practical Physics, S.Panigrahi& B.Mallick,2015, Cengage Learning India Pvt. Ltd.
3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
4. Practical Physics B.Sc. I : R P Goyal, Shival Publications

#### Reference Books Recommended-

1. Advanced Practical Physics for Students by B.L. Worsnop and H.T. Flint
2. Practical Physics by G.L. Squires
3. An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements by John R. Taylor
4. Mechanics and Properties of Matter by J.C. Upadhyaya

### Online Resources (e-books/ learning portals/ other e-resources)

1. Link for e-Books for Physics:Physics Practical :  
<https://www.uou.ac.in/sites/default/files/slm/BSCPH-104.pdf>
2. Virtual Lab :<https://vlab.amrita.edu/?sub=1&brch=74>
3. <https://vlab.amrita.edu/?sub=1&brch=74&sim=571&cnt=1>
4. <https://www.ae.msstate.edu/vlsm/>

## PART – D : ASSESSMENT AND EVALUATION

### Suggested Continuous Evaluation Methods:

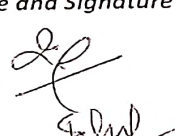
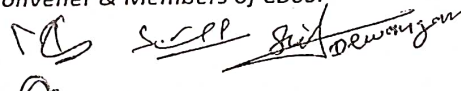

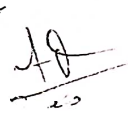
Maximum Marks: 50 Marks

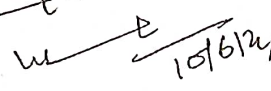
Continuous Internal Assessment(CIA):15 Marks

EndSemester Exam(ESE):35 Marks

Continuous Internal Assessment(CIA): (By Course Teacher)	Internal Test / Quiz - (2): 10 & 10	Better marks out of the two Test/Quiz +Marks obtained in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance -05 Total Marks - 15	
End Semester Exam (ESE):	Laboratory Performance: On spot Assessment Performed the Task based on lab. work -20 Marks Spotting based on tools & technology (written) - 10 Marks Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of CBoS:



**Chairman**  
 Shaheed Nandkumar Patel  
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**Officer-In-Charge (Academic)**  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

**FOUR YEARS UNDERGRADUATE PROGRAM (2024-28)**  
**DEPARTMENT OF PHYSICS**  
**COURSE CURRICULUM**

<b>PART – A: INTRODUCTION</b>			
	Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)	Semester: II	Session: 2024-25
1	Course Code	PHISC-02T	
2	Course Title	ELECTRICITY AND MAGNETISM	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	After going through the course, the student should be able to: <ul style="list-style-type: none"> <li>➤ State various laws related with electrostatics, dielectric, electric current, magnetism and electromagnetic induction.</li> <li>➤ Apply vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics.</li> <li>➤ Compare rise and decay of current in LR, CR, LCR circuits.</li> <li>➤ Apply Biot-Savart law for calculation of magnetic field in simple geographic situations.</li> <li>➤ Derive and analyze Maxwell's equations.</li> </ul>	
6	Credit Value	03 Credits	1 Credit= 15 Hours for Learning & Observation
7	Total Marks	Maximum Marks: 100	Minimum Pass Marks: 40

**PART – B: CONTENT OF THE COURSE**

Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Periods
I	<b>Power plants in Chhattisgarh:</b> An overview of thermal and hydroelectric power plants in Chhattisgarh. <b>Vector Analysis:</b> Divergence & Curl of Vector fields, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors and its application in electrostatics and magnetostatics. <b>Electrostatics field:</b> Electrostatic Field, electric flux, Gauss's theorem of electrostatics, Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, plane charged sheet, charged conductor.	12
II	<b>Electrostatic potential:</b> Electric potential as line integral of electric field, potential due to a point charge, Calculation of electric field from potential, Capacitance of Parallel plate capacitor, Energy per unit volume in electrostatic field. <b>Dielectric &amp; Electric Currents:</b> Dielectric medium, Polarisation, Displacement vector, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric. Steady current, current density J, non – steady current and Continuity equation, Rise and decay of current in LR, CR, LCR circuits.	13
III	<b>Magnetism:</b> Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law, Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, Brief introduction of dia, para and ferro-magnetic materials.	10
IV	<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. <b>Maxwell's equations and Electromagnetic wave propagation:</b> Equation of continuity of current, Displacement current, Maxwell's equations, Wave equation in free space.	10

**Keywords:** Vector calculus, Electrostatics, Dielectrics and Electric Current, Magnetism, Electromagnetic Induction, Maxwell's Equation and Electromagnetic Wave Propagation

**Signature of Convener & Members (CBoS) :**

**Chairman**  
 Head of Studies ...  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

**Officer-In-Charge**  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

## PART – C: LEARNING RESOURCES

### Text Books, Reference Books and Others

#### Text Books

1. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
2. Unified Physics – Part II, R. P.Goyal, Shivalal Agrawal and Sons
3. Unified Physics – Navbodh Publications
4. Introduction to Electrodynamics and Electromagnetism, H.C.Verma.

#### Reference Books

1. Vector analysis – Schaum's Outline, M.R. Spiegel, S. Lipschutz, D. Spellman, 2nd Edn., 2009, McGraw- Hill Education.
2. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

#### Online Resources (e-books/ learning portals/ other e-resources)

1. All e-books of physics <https://www.e-booksdirectory.com/listing.php?category=2>
2. Free physics text book in PDF  
[https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB\\_EiwAjkNDp5v8Yy6xK1s0Kma0VR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD\\_BwE](https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yy6xK1s0Kma0VR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD_BwE)
3. Cambridge University Books for Physics <https://www.cambridgeindia.org/>
4. Books for solving physics problems <https://bookboon.com/en/physics-ebooks>
5. NPTEL Online courses: [https://onlinecourses.nptel.ac.in/noc21\\_ph05/preview](https://onlinecourses.nptel.ac.in/noc21_ph05/preview)
6. <https://archive.nptel.ac.in/courses/115/104/115104088/>
7. Classical Electromagnetism - 1 (Electrostatics) <https://bsc.hcverma.in/course/cee1>
8. Classical Electromagnetism - 2 (Electrostatics) <https://bsc.hcverma.in/course/cee2>

## PART – D: Assessment and Evaluation

### Suggested Continuous Evaluation Methods:

Maximum Marks: 100Marks

Continuous Internal Assessment (CIA):30 Marks

End Semester Examination (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By course teacher)	Internal Test/ Quiz (2): 20+20Assignment/ Seminar (1): 10 Total Marks: 30	Better marks out of the two Test / Quiz + marks obtained in Assignment shall be considered against 30 Marks
End Semester Examination (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20Marks Section B: Descriptive answer type,1out of 2 from each unit-4x10=40 Marks	

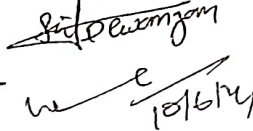
Name and Signature of Convener & Members of CBOS:



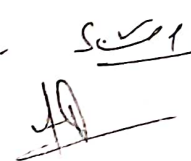
Chairman

Shaheed Nandkumar Patel  
Vishwavidyalaya, Raigarh (C.G.)









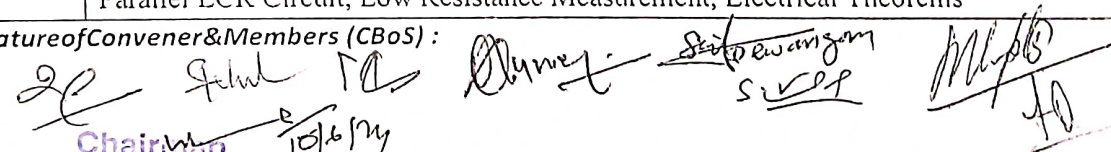
Officer-In-Charge  
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**FOUR YEARS UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF PHYSICS**  
**COURSE CURRICULUM**

<b>PART – A: INTRODUCTION</b>			
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: II	
		Session: 2024-25	
1	Course Code	PHSC- 02P	
2	Course Title	Electricity & Magnetism	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if any)	As per program	
5	Course Learning Outcomes (CLO)	<p><i>After the completion of the course, Students are expected to understand working laws of Electricity, Magnetism and EMWs. The students will also be able to</i></p> <ul style="list-style-type: none"> <li>➤ <i>Verify various circuit laws, network theorems, using simple electric circuits. Assemble required parts/devices and arrange them to perform experiments.</i></li> <li>➤ <i>Verify various laws in electricity and magnetism such as Lenz's law, Faraday's law and learn about the construction, working of various measuring instruments</i></li> <li>➤ <i>Record/ observe data as required by the experimental objectives. Analyze recorded data and formulate it to get desired results.</i></li> <li>➤ <i>Interpret results and check for attainment of proposed objectives related to laws of Electricity, Magnetism and its applications</i></li> </ul>	
6	Credit Value	01 Credit	1 Credit = 30 Hours Laboratory Work
7	Total Marks	Maximum Marks: 50	Minimum Pass Marks: 20
<b>PART – B: CONTENT OF THE COURSE</b>			
<b>Total No. of learning-Training/performance Periods -30 Periods (30 Hours)</b>			
Sr. No.	Objects (At least 10 of the following or related Experiments)	No. of Periods	
1	To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.	30	
2	To compare capacitances using De'Sauty's bridge.		
3	Measurement of field strength B and its variation in a Solenoid Determine (dB/dx).		
4	To study the Characteristics of a Series RC Circuit.		
5	To study a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor.		
6	To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.		
7	To determine a Low Resistance by Carey Foster's Bridge.		
8	To verify the Thevenin and Norton theorem.		
9	To verify the Superposition, and Maximum Power Transfer Theorem.		
10	To use a vibration magnetometer and study magnetic field.		
11	Study of magnetic field due to a current loop.		
12	Study of magnetic fields using Deflection Magnetometer		
13	Mini Project: Construction and Study of Solenoid and measurement of its magnetic field		
<b>Keywords:</b>	Multimeter, Capacitance Comparison, Magnetic Field, RC Circuit, Series LCR Circuit, Parallel LCR Circuit, Low Resistance Measurement, Electrical Theorems		

Signature of Convener & Members (CBOs):

  
**Chairman**  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

**Officer-In-Charge**  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

**PART – C: LEARNING RESOURCES**

**Text Books, Reference Books and Others**

**Text Books Recommended-**

1. Engineering Practical Physics, S.Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
2. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
3. Unified Practical Physics : R P Goyal, Shivalal Agrawal & Sons
4. Unified Practical Physics: YugbodhPrakashan
5. Unified Practical Physics: NavbodhPrakashan

**Reference Books Recommended-**

1. Basic Electrical and Electronics Engineering by S. K. Bhattacharya
2. A Textbook of Electrical Technology by B.L. Theraja and A.K. Theraja (Volumes 1 and 2)
3. Engineering Circuit Analysis by William H. Hayt, Jack E. Kemmerly, and Steven M. Durbin
4. Practical Physics by G.L. Squires

**Online Resources (e-books/ learning portals/ other e-resources)**

1. Link for e-Books for Physics: Physics Practical;  
<https://www.uou.ac.in/sites/default/files/slm/BSCPH-104.pdf>
2. Virtual Lab : <https://vlab.amrita.edu/index.php?sub=1&brch=192>
3. <http://emv-au.vlabs.ac.in/#>
4. <https://www.ae.msstate.edu/vlsm/>
5. <https://nationalmaglab.org/magnet-academy/watch-play/interactive-tutorials>
6. <https://jigyasa-csir.in/cgcri/n12-14-a3/>

**PART – D: ASSESSMENT AND EVALUATION**

**Suggested Continuous Evaluation Methods:**

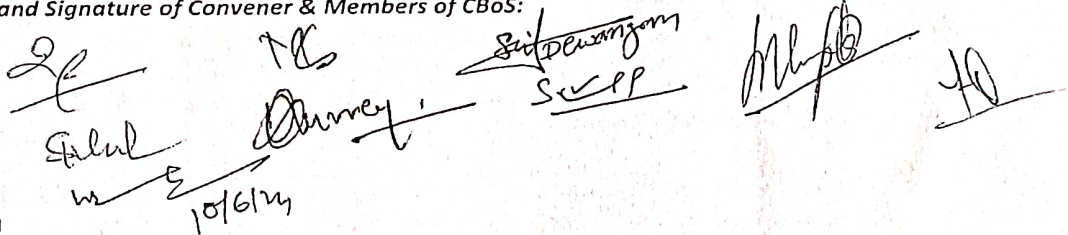
**Maximum Marks: 50 Marks**

**Continuous Internal Assessment(CIA):15 Marks**

**EndSemester Exam(ESE):35 Marks**

<b>Continuous Internal Assessment(CIA):</b> (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar +Attendance –05 Total Marks - 15	Better marks out of the two Test / Quiz +Marks obtained in Assignment shall be considered against 15 Marks
	<b>End Semester Exam (ESE):</b>	Laboratory Performance: On spot Assessment Performed the Task based on lab. work - 20 Marks Spotting based on tools & technology (written) –10 Marks Viva-voce (based on principle/technology) - 05 Marks
		Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of CBoS:



**Chairman**

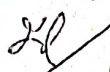
of Studies .....  
Shaheed Nandkumar Patel  
Wishwavidyalaya, Raigarh (C.G.)

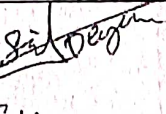
**Officer-in-Charge** (Approved)  
Shaheed Nandkumar Patel  
Wishwavidyalaya, Raigarh (C.G.)

**FOUR YEARS UNDERGRADUATE PROGRAM (2024-28)**  
**DEPARTMENT OF PHYSICS**  
**COURSE CURRICULUM**

<b>PART – A: INTRODUCTION</b>			
<b>Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)</b>		<b>Semester: I</b>	
<b>Session: 2024-25</b>			
1	<b>Course Code</b>	<b>PHGE-01 T</b>	
2	<b>Course Title</b>	<b>Mechanics</b>	
3	<b>Course Type</b>	<b>Generic Elective Course</b>	
4	<b>Pre-requisite (if any)</b>	<b>As per Program</b>	
5	<b>Course Learning Outcomes (CLO)</b>	<i>After going through the course, the student should be able to:</i> <ul style="list-style-type: none"> <li>➤ Analyze and apply the laws of motion to various dynamical situations.</li> <li>➤ Explain and demonstrate the principle of conservation of momentum and energy including their application in real-world scenario such as collision and energy transformation.</li> <li>➤ Evaluate and calculate moment of inertia for objects of different shapes and analyze how these properties affect the motion of rotating bodies.</li> <li>➤ Analyze flow of fluids.</li> <li>➤ Describe special relativistic effects and their effects on the mass and energy of a moving object.</li> </ul>	
6	<b>Credit Value</b>	<b>03 Credits   1 Credit= 15 Hours for Learning &amp; Observation</b>	
7	<b>Total Marks</b>	<b>Maximum Marks: 100</b>	<b>Minimum Pass Marks: 40</b>
<b>PART – B: CONTENT OF THE COURSE</b>			
<b>Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)</b>			
Unit	Topics (Course contents)		No. of Periods
I	<b>Historical Background:</b> Contribution of Aryabhata and Varahmihir to science and society, Brief biography of Vikram Sarabhai with his contribution. <b>Vectors:</b> Scalar and vector quantities & fields, Scalar & Vector products of two vectors, Derivatives of a vector, Gradient of scalar field and its physical significance. <b>Laws of Motion:</b> Review of Newton's Laws of motion, Dynamics of a system of particles, Concept of Center of Mass, Motion of center of mass, Conservation of linear momentum, Motion of Rocket. <b>Work and Energy:</b> Work-Energy theorem for conservative forces, Force as a gradient of Potential Energy, Conservation of energy, Elastic and in-elastic Collisions		12
II	<b>Rotational Dynamics:</b> Angular momentum, Torque, Conservation of angular momentum, Moment of Inertia, Theorem of parallel and perpendicular axes (statements only), Calculation of Moment of Inertia of discrete and continuous objects (Rectangular lamina, disc, solid cylinder, solid sphere). <b>Elasticity:</b> Stress & Strain, Hooke's law, Elastic constants, Poisson's Ratio, Relationship between various elastic moduli (without derivation), Work done in twisting a cylinder. <b>Fluid Dynamics:</b> Flow of fluids, Coefficient of viscosity, Derivation of Poiseuille's formula, Motion of a spherical body falling in a viscous fluid, Stoke's law, Expression for terminal velocity.		12
III	<b>Gravitation:</b> Newton's Law of Gravitation, Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant), Kepler's Laws (statements only), Satellite in circular orbit and applications, Geosynchronous orbits. <b>Oscillations:</b> Simple harmonic motion, Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Compound pendulum, Differential equations of damped oscillations and forced oscillations (Conceptual only).		11
IV	<b>Special Theory of Relativity:</b> Frame of reference, Galilean Transformations, Inertial and Non-inertial frames, Outcomes of Michelson Morley's Experiment, Postulates of Special Theory of Relativity, Lorentz Transformation, Length contraction, Time dilation, Relativistic transformation of velocity, Relativistic variation of mass, Mass-energy equivalence, Transformation of Energy and Momentum.		10
<b>Keywords:</b> Aryabhata, Vectors, Newton's Laws, Angular Momentum, Elasticity, Gravitation, Oscillations, Relativity			

**Signature of Convener & Members (CBoS):**

  
**Chairman**  
 of Studies  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

  
**Officer-In-Charge**  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

## PART – C: LEARNING RESOURCES

### Text Books, Reference Books Recommended and Others

#### Text Books Recommended-

1. Mechanics & Properties of matter, D.C. Tayal & P. Tayal, 2023, Pub. By Authors.
2. Unified Physics I –R. P. Goyal, Shivalal Agrawal Publication
3. Unified Physics I, Navbodh Publication

#### Reference Books Recommended-

1. Mechanics, Berkeley Physics, vol.1, C. Kittel, W. Knight, et.al. 2007, Tata McGraw-Hill.
2. Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
3. Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons.

#### Online Resources (e-books/ learning portals/ other e-resources)

1. All e-books of physics <https://www.e-booksdirectory.com/listing.php?category=2>
2. Free physics text book in PDF
3. [https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB\\_EiwAjkNDp5v8Yy6xK1s0Km a0VR0AWGlichRwFiCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD\\_BwE](https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yy6xK1s0Km a0VR0AWGlichRwFiCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD_BwE)
4. Cambridge University Books for Physics <https://www.cambridgeindia.org/>
5. Books for solving physics problems <https://bookboon.com/en/physics-ebooks>
6. NPTEL Online courses <https://nptel.ac.in/courses/115105098;>  
[https://archive.nptel.ac.in/courses/115/106/115106123/;](https://archive.nptel.ac.in/courses/115/106/115106123/)
7. BSc Lectures by Prof. H C Verma: <https://bsc.heverma.in/index.php/course/relativity;>  
<https://bsc.heverma.in/index.php/course/cm1>

## PART – D: ASSESSMENT AND EVALUATION

### Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

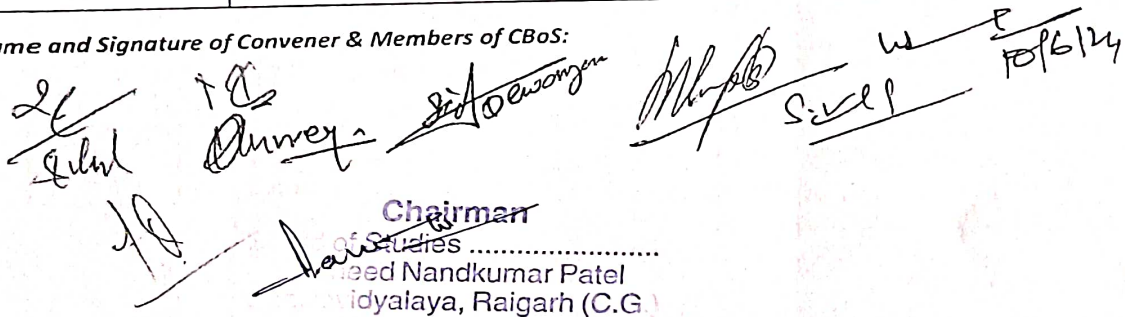
Continuous Internal Assessment (CIA): 30 Marks

End Semester Examination (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By course teacher)	Internal Test/ Quiz (2):	20 + 20	Better marks out of the two Test / Quiz + marks obtained in Assignment shall be considered against 30 Marks
	Assignment/ Seminar (1):	10	
	Total Marks:	30	

End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 = 20 Marks Section B: Descriptive answer type, 1 out of 2 from each unit-4 x 10=40 Marks
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Name and Signature of Convener & Members of CBAs:



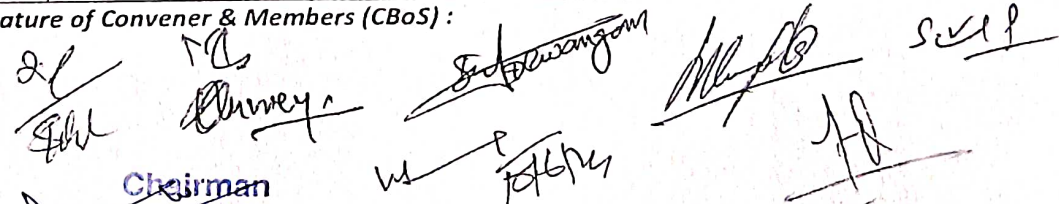
Chairman  
Shaheed Nandkumar Patel  
Vishwavidyalaya, Raigarh (C.G.)

Officer-In-Charge  
Shaheed Nandkumar Patel  
Vishwavidyalaya, Raigarh (C.G.)

**FOUR YEARS UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF PHYSICS**  
**COURSE CURRICULUM**

<b>PART – A: INTRODUCTION</b>			
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: I	Session: 2024-25
1	Course Code	PHGE- 01 P	
2	Course Title	Mechanics	
3	Course Type	Generic Elective Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	After the completion of the course, Students are expected to understand working mechanism and laws of classical mechanics. The Students will be able to <ul style="list-style-type: none"> <li>➤ Assemble required parts/devices and arrange them to perform experiments.</li> <li>➤ Record/ observe data as required by the experimental objectives.</li> <li>➤ Analyze recorded data and formulate it to get desired results.</li> <li>➤ Interpret results and check for attainment of proposed objectives related to laws of mechanics and its applications</li> </ul>	
6	Credit Value	01 Credit	1 Credit = 30 Hours Laboratory Work
7	Total Marks	Maximum Marks: 50	Minimum Pass Marks: 20
<b>PART – B: CONTENT OF THE COURSE</b>			
<b>Total No. of learning-Training/performance Periods- 30 Periods (30 Hours)</b>			
Sr. No.	Objects (At least 10 of the following or related Experiments)	No. of Period	
1	Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.	30	
2	To study the random error in observations.		
3	To study the motion of the spring and calculate (a) Spring constant and, (b) g.		
4	To determine the Moment of Inertia of a Flywheel.		
5	To determine g and velocity for a freely falling body using Digital Timing Technique.		
6	To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).		
7	To determine the Young's Modulus of a Wire by Optical Lever Method.		
8	To determine the Modulus of Rigidity of a Wire by Maxwell's needle.		
9	To determine the elastic constants of a wire by Searle's method		
10	To determine the value of g using Bar Pendulum.		
11	To determine the value of g using Kater's Pendulum.		
12	Study of bending of a beam/ cantilever		
13	To determine Moment of Inertia of an irregular body by Inertia Table		
<i>Keywords</i>	Moment of Inertia, Pendulum, Vernier Callipers, Screw Gauge, Travelling microscope, Elastic Constant, Searle's Method, Stoke's Method, Cappillary Rise Method, Viscosity, Surface Tension		

**Signature of Convener & Members (CBoS) :**

  
**Chairman**  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

**Officer-In-Charge**  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

## PART – C: Learning Resources

### Text Books, Reference Books and others

#### Text Books Recommended-

1. Advanced Practical Physics for students, B.L.Flint&H.T.Worsnop, 1971, Asia Publishing House.
2. Engineering Practical Physics, S.Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
4. Practical Physics B.Sc. I : R P Goyal, Shival Publications

#### Reference Books Recommended-

1. Advanced Practical Physics for Students by B.L. Worsnop and H.T. Flint
2. Practical Physics by G.L. Squires
3. An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements by John R. Taylor
4. Mechanics and Properties of Matter by J.C. Upadhyaya

### Online Resources (e-books/ learning portals/ other e-resources)

1. Link for e-Books for Physics: Physics Practical:  
<https://www.uou.ac.in/sites/default/files/slm/BSCPH-104.pdf>
2. Virtual Lab : <https://vlab.amrita.edu/?sub=1&brch=74>
3. <https://vlab.amrita.edu/?sub=1&brch=74&sim=571&cnt=1>
4. <https://www.ae.msstate.edu/vlsm/>

## PART – D : ASSESSMENT AND EVALUATION

### Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks


End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz - (2):	10 & 10	Better marks out of the two Test/Quiz +Marks obtained in Assignment shall be considered against 15 Marks
	Assignment/Seminar + Attendance –	05	
	Total Marks -	15	

End Semester Exam (ESE):	Laboratory Performance: On spot Assessment	Managed by Course teacher as per lab. status	
	Performed the Task based on lab. work		-20 Marks
	Spotting based on tools & technology (written) –		10 Marks
	Viva-voce (based on principle/technology)		- 05 Marks

Name and Signature of Convener & Members of CBoS:



  
Shaheed Nandkumar Patel  
Head of Studies .....  
Ishwavidyalaya, Raigarh (C.G.)

Officer-In-Charge (C.G.)  
Shaheed Nandkumar Patel  
Ishwavidyalaya, Raigarh (C.G.)

**FOUR YEARS UNDERGRADUATE PROGRAM (2024-28)**  
**DEPARTMENT OF PHYSICS**  
**COURSE CURRICULUM**

<b>PART – A: INTRODUCTION</b>			
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: II	Session: 2024-25
1	Course Code	PHGE-02 T	
2	Course Title	ELECTRICITY AND MAGNETISM	
3	Course Type	Generic Elective Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	After going through the course, the student should be able to: <ul style="list-style-type: none"> <li>➤ State various laws related with electrostatics, dielectric, electric current, magnetism and electromagnetic induction.</li> <li>➤ Apply vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics.</li> <li>➤ Compare rise and decay of current in LR, CR, LCR circuits.</li> <li>➤ Apply Biot-Savart law for calculation of magnetic field in simple geographic situations.</li> <li>➤ Derive and analyze Maxwell's equations.</li> </ul>	
6	Credit Value	03 Credits	1 Credit= 15 Hours for Learning & Observation
7	Total Marks	Maximum Marks: 100	Minimum Pass Marks: 40

**PART – B: CONTENT OF THE COURSE**

Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)		
Unit	Topics (Course contents)	No. of Periods
<b>I</b>	<b>Power plants in Chhattisgarh:</b> An overview of thermal and hydroelectric power plants in Chhattisgarh. <b>Vector Analysis:</b> Divergence & Curl of Vector fields, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors and its application in electrostatics and magnetostatics. <b>Electrostatics field:</b> Electrostatic Field, electric flux, Gauss's theorem of electrostatics, Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, plane charged sheet, charged conductor.	12
<b>II</b>	<b>Electrostatic potential:</b> Electric potential as line integral of electric field, potential due to a point charge, Calculation of electric field from potential, Capacitance of Parallel plate capacitor, Energy per unit volume in electrostatic field. <b>Dielectric &amp; Electric Currents:</b> Dielectric medium, Polarisation, Displacement vector, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric. Steady current, current density J, non – steady current and Continuity equation, Rise and decay of current in LR, CR, LCR circuits.	13
<b>III</b>	<b>Magnetism: Magnetostatics:</b> Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law, Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, Brief introduction of dia, para and ferro-magnetic materials.	10
<b>IV</b>	<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.  <b>Maxwell's equations and Electromagnetic wave propagation:</b> Equation of continuity of current, Displacement current, Maxwell's equations, Wave equation in free space.	10
<b>Keywords:</b>	Vector calculus, Electrostatics, Dielectrics and Electric Current, Magnetism, Electromagnetic Induction, Maxwell's Equation and Electromagnetic Wave Propagation	

Signature of Convener & Members (CBOS) :

Chairman  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

Officer-In-Charge  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

## PART – C: LEARNING RESOURCES

### Text Books, Reference Books and Others

#### Text Books

1. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
2. Unified Physics – Part II, R. P. Goyal, Shivalal Agrawal and Sons
3. Unified Physics – Navbodh Publications
4. Introduction to Electrodynamics and Electromagnetism, H. C. Verma,

#### Reference Books

1. Vector analysis – Schaum's Outline, M.R. Spiegel, S. Lipschutz, D. Spellman, 2nd Edn., 2009, McGraw- Hill Education.
2. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

#### Online Resources (e-books/ learning portals/ other e-resources)

1. All e-books of physics <https://www.e-booksdirectory.com/listing.php?category=2>
2. Free physics text book in PDF  
[https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRBEiwAjkNDp5v8Yv6xK1s0Kma0YR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD\\_BwE](https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRBEiwAjkNDp5v8Yv6xK1s0Kma0YR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD_BwE)
3. Cambridge University Books for Physics <https://www.cambridgeindia.org/>
4. Books for solving physics problems <https://bookboon.com/en/physics-ebooks>
5. NPTEL Online courses: [https://onlinecourses.nptel.ac.in/noc21\\_ph05/preview](https://onlinecourses.nptel.ac.in/noc21_ph05/preview)
6. <https://archive.nptel.ac.in/courses/115/104/115104088/>
7. Classical Electromagnetism - 1 (Electrostatics) <https://bsc.hcverma.in/course/cee1>
8. Classical Electromagnetism - 2 (Electrostatics) <https://bsc.hcverma.in/course/cee2>

## PART – D: Assessment and Evaluation

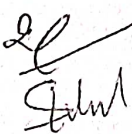
### Suggested Continuous Evaluation Methods:

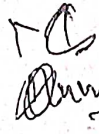
Maximum Marks:	100 Marks
Continuous Internal Assessment (CIA):	30 Marks
End Semester Examination (ESE):	70 Marks

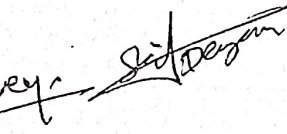
Continuous Internal Assessment (CIA): (By course teacher)	Internal Test/ Quiz (2): 20 + 20 Assignment/ Seminar (1): 10 Total Marks: 30	Better marks out of the two Test / Quiz + marks obtained in Assignment shall be considered against 30 Marks
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End Semester Examination (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type, 1 out of 2 from each unit- 4 x 10=40 Marks
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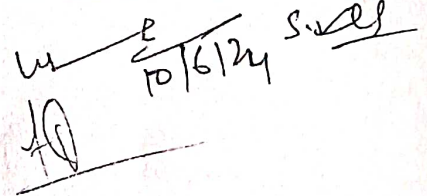
Name and Signature of Convener & Members of CBoS:









 10/6/24 S. S. S.

Chairman

Head of Studies

Shaheed Nandkumar Patel

Vishwavidyalaya, Raigarh (C.G.)

Officer-In-Charge (Academic)

Shaheed Nandkumar Patel

Vishwavidyalaya, Raigarh (C.G.)



**FOUR YEARS UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF PHYSICS**  
**COURSE CURRICULUM**

<b>PART – A: INTRODUCTION</b>			
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: II	Session: 2024-25
1	Course Code	<b>PHGE- 02 P</b>	
2	Course Title	<b>Electricity &amp; Magnetism</b>	
3	Course Type	<b>Generic Elective Course</b>	
4	Pre-requisite (if any)	<b>As per program</b>	
5	Course Learning Outcomes (CLO)	<p><i>After the completion of the course, Students are expected to understand working laws of Electricity, Magnetism and EMWs. The students will also be able to</i></p> <ul style="list-style-type: none"> <li>➤ <i>Verify various circuit laws, network theorems, using simple electric circuits. Assemble required parts/devices and arrange them to perform experiments.</i></li> <li>➤ <i>Verify various laws in electricity and magnetism such as Lenz's law, Faraday's law and learn about the construction, working of various measuring instruments</i></li> <li>➤ <i>Record/ observe data as required by the experimental objectives Analyze recorded data and formulate it to get desired results.</i></li> <li>➤ <i>Interpret results and check for attainment of proposed objectives related to laws of Electricity, Magnetism and its applications</i></li> </ul>	
6	Credit Value	<b>01 Credit</b>	<b>1 Credit = 30 Hours Laboratory Work</b>
7	Total Marks	<b>Maximum Marks: 50</b>	<b>Minimum Pass Marks: 20</b>

**PART – B: CONTENT OF THE COURSE**

Total No. of learning-Training/performance Periods - 30 Periods (30 Hours)		
Sr. No.	Objects (At least 10 of the following or related Experiments)	No. of Periods
1	To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages,(c) DC Current, and (d) checking electrical fuses.	30
2	To compare capacitances using De'Sauty's bridge.	
3	Measurement of field strength B and its variation in a Solenoid Determine (dB/dx).	
4	To study the Characteristics of a Series RC Circuit.	
5	To study a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor.	
6	To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.	
7	To determine a Low Resistance by Carey Foster's Bridge.	
8	To verify the Thevenin and Norton theorem.	
9	To verify the Superposition, and Maximum Power Transfer Theorem.	
10	To use a vibration magnetometer and study magnetic field.	
11	Study of magnetic field due to a current loop.	
12	Study of magnetic fields using Deflection Magnetometer	
13	Mini Project: Construction and Study of Solenoid and measurement of its magnetic field	
<b>Keywords:</b>	Multimeter, Capacitance Comparison, Magnetic Field, RC Circuit, Series LCR Circuit, Parallel LCR Circuit, Low Resistance Measurement, Electrical Theorems	

Signature of Convener & Members (CBOS):

**Chairman**

Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

**Officer-In-Charge**  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

## PART – C: LEARNING RESOURCES

### Text Books, Reference Books and Others

#### Text Books Recommended-

1. Engineering Practical Physics, S. Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
2. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
3. Unified Practical Physics : R P Goyal, Shivalal Agrawal & Sons
4. Unified Practical Physics: Yugbodh Prakashan
5. Unified Practical Physics: Navbodh Prakashan

#### Reference Books Recommended-

1. Basic Electrical and Electronics Engineering by S. K. Bhattacharya
2. A Textbook of Electrical Technology by B.L. Theraja and A.K. Theraja (Volumes 1 and 2)
3. Engineering Circuit Analysis by William H. Hayt, Jack E. Kemmerly, and Steven M. Durbin
4. Practical Physics by G.L. Squires

#### Online Resources (e-books/ learning portals/ other e-resources)

1. Link for e-Books for Physics: Physics Practical:  
<https://www.uou.ac.in/sites/default/files/slm/BSCPH-104.pdf>
2. Virtual Lab <https://vlab.amrita.edu/index.php?sub=1&brch=192>
3. <http://emv-au.vlabs.ac.in/#>
4. <https://www.ae.msstate.edu/vlsm/>
5. <https://nationalmaglab.org/magnet-academy/watch-play/interactive-tutorials>
6. <https://jigvasa-csiri/cgcri/n12-t4-a3/>

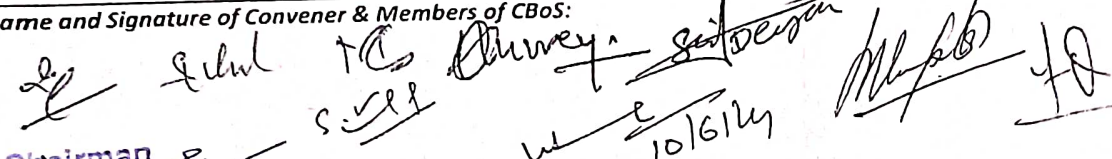
## PART – D: ASSESSMENT AND EVALUATION

### Suggested Continuous Evaluation Methods:

Maximum Marks:	50 Marks
Continuous Internal Assessment (CIA):	15 Marks
End Semester Exam(ESE):	35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2):	10 & 10	Better marks out of the two Test / Quiz + Marks obtained in Assignment shall be considered against 15 Marks
	Assignment/Seminar + Attendance – Total Marks -	05 15	
End Semester Exam (ESE):	Laboratory Performance: On spot Assessment Performed the Task based on lab. work - 20 Marks Spotting based on tools & technology (written) – 10 Marks Viva-voce (based on principle/technology) - 05 Marks		Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of CBOS:

  
 Chairman  
 Shaheed Nandkumar Patel  
 Ashwavidyalaya, Raigarh (C.G.)

Officer-In-Charge (Academic)  
 Shaheed Nandkumar Patel  
 Ashwavidyalaya, Raigarh (C.G.)

**FOUR YEARS UNDERGRADUATE PROGRAM (2024-28)**  
**DEPARTMENT OF PHYSICS**  
**COURSE CURRICULUM**

<b>PART – A: INTRODUCTION</b>			
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: I/ III/ V	Session: 2024-25
1	Course Code	PHVAC-01	
2	Course Title	Renewable Energy and Energy Harvesting	
3	Course Type	Value Addition Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	Objective of the course is to impart students; the knowledge of renewable energy and they are expected to learn about: <ul style="list-style-type: none"> <li>➤ Energy crisis at national and international scenario.</li> <li>➤ Renewable sources of energy and their importance.</li> <li>➤ Availability of renewable energy resources in India.</li> <li>➤ Knowledge about energy harvesting technology.</li> </ul>	
6	Credit Value	02 Credits	1 Credit = 15 Hours- Learning & Observation
7	Total Marks	Maximum Marks: 50	Minimum Pass Marks: 20
<b>PART – B: CONTENT OF THE COURSE</b>			
Total No. of Teaching-learning Periods (01 Hr. per period) - 30 Periods (30 Hours)			
Unit	Topics	No. of Period	
I	<b>Fossil fuels and Alternate Sources of energy:</b> Fossil fuels and nuclear energy, their limitation, need of renewable energy, non-conventional energy sources. Limitations of non-conventional energy resources. Environmental aspect of energy, World energy status, Energy scenario in India. <b>Geo thermal Energy:</b> Geothermal Resources, Geo thermal Technologies.	07	
II	<b>Solar energy:</b> Solar energy, its importance, storage of solar energy, solar pond, non-convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, sun tracking systems. <b>Hydro Energy:</b> Hydro power resources, hydro power technologies, environmental impact of hydro power sources.	08	
III	<b>Biomass energy:</b> Biomass resources, Biomass conversion technology, biogas generation, factors affecting bio-digestion, working of biogas plant (with block diagram), biogas from plant waste, biomass energy programme in India, Biodiesel production from non-edible oil seeds. <b>Ocean Energy:</b> Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices.	08	
IV	<b>Wind Energy harvesting:</b> Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines. grid interconnection topologies. <b>Piezoelectric Energy harvesting:</b> Introduction, Physics and characteristics of piezoelectric effect, piezoelectric materials, Piezoelectric Energy harvesting applications.	07	
<b>Keywords:</b>	Fossil fuel, Renewable energy sources, Solar energy, Biomass energy, Electromagnetic Energy Harvesting, Piezoelectric Energy harvesting.		

Signature of Convener & Members (CBOS):

**Chairman**

Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

**Officer-In-Charge**  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

## PART – C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended-

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 Assessment Handbook, 2009
6. J. Balfour, M. Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).

#### Reference Books Recommended-

1. Non-Conventional Energy Resources by B.H. Khan
2. Renewable Energy Sources and Emerging Technologies by D.P. Kothari, K.C. Singal, and Rakesh Ranjan
3. Solar Energy: Fundamentals, Design, Modelling and Applications by G.N. Tiwari
4. Hydropower Development in India: A Sector Assessment by Pradeep Chaturvedi
5. Biomass Conversion: The Interface of Biotechnology, Chemistry and Materials Science by Samir K. Khanal, edited by B.C. Meikap and P.K. Bhattacharya
6. Ocean Energy: Technology, Environmental Impact and Renewable Energy by Pranav Kumar and T. Balaji
7. Wind Energy: Theory and Practice by S. Rao and Dr. B.B. Parulekar
8. Piezoelectric Materials and Devices: Applications in Engineering and Medical Sciences by Arun Ghosh

#### Online Resources (e-books/ learning portals/ other e-resources)

1. [http://en.wikipedia.org/wiki/Renewable\\_energy](http://en.wikipedia.org/wiki/Renewable_energy)
2. [Renewable Energy Engineering: Solar, Wind And Biomass Energy Systems - Course \(nptel.ac.in\)](#)
3. [Technologies For Clean And Renewable Energy Production – NPTEL+](#)
4. [NPTEL :: Mechanical Engineering - NOC:Selection Of Nanomaterials For Energy Harvesting And Storage Application](#)
5. [Wind energy Labs : Mechanical Engineering : Amrita Vishwa Vidyapeetham Virtual Lab](#)
6. [Virtual Labs \(vlabs.ac.in\)](#)
7. <https://youtu.be/uY3x7TycyDg>

## PART – D: ASSESSMENT AND EVALUATION

#### Suggested Continuous Evaluation Methods:

Maximum Marks:	50 Marks
Continuous Internal Assessment (CIA):	15 Marks
End Semester Exam (ESE):	35 Marks

Continuous Internal Assessment (CIA): (By course teacher)	Internal Test/ Quiz- (2):	10 + 10	Better marks out of the two Test / Quiz + marks obtained in Assignment shall be considered against 15 Marks.
	Assignment/ Seminar+ Attendance-	05	
	Total Marks-	15	
End Semester Examination (ESE):	Two section – A & B Section A: Q1. Objective – 05 x1= 05 Mark; Q2. Short answer type- 5x2 =10Marks Section B: Descriptive answer type qts.,1 out of 2 from each unit- 4x05 =20 Marks		

#### Signature of Convener & Members (CBOS):

Chairman

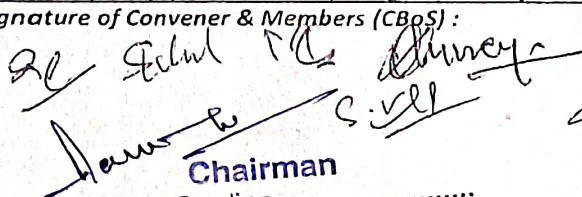
Head of Studies .....  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G)

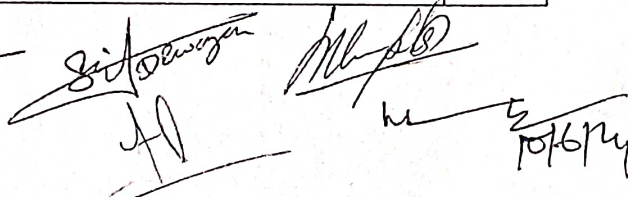
Officer-In-Charge .....  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

**FOUR YEARS UNDERGRADUATE PROGRAM (2024-28)**  
**DEPARTMENT OF PHYSICS**  
**COURSE CURRICULUM**

<b>PART – A: INTRODUCTION</b>			
<b>Program: Bachelor in Science</b> (Certificate/ Diploma/ Degree/ Honors)		<b>Semester: II/ IV/V/ VI</b>	
		<b>Session: 2024-25</b>	
1	Course Code	PHSEC- 01	
2	Course Title	Basic Electrical Skill	
3	Course Type	Skill Enhancement Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	On successful completion of the course, student is expected to enhance his electrical skill through: <ul style="list-style-type: none"> <li>➤ Understanding importance of accuracy in measuring physical quantities.</li> <li>➤ Using basic mechanical tools.</li> <li>➤ Using various measuring instruments.</li> <li>➤ Fault finding and repairing simple domestic appliances</li> </ul>	
6	Credit Value	02 Credits (1C+1C)	1 Credit= 15 Hours for Theoretical Learning & = 30 Hours Laboratory or Field learning/ Training
7	Total Marks	Maximum Marks: 50	Minimum Pass Marks: 20
<b>PART – B: CONTENT OF THE COURSE</b>			
<b>Total No. of Teaching–learning Periods:</b> Theory – 15 Periods (15 Hrs) and Lab. or Field learning/Training 30 Periods (30 Hours)			
Module	Topic (Course Contents)		No. of Period
I	<b>Measurement:</b> Idea about accuracy in measurement, measuring devices for commonly used physical quantities (Length, Mass, Density, Temperature, Power, Current, Voltage, Resistance, capacitance, inductance, frequency etc). <b>D.C. Circuit:</b> Ohms law, Series and parallel resistance circuit, Kirchhoff's law & their application, Primary and secondary cells, maintenance of secondary cells. <b>A.C. Circuits:</b> Generation of AC voltage, wave shape, frequency, peak, average, instantaneous & RMS values, idea about R, L, C circuits <b>Heating &amp; Lighting effects of current:</b> Joule's law of electric heating and its domestic applications, idea of commonly used lighting bulb, tube, CFL, LED. <b>Working:</b> Working principle of Domestic appliances like electric fan, Cooler, Inverters, Mixer, Electric heater etc <b>Safety measurements-</b> Safety measurements in working with mechanical and electrical tools, testing and repair of electrical appliances.		15
II	<b>Laboratory Work:</b> <ul style="list-style-type: none"> <li>(i) Use of basic tools: Screwdriver, Pliers, Wrench, Hacksaw, Spanner, Hand and electric drill, Soldering iron etc.</li> <li>(ii) Use of Voltmeter, Current meter, electronic balance.</li> <li>(iii) Use of Multimeter, CRO.</li> <li>(iv) Design &amp; Construction of extension board</li> <li>(v) Fan repairing and its study</li> <li>(vi) Mixer repairing and its study</li> <li>(vii) Electric kettle repairing and its study</li> <li>(viii) Electric press repairing and its study</li> <li>(ix) Cooler repairing and its study</li> <li>(x) Geezer repairing and its study</li> <li>(xi) Invertor repairing and its study</li> </ul>		30

Signature of Convener & Members (CBoS) :

  
 Chairman  
 Head of Studies .....  
 Shaheed Nandkumar Patel  
 Chhwavidyalaya, Raigarh (C.G.)

  
 Officer-In-Charge  
 Shaheed Nandkumar Patel  
 Chhwavidyalaya, Raigarh (C.G.)

## PART - C: LEARNING RESOURCES

### Text Books, Reference Books and Others

#### Text Books Recommended-

1. A text book in Electrical Technology - B L Theraja - S Chand and Co.
2. Electrical circuits, - M Nahvi and J Edminister, Schaum's outline series, Tata McGraw 2005
3. Circuit Theory, A Chakraborti, Dhanpat Rai & Co.
4. A Text book of electrical technology, - Vol.1, B L Thereja, S. Chand & Co, Delhi
5. A text book of electrical technology- J B Gupta, SK Kalaria & Sons,
6. Principle of electrical engineering- V K Mehta, Rohit Mehta, S. Chand & Co, Delhi

#### Reference Books Recommended

1. Electrical and Electronic Measurements and Instrumentation by R.K. Rajput
2. Electrical Workshop: Safety, Commissioning, Maintenance & Testing of Electrical Equipment by R.P. Singh
3. Electricity and Magnetism by D.N. Vasudeva

#### Online Resources (e-books/ learning portals/ other e-resources)

1. National Digital Library- <https://ndl.iitkgp.ac.in/>
2. <https://nptel.ac.in/courses/108/108/108108076/>
3. Basic Instrumentation Skills – Selfstudy Institute
4. [physics.iisuniv.ac.in](http://physics.iisuniv.ac.in)
5. [https://www.sathyabama.ac.in/sites/default/files/course-material/2020-10/note\\_1469078786.PDF](https://www.sathyabama.ac.in/sites/default/files/course-material/2020-10/note_1469078786.PDF)

## PART - D: ASSESSMENT AND EVALUATION

### Suggested Continuous Evaluation Methods:

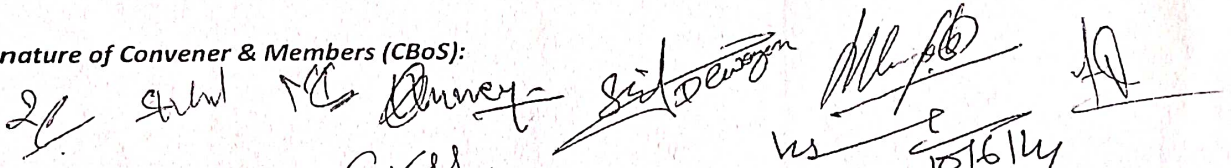
Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Coordinator)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + marks obtained in Assignment shall be considered against 15 Marks
	Assignment/Seminar + Attendance - 05 Total Marks- 15	
End Semester Examination (ESE)	Laboratory /Skill Performance: On spot Assessment A. Performed the Task based on learned skill - 20 Marks B. Spotting based on tools (written) - 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Evaluation by Coordinator

Signature of Convener & Members (CBoS):

  
**Chairman**  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)

**Officer-In-Charge (Convener)**  
 Shaheed Nandkumar Patel  
 Vishwavidyalaya, Raigarh (C.G.)