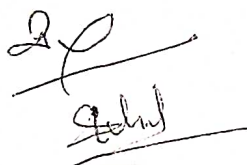


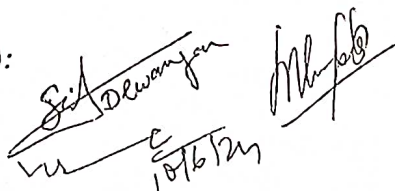
FOUR YEAR UNDERGRADUATE PROGRAM (NEP- 2020)
PROGRAM: BACHELOR IN SCIENCE (2024 – 28)
DISCIPLINE – PHYSICS
SESSION - 2024 – 25

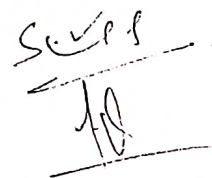
DSC- 01 to 08		DSE- 01 to 12		DGE- 01 to 02	
Code	Course Title	Code	Course Title	Code	Course Title
PHSC- 01 T	Mechanics	PHSE- 01	Introduction to Statistical Mechanics	PHGE- 01 T	Mechanics
PHSC- 01P	Lab Course			PHGE- 01 P	Lab Course
PHSC- 02 T	Electricity & Magnetism	PHSE- 02	Mathematical Physics-I	PHGE- 02 T	Electricity & Magnetism
HSC- 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		
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				
HSC- 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		
		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		

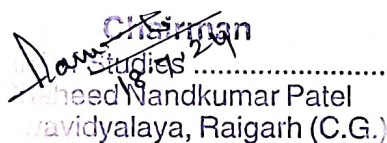
Signature of Convener & Members (CBoS):

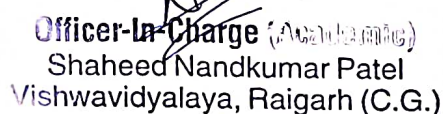









 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

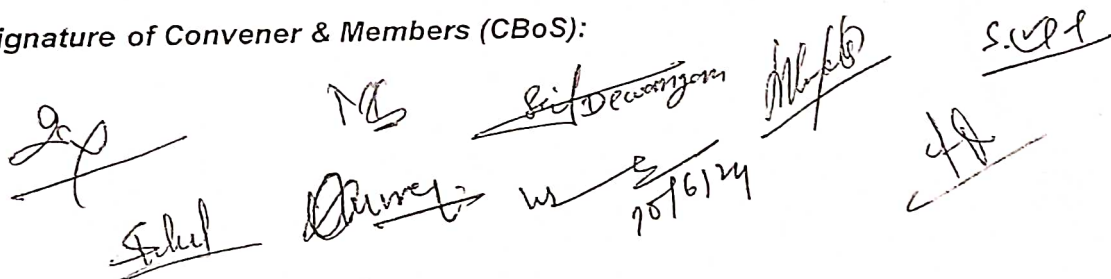

 Officer-In-Charge (Academic)
 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

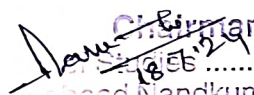
Program Outcomes (PO):

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):



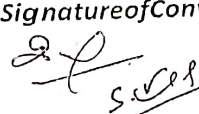
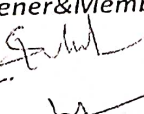
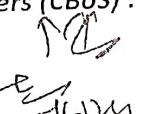

Shaheed Nandkumar Patel
Wishwavidyalaya, Raigarh (C.G.)

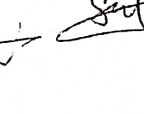
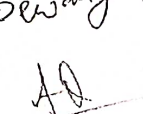
Officer-In-Charge (Academic)
Shaheed Nandkumar Patel
Wishwavidyalaya, Raigarh (C.G.)

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

PART – A: INTRODUCTION				
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)			Semester: I	Session: 2024-25
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)	<i>After going through the course, the student should be able to:</i> ➤ Analyze and apply the laws of motion to various dynamical situations. ➤ Explain and demonstrate the principle of conservation of momentum and energy including their application in real-world scenario such as collision and energy transformation. ➤ Evaluate and calculate moment of inertia for objects of different shapes and analyze how these properties affect the motion of rotating bodies. ➤ Analyze flow of fluids. ➤ Describe special relativistic effects and their effects on the mass and energy of a moving object.		
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				
TotalNo.of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)				
Unit	Topics (Course contents)			No. of Periods
I	Historical Background: Contribution of Aryabhatta and Varahmihir to science and society, Brief biography of Vikram Sarabhai with his contribution. Vectors: Scalar and vector quantities & fields, Scalar & Vector products of two vectors, Derivatives of a vector, Gradient of scalar field and its physical significance. Laws of Motion: 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. Work and Energy: Work-Energy theorem for conservative forces, Force as a gradient of Potential Energy, Conservation of energy, Elastic and in-elastic Collisions			12
II	Rotational Dynamics: 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). Elasticity: Stress & Strain, Hooke’s law, Elastic constants, Poisson’s Ratio,Relationship between various elastic modulii (without derivation), Work done in twisting a cylinder. Fluid Dynamics: Flow of fluids, Coefficient of viscosity,Derivation of Poiseulli’s formula, Motion of a spherical body falling in a viscous fluid, Stoke’s law, Expression for terminal velocity.			12
III	Gravitation: 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. Oscillations: 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	Special Theory of Relativity: 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 (Academic)
 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

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

PART – A: INTRODUCTION				
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 ➤ Assemble required parts/devices and arrange them to perform experiments. ➤ Record/ observe data as required by the experimental objectives. ➤ Analyze recorded data and formulate it to get desired results. ➤ Interpret results and check for attainment of proposed objectives related to laws of mechanics and its applications		
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			
Keywords	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
 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_a0VR0AWGlichRwFfCC0-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

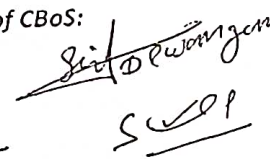
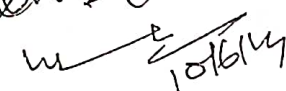
Continuous Internal Assessment (CIA):30 Marks

End Semester Examination (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By course teacher)	Internal Test/ Quiz (2): 20+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
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)




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, Shivlal 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:

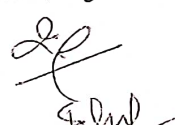
Maximum Marks: 50 Marks

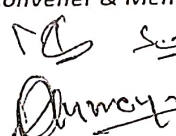
Continuous Internal Assessment(CIA):15 Marks

EndSemester Exam(ESE):35 Marks

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


10/6/24


10/6/24

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

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

PART – A: INTRODUCTION				
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: ➤ State various laws related with electrostatics, dielectric, electric current, magnetism and electromagnetic induction. ➤ Apply vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics. ➤ Compare rise and decay of current in LR, CR, LCR circuits. ➤ Apply Biot-Savart law for calculation of magnetic field in simple geographic situations. ➤ Derive and analyze Maxwell's equations.		
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				
TotalNo.of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)				
Unit	Topics (Course contents)			No. of Periods
I	Power plants in Chhattisgarh: An overview of thermal and hydroelectric power plants in Chhattisgarh. Vector Analysis: 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. Electrostatics field: 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	Electrostatic potential: 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. Dielectric & Electric Currents: 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	Magnetism: 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	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. Maxwell's equations and Electromagnetic wave propagation: 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, Shival 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
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
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:

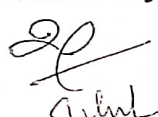
Maximum Marks: 100Marks

Continuous Internal Assessment (CIA):30 Marks

End Semester Examination (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By course teacher)	Internal Test/ Quiz (2): 20+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 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
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

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

PART – A: INTRODUCTION				
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)	<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> ➤ <i>Verify various circuit laws, network theorems, using simple electric circuits. Assemble required parts/devices and arrange them to perform experiments.</i> ➤ <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> ➤ <i>Record/ observe data as required by the experimental objectives. Analyze recorded data and formulate it to get desired results.</i> ➤ <i>Interpret results and check for attainment of proposed objectives related to laws of Electricity, Magnetism and its applications</i>		
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 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			
Keywords:	Multimeter, Capacitance Comparison, Magnetic Field, RC Circuit, Series LCR Circuit, Parallel LCR Circuit, Low Resistance Measurement, Electrical Theorems			

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 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-t4-a3/>

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

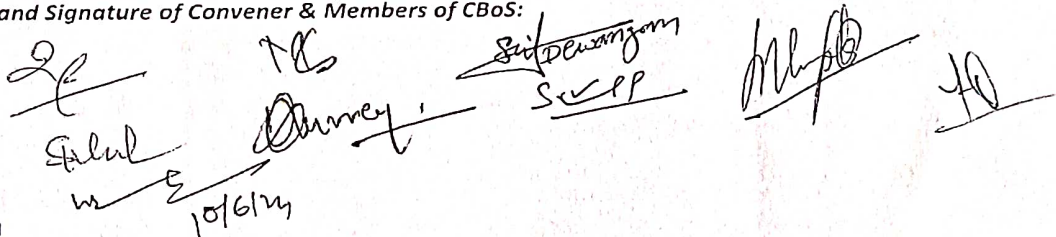
Maximum Marks: 50 Marks

Continuous Internal Assessment(CIA):15 Marks

EndSemester Exam(ESE):35 Marks

Continuous Internal Assessment(CIA): (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
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

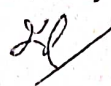
of Studies
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

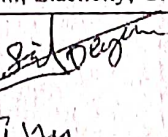
Officer-in-Charge (CBoS)
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

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

PART – A: INTRODUCTION			
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: I	Session: 2024-25
1	Course Code	PHGE-01 T	
2	Course Title	Mechanics	
3	Course Type	Generic Elective Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	<i>After going through the course, the student should be able to:</i> ➤ <i>Analyze and apply the laws of motion to various dynamical situations.</i> ➤ <i>Explain and demonstrate the principle of conservation of momentum and energy including their application in real-world scenario such as collision and energy transformation.</i> ➤ <i>Evaluate and calculate moment of inertia for objects of different shapes and analyze how these properties affect the motion of rotating bodies.</i> ➤ <i>Analyze flow of fluids.</i> ➤ <i>Describe special relativistic effects and their effects on the mass and energy of a moving object.</i>	
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	Historical Background: Contribution of Aryabhatta and Varahmihir to science and society, Brief biography of Vikram Sarabhai with his contribution. Vectors: Scalar and vector quantities & fields, Scalar & Vector products of two vectors, Derivatives of a vector, Gradient of scalar field and its physical significance. Laws of Motion: 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. Work and Energy: Work-Energy theorem for conservative forces, Force as a gradient of Potential Energy, Conservation of energy, Elastic and in-elastic Collisions		12
II	Rotational Dynamics: 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). Elasticity: Stress & Strain, Hooke's law, Elastic constants, Poisson's Ratio, Relationship between various elastic moduli (without derivation), Work done in twisting a cylinder. Fluid Dynamics: Flow of fluids, Coefficient of viscosity, Derivation of Poiseulli's formula, Motion of a spherical body falling in a viscous fluid, Stoke's law, Expression for terminal velocity.		12
III	Gravitation: 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. Oscillations: 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	Special Theory of Relativity: 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
 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 a0VR0AWGlichRwFtCC0-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.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

Name and Signature of Convener & Members of CBoS:

[Signature]
Chairman

[Signature]
Member

[Signature]
Member

[Signature]
Member

[Signature]
Member

[Signature]
Member

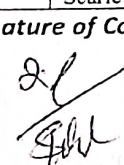
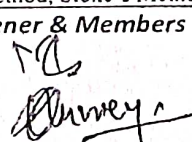
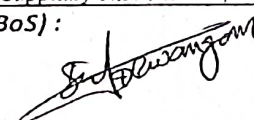
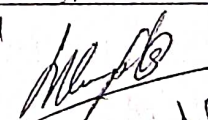
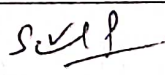
[Signature]
Chairman
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

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

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

PART – A: INTRODUCTION				
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 ➤ Assemble required parts/devices and arrange them to perform experiments. ➤ Record/ observe data as required by the experimental objectives. ➤ Analyze recorded data and formulate it to get desired results. ➤ Interpret results and check for attainment of proposed objectives related to laws of mechanics and its applications		
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			
Keywords	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

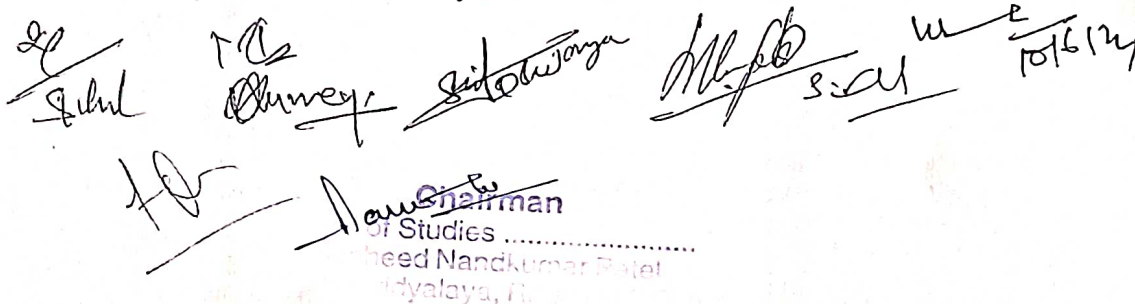
Continuous Internal Assessment (CIA): 15 Marks

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:



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

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

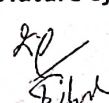
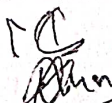
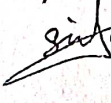
PART – A: INTRODUCTION

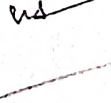
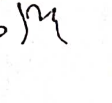
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: II	Session: 2024-25
1	Course Code	PHGE-02 T	
2	Course Title	ELECTRICITY AND MAGNETISM	
3	Course Type	Generic Elective Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	After going through the course, the student should be able to: ➤ State various laws related with electrostatics, dielectric, electric current, magnetism and electromagnetic induction. ➤ Apply vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics. ➤ Compare rise and decay of current in LR, CR, LCR circuits. ➤ Apply Biot-Savart law for calculation of magnetic field in simple geographic situations. ➤ Derive and analyze Maxwell's equations.	
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	Power plants in Chhattisgarh: An overview of thermal and hydroelectric power plants in Chhattisgarh. Vector Analysis: 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. Electrostatics field: 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	Electrostatic potential: 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. Dielectric & Electric Currents: 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	Magnetism: 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	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. Maxwell's equations and Electromagnetic wave propagation: 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
 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=CjwKCAjwmq3kBRBEiwAjkNDp5v8Yv6xK1s0Kma0VR0AWGlichRwFfCC0-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
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

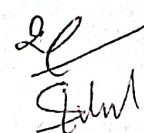
Continuous Internal Assessment (CIA): 30 Marks

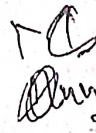
End Semester Examination (ESE): 70 Marks

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 x 1 = 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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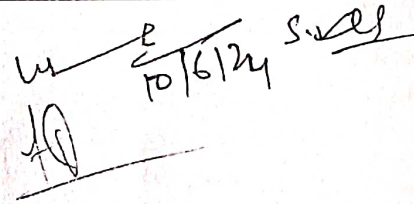
Name and Signature of Convener & Members of CBOs:









 10/6/24 S. S. S.

Chairman

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

PART – A: INTRODUCTION			
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: II	Session: 2024-25
1	Course Code	PHGE- 02 P	
2	Course Title	Electricity & Magnetism	
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 laws of Electricity, Magnetism and EMWs. The students will also be able to ➤ Verify various circuit laws, network theorems, using simple electric circuits. Assemble required parts/devices and arrange them to perform experiments. ➤ 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 ➤ Record/ observe data as required by the experimental objectives Analyze recorded data and formulate it to get desired results. ➤ Interpret results and check for attainment of proposed objectives related to laws of Electricity, Magnetism and its applications	
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 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		
Keywords:		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, Shival 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://jigvsa-csiri.in/cgri/n12-14-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

PART – A: INTRODUCTION

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: ➤ Energy crisis at national and international scenario. ➤ Renewable sources of energy and their importance. ➤ Availability of renewable energy resources in India. ➤ Knowledge about energy harvesting technology.	
6	Credit Value	02 Credits	1 Credit = 15 Hours- Learning & Observation
7	Total Marks	Maximum Marks: 50	Minimum Pass Marks: 20

PART – B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods (01 Hr. per period) - 30 Periods (30 Hours)		
Unit	Topics	No. of Period
I	Fossil fuels and Alternate Sources of energy: 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. Geo thermal Energy: Geothermal Resources, Geo thermal Technologies.	07
II	Solar energy: 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. Hydro Energy: Hydro power resources, hydro power technologies, environmental impact of hydro power sources.	08
III	Biomass energy: 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. Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices.	08
IV	Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines. grid interconnection topologies. Piezoelectric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect, piezoelectric materials, Piezoelectric Energy harvesting applications.	07
Keywords:	Fossil fuel, Renewable energy sources, Solar energy, Biomass energy, Electromagnetic Energy Harvesting, Piezoelectric Energy harvesting.	

Signature of Convener & Members (CBOS):

Chairman

of Studies

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

Officer-In-Charge
Shaheed Nandkumar Patel
Ishwavidyalaya, 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
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/uY3z7Tycyp2>

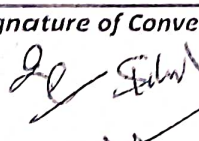
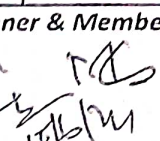
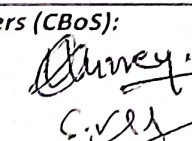
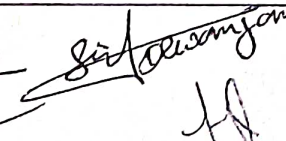
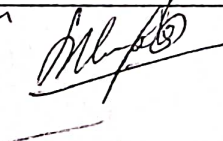
PART – D: ASSESSMENT AND EVALUATION

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 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.
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

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

PART – A: INTRODUCTION

Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: II/ IV/V/ VI	Session: 2024-25
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: ➤ Understanding importance of accuracy in measuring physical quantities. ➤ Using basic mechanical tools. ➤ Using various measuring instruments. ➤ Fault finding and repairing simple domestic appliances	
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

PART – B: CONTENT OF THE COURSE

Total No. of Teaching–learning Periods: Theory – 15 Periods (15 Hrs) and Lab. or Field learning/Training 30 Periods (30 Hours)		
Module	Topic (Course Contents)	No. of Period
I	Measurement: Idea about accuracy in measurement, measuring devices for commonly used physical quantities (Length, Mass, Density, Temperature, Power, Current, Voltage, Resistance, capacitance, inductance, frequency etc). D.C. Circuit: Ohms law, Series and parallel resistance circuit, Kirchhoff's law & their application, Primary and secondary cells, maintenance of secondary cells. A.C. Circuits: Generation of AC voltage, wave shape, frequency, peak, average, instantaneous & RMS values, idea about R, L, C circuits Heating & Lighting effects of current: Joule's law of electric heating and its domestic applications, idea of commonly used lighting bulb, tube, CFL, LED. Working: Working principle of Domestic appliances like electric fan, Cooler, Inverters, Mixer, Electric heater etc Safety measurements- Safety measurements in working with mechanical and electrical tools, testing and repair of electrical appliances.	15
II	Laboratory Work: (i) Use of basic tools: Screwdriver, Pliers, Wrench, Hacksaw, Spanner, Hand and electric drill, Soldering iron etc. (ii) Use of Voltmeter, Current meter, electronic balance. (iii) Use of Multimeter, CRO. (iv) Design & Construction of extension board (v) Fan repairing and its study (vi) Mixer repairing and its study (vii) Electric kettle repairing and its study (viii) Electric press repairing and its study (ix) Cooler repairing and its study (x) Geezer repairing and its study (xi) Invertor repairing and its study	30

Signature of Convener & Members (CBOS) :

[Signatures]
 Chairman

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

[Signatures]

Officer-In-Charge
 Shaheed Nandkumar Patel
 Vishwavidyalaya, 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.I, 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.iituniv.ac.in
5. 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):

20/01/2021
Chairman
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

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

शहीद नंदकुमार पटेल विश्वविद्यालय, रायगढ़ (छ.ग.)

(छत्तीसगढ़ विश्वविद्यालय अधिनियम 1973 द्वारा स्थापित राजकीय विश्वविद्यालय)



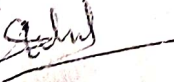
राष्ट्रीय शिक्षा नीति – 2020
के तहत तृतीय एवं चतुर्थ सेमेस्टर
नवीन पाठ्यक्रम
(सत्र 2025–26)

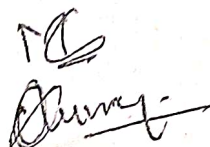
भौतिकी

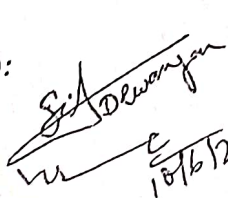
FOUR YEAR UNDERGRADUATE PROGRAM (NEP- 2020)
PROGRAM: BACHELOR IN SCIENCE (2024 – 28)
DISCIPLINE – PHYSICS
SESSION - 2024 – 25

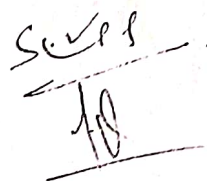
SESSION - 2024 – 25					
DSC- 01 to 08		DSE- 01 to 12		DGE- 01 to 02	
Code	Course Title	Code	Course Title	Code	Course Title
PHSC- 01 T	Mechanics	PHSE- 01	Introduction to Statistical Mechanics	PHGE- 01 T	Mechanics
PHSC- 01 P	Lab Course			PHGE- 01 P	Lab Course
PHSC- 02 T	Electricity & Magnetism	PHSE- 02	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		
PHSC- 04 P	Lab Course	PHSE- 04 P	Lab Course	PHVAC- 01 Renewable Energy and Energy Harvesting	
PHSC- 05 T	Introduction to Quantum Mechanics	PHSE- 05	Mathematical Physics-II		
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		
		PHSE- 07 P	Lab Course		
PHSC- 08	Quantum Mechanics	PHSE- 08 T	Operational Amplifier & Its Applications		
		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		

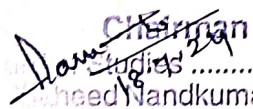
Signature of Convener & Members (CBoS):






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

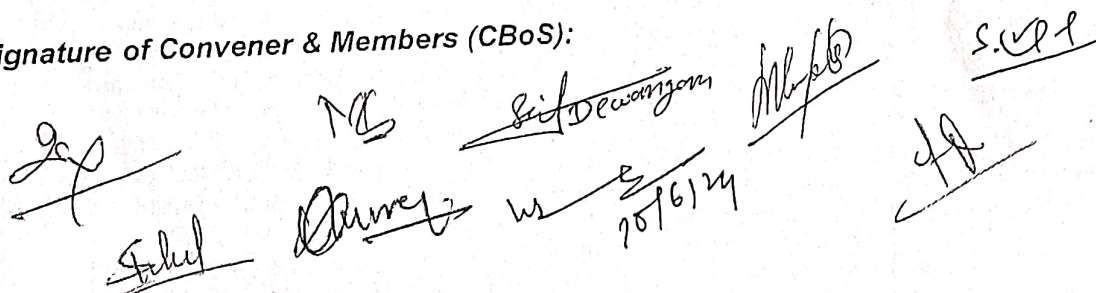

Officer-In-Charge (Academic)
Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

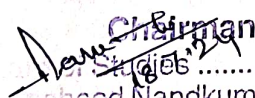
Program Outcomes (PO):

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):




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

PART – A: INTRODUCTION			
Program: Bachelor in Science (Diploma/ Degree/ Honors)		Semester: III	Session: 2024-25
1	Course Code	PHSC-03T	
2	Course Title	Heat and Thermodynamics	
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: ☐ Demonstrate a deep comprehension of the fundamental principles of thermodynamics, including concepts such as energy, entropy and laws of thermodynamics. ☐ Apply the laws of thermodynamics to analyze and solve problems related with energy transfer, heat engines, refrigeration system and other thermodynamic processes. ☐ Analyze basic aspects of kinetic theory and transport phenomenon in gases.	
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 Period
I	Historical background: A brief historical background of thermodynamics and statistical physics in the context of India and Indian culture, Contribution of S. N. Bose in Statistical mechanics. Laws of Thermodynamics: Thermodynamic Description of system, Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, various Thermodynamical Processes, Work Done during Isothermal and Adiabatic Processes, Reversible & irreversible processes. Second law of thermodynamics & Entropy, Carnot's cycle, Carnot's theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics.		12
II	Thermodynamic Potentials: Internal Energy, Enthalpy, Helmholtz Free Energy and Gibbs function. Maxwell's relations & applications, Clausius- Clapeyron Equation, Expression for ($C_p - C_v$), C_p/C_v, TdS equations, Thermodynamic energy equation- change in internal energy of an ideal and Vander Waal's gas, Joule-Thompson Effect, Cooling by adiabatic demagnetization.		11
III	Kinetic Theory of Gases: Maxwellian distribution of speeds in an ideal gas: distribution of speeds and velocities, experimental verification, distinction between mean, rms and most probable speed values, Molecular Collision and Mean Free Path. Transport Phenomena in gases: Viscosity, Conduction and Diffusion, Law of equipartition of energy.		11
IV	Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Stefan Boltzmann Law, Newton's law of cooling from Stefan Boltzmann's law. Wien's displacement law and Rayleigh-Jeans Law (Only qualitative). Planck's radiation Law, Deduction of Wien's distribution law and Rayleigh- Jeans Law from Planck's law. Experimental verification of Planck's radiation law.		11
Keywords:		Zeroth and First Law of Thermodynamics, Second Law of Thermodynamics, Entropy, Thermodynamic Potentials, Maxwell's Thermodynamic Relations Kinetic Theory of Gases, Distribution of Velocities, Molecular Collisions, Real Gases, Laws of radiation	

Signature of Convener & Members (CBoS) :

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books

1. Heat and Thermodynamics: Singhal, Agrawal and Satya Prakash, Pragati Prakashan 1984
2. Physics (Part-2): Editor, Prof. B.P.Chandra, M.P. Hindi Granth Academy
3. Unified Physics –II, R.P.Goyal, Shivalal Agrawal & Sons
4. Unified Physics –II. NovbodhPrakashan

Reference Books

1. Thermodynamics, Kinetic theory & Statistical thermodynamics, F.W.Sears & G.L.Salinger. 1988, Narosa
2. Energy Science in Vedas: A Treatise on Vedic Thermodynamics and Free Energy (Exploring Lost Science and Technology in Vedas), Ramesh Kumar Mineria; Priya Veda Publications

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

1. Basics of thermodynamics
<https://www.youtube.com/watch?v=9GMBpZZtjXM&list=PLD8E646BAB3366BC8>
2. Thermodynamics <https://www.youtube.com/watch?v=E9cOAMhFUz0>
3. Second law of thermodynamics https://www.youtube.com/watch?v=F_fIGosPY8o
4. NPTEL Online Lectures: <https://archive.nptel.ac.in/courses/115/105/115105129/>
5. <https://archive.nptel.ac.in/courses/115/106/115106090/>
6. <https://bsc.hcverma.in/course/penopcyv>
7. Vedic Science and Thermodynamics : <https://www.puranavedas.com/vedic-physics/>
8. <https://www.amazon.in/Vedic-Physics-Raja-Ram-Mohan/dp/0968412009?asin=1988207045&revisionId=&format=4&depth=2>
9. <https://ia903100.us.archive.org/3/items/wholelottabooks/The%20Astronomical%20Code%20of%20the%20Rgveda%20-%20Shubash%20Kak.pdf>

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 Marks
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 x 1 = 10 Mark; Q2. Short answer type- 5 x 4 = 20 Marks
Section B: Descriptive answer type, 1 out of 2 from each unit- 4 x 10 = 40 Marks

Name and Signature of Convener & Members of CBoS:

[Signatures of Convener and Members of CBoS]

[Stamp: 10/6/24]

[Stamp: 10/6/24]

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

PART – A: INTRODUCTION				
Program: Bachelor in Science (Diploma/ Degree/ Honors)		Semester: III		Session: 2024-25
1	Course Code	PHSC- 03P		
2	Course Title	Heat and Thermodynamics		
3	Course Type	Discipline Core Course		
4	Pre-requisite (if any)	As per Program		
5	Course Learning Outcomes (CLO)	➤ Lab Proficiency: Thermometers, pressure gauges, calorimeters, heat transfer apparatus, experimental setup, data acquisition. ➤ Hands-on Learning**: Heat transfer, work done, entropy, phase transitions, experiments. ➤ Data Analysis: Experimental data, theoretical discrepancies, analysis. ➤ Predictive Skills: Thermodynamic behavior, varying conditions, experimentation. ➤ Theory-Practice Integration: Theoretical knowledge, practical lab work, synthesis, applications.		
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 Periods
1	To determine the thermal conductivity of a non-conducting material by Lee's disc method.			30
2	To study the variation of thermo emf across two junctions of a thermocouple with temperature.			
3	To verify Newton's law of cooling.			
4	To determine the temperature co-efficient of resistance by Platinum resistance thermometer.			
5	To determine the coefficient of thermal conductivity(k) of a rubber tube.			
6	To study the heat efficiency of an electric kettle with varying voltage.			
7	To determine the ratio of specific heat at constant pressure and constant volume ($\gamma=C_p/C_v$) of air Clement and Desorme's method.			
8	To determine the coefficient of thermal conductivity of copper by Searle's Apparatus.			
9	To study the variation of thermos-Emf of thermos couple with Difference of Temperature of its Two Junctions.			
10	To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.			
11	Measurement of Planck's constant using black body radiation.			
12	To determine Stefan's Constant.			
Keywords:		Thermal conductivity, Thermocouple, Newton's law of cooling, Temperature coefficient of resistance, Heat efficiency, Specific heat ratio, Mechanical equivalent of heat, Planck's constant		

Signature of Convener & Members (CBoS):

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. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
4. A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, 1985, Vani Publication.
5. Unified Practical Physics B.Sc II : R P Goyal, Shivlal Agrawal & Sons Publications

Reference Books Recommended-

1. Practical Physics by C.L. Arora
2. Practical Physics by S.L. Gupta and Vijay Kumar
3. Advanced Practical Physics for Students by B.L. Worsnop and H.T. Flint

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

Link for e-Books for Physics Practical and Virtual labs

1. Thermal Physics and Statistical Mechanics: Laboratory Collection <https://egyankosh.ac.in/handle/123456789/67450>
2. Virtual Lab : <https://vlab.amrita.edu/index.php?sub=1&brch=194>
3. <https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=802&cnt=1>
4. <https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=801&cnt=4>
5. <https://srmap.edu.in/seas/physics-virtual-lab/>
6. <https://sites.google.com/view/vlab-bnmitmech/home/heat-transfer-lab>
<https://www.pbslearningmedia.org/resource/lsp07-sci-phys-thermalenergy/thermal-energy-transfer/#.WdJiOJrLIU>

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

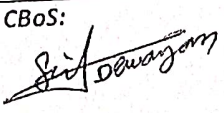
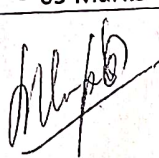
Continuous Internal Assessment(CIA): 15 Marks

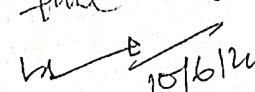
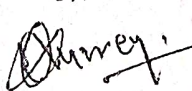
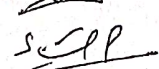
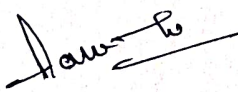
End Semester Exam(ESE): 35 Marks

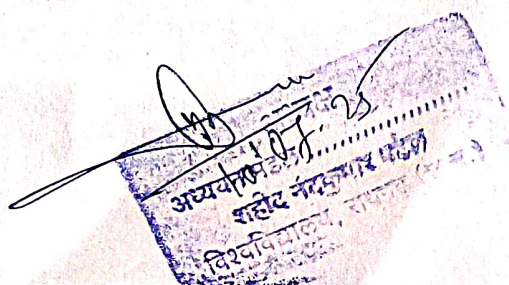
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar + Attendance -05 Total Marks - 15	Better marks out of the two Test / Quiz + Marks obtained in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory Performance: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





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

PART – A: INTRODUCTION			
Program: Bachelor in Science (Diploma/ Degree/ Honors)		Semester: IV	Session: 2024-25
1	Course Code	PHSC-04T	
2	Course Title	Waves and Optics	
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: ➤ Analyze the behavior of waves propagating through different mediums and predict how factors such as density, elasticity, and temperature affect wave propagation. ➤ Demonstrate an understanding of interference phenomena, including constructive and destructive interference, and apply this knowledge to solve problems involving wave superposition. ➤ Explain the concept of diffraction and its implications for wave propagation, including how waves bend around obstacles and spread out after passing through narrow openings. ➤ Describe the polarization of waves, including linear, circular, and elliptical polarization, and apply polarization concepts to analyze and manipulate electromagnetic waves.	
6	Credit Value	03 Credits	1 Credit= 15 Hours - Learning & Observation
7	Total Marks	Maximum Marks: 100	Minimum Pass Marks: 40
PART – B: CONTENT OF THE COURSE			
TotalNo.of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Contribution of C. V. Raman: Brief biography of C. V. Raman with his contribution in field of acoustics and optics. Waves in Medium: Speed of transverse waves on uniform string, Speed of longitudinal waves in a fluid, Energy density and energy transmission in waves. Group velocity and phase velocity and relationship between them. Reflection, refraction and diffraction of sound: Acoustic impedance of a medium, percentage reflection & refraction at a boundary, diffraction of sound, principle of a sonar system.		11
II	Interference: Principle of superposition, Division of wavefront and division of amplitude, Young's Double Slit experiment. Fresnel's Biprism, Phase change on reflection, Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings, measurement of wavelength and refractive index. Michelson's Interferometer, Formation of fringes, Determination of wavelength, Wavelength difference.		12
III	Diffraction: Fresnel Diffraction; Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis. Fraunhofer diffraction; Single slit, Double slit. Multiple slits & Plane Diffraction Grating, Resolving Power of Grating.		11
IV	Polarization: Polarized light and its mathematical representation, Electromagnetic theory of double refraction, Nicol Prism, Double image prism, Polaroid, Phase retardation plates, Circular and elliptical polarization. Polarization by double refraction and Huygens's theory, Rotation of plane of polarization, Biquartz polarimeter.		11
Keywords:		Longitudinal and transverse waves, principle of superposition, Haidinger Fringes, Fresnel Diffraction, Fraunhofer diffraction, Polarization	

Signature of Convener & Members (CBOS):

15/6/24

PART – C: LEARNING RESOURCES

Text Book, Reference Book and Others

Text Books Recommended-

1. Berkely Physics Course: Vol.-III, 'Waves and Oscillations'
2. Principles of Optics, B.K. Mathur, 1995, Gopal Printing
3. Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, S. Chand Publication
4. Physical Optics, A.K. Ghatak
5. Unified Physics- II, R. P. Goyal, Shivalal Agrawal Publications
6. Unified Physics- II, Navbodh Publications

Reference Books Recommended

1. Concepts of Physics by H.C. Verma
2. Fundamentals of Physics by R. Shankar
3. Optics by Ajoy

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

1. Wave an introduction <https://youtu.be/SuQE7eUErIU>
2. Interference <https://youtu.be/hvpYKPyT-vc>
3. Diffraction <https://youtu.be/3RZZQvEVrEA>
4. Polarization https://youtu.be/nELYaf_N528
5. Waves and Oscillations- <https://archive.nptel.ac.in/courses/115/106/115106119/>
6. Optics- <https://archive.nptel.ac.in/courses/115/107/115107131/>

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

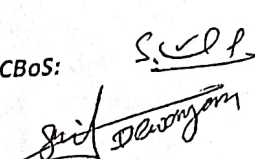
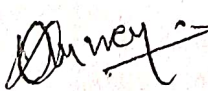
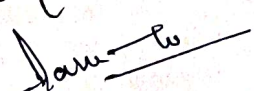
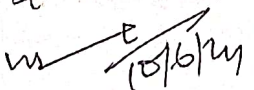
Maximum Marks: 100Marks

Continuous Internal Assessment (CIA):30 Marks

End Semester Examination (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By course teacher)	Internal Test/ Quiz (2): 20 Marks 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 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:


10/07/21
अध्यक्ष, नंदकुमार पटेल
शहीद नंदकुमार पटेल
विश्वविद्यालय, रायगढ़ (उ.प्र.)

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

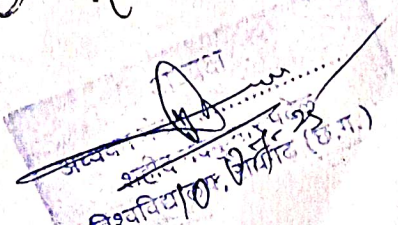
PART – A: INTRODUCTION			
Program: Bachelor in Science (Diploma/ Degree/ Honors)		Semester: IV	Session: 2024-25
1	Course Code	PHSC- 04P	
2	Course Title	Waves and Optics	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if any)	As per program	
5	Course Learning Outcomes (CLO)	After the completion of the course, Students are expected to understand laws and principles behind various optical phenomena, specially related to wave nature of light. The students will also be able to ➤ Gain proficiency in operating laboratory equipment such as light source i.e. mercury, sodium and Laser, spectrometers, polarimeter, demonstrating competence in setting up experiments, calibrating instruments, and collecting accurate data. ➤ Develop a deep understanding of optical principles such as refraction, diffraction, dispersion, and interference, as well as their applications in various scientific disciplines ➤ Analyze recorded data and formulate it to get desired results.	
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	To determine the Frequency of AC mains with the help of Sonometer.	30
2	Determination of angle of prism using spectrometer.	
3	To determine the Refractive Index of the Material of a given Prism using Spectrometer.	
4	To determine Dispersive Power of the Material of a given Prism using Spectrometer	
5	To determine the value of Cauchy Constants of a material of a prism.	
6	To determine the Resolving Power of a Prism.	
7	To determine wavelength of sodium light using Fresnel Biprism.	
8	To determine wavelength of sodium light using Newton's Rings Method.	
9	To determine the wavelength of Laser light using Single Slit Diffraction.	
10	To determine wavelength of Sodium light by laser diffraction.	
11	To determine wavelength of spectrum of Mercury light using plane diffraction Grating and Spectrometer.	
12	To determine the Resolving Power of a Plane Diffraction Grating.	
13	To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.	
14	Determination of resolving power telescope.	
15	Study of polarization of sugar solution using polarimeter.	
Keywords: Waves Motion – General, Velocity of Waves, Wave Optics, Interference, Interferometer, Diffraction, Polarization, Spectrometer.		

Signature of Convener & Members (CBOS):

[Handwritten signatures and stamps]



PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Ed., 2011, Kitab Mahal
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
4. A Laboratory Manual of Physics for undergraduate classes, D.P. Khandelwal, 1985, Vani Pub.
5. Practical Physics B.Sc II : R P Goyal, Shival Publications

Reference Books Recommended

1. Practical Physics by S.L. Gupta and V. Kumar
2. Advanced Practical Physics for Students by B.L. Worsnop and H.T. Flint
3. B.Sc. Practical Physics by C.L. Arora
4. Experimental Physics: Modern Methods by R.A. Dunlap

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

1. Link for e-Books for Physics: Physics Practical: <https://egyankosh.ac.in/handle/123456789/82374>;
2. https://www.lightandmatter.com/lab_223.pdf;
3. Virtual Lab : <https://vlab.amrita.edu/index.php?sub=1&brch=281>
4. <https://www.compadre.org/books/?ID=70&FID=63273>
5. <https://www.edutech.com/category/higher-education/engineering-labs/virtual-labs-1>
6. <https://phet.colorado.edu/en/simulations/wave-interference>
7. <https://egyankosh.ac.in/handle/123456789/82374>

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

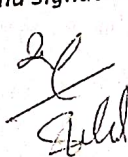
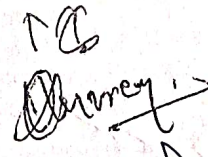
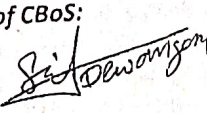
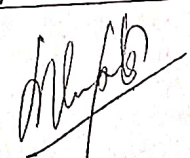
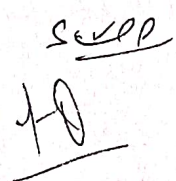
Maximum Marks: 50 Marks

Continuous Internal Assessment(CIA):15 Marks

EndSemester Exam(ESE):35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 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
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

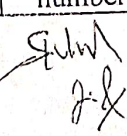
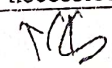
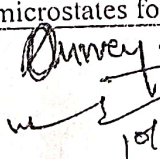
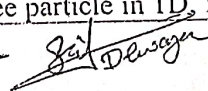
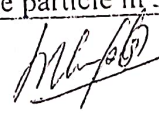
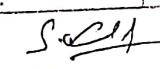
Name and Signature of Convener & Members of CBOS:


 10/6/24
 अध्यक्ष
 शहीद नन्दुनार पटेल
 विश्वविद्यालय, रायगढ़ (उ.प्र.)

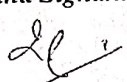
FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

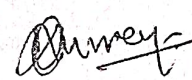
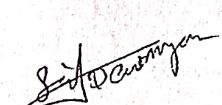
PART-A: INTRODUCTION				
Program : Bachelor in Science (Diploma / Degree/Honors)		Semester - III		Session: 2024-2025
1	Course Code	PHSE-01		
2	Course Title	Introduction to Statistical Mechanics		
3	Course Type	Discipline Specific Elective		
4	Pre-requisite (if, any)	As per Program		
5	Course Learning Outcomes(CLO)	➤ Differentiate between macrostate and microstate and calculate their numbers ➤ Comprehend the concept of ensembles and its requirement in study of physical phenomenon ➤ Correlate and compare the classical and quantum statistical distribution laws. ➤ Apply concepts of statistical distribution laws for different physical systems.		
6	Credit Value	4 Credits	Credit = 15 Hours -learning & Observation	
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40	
PART -B: CONTENT OF THE COURSE				
Total No.of Teaching-learning Periods (01 Hr. per period) – 60 Periods (60 Hours)				
Unit	Topics (Course Contents)			No. of Period
I	Maxwellian Distribution of Speeds In An Ideal Gas: Distribution of speeds and velocity, experimental verification, distinction between mean, rms and most probable speeds, Doppler broadening of spectral lines, transport phenomena in gases: molecular collision, collision cross section, estimates of molecular diameter and mean free path; transport of mass , momentum and energy and inter-relationship, dependence on temperature and pressure. Behaviour of Real Gases : deviation from ideal gas equation, the Virial equation, Andrew's experiment on CO ₂ gas; critical constants.			15
II	Macrostate & Microstate Macrostate, Microstate, Number of accessible microstates and Postulate of equal a priori. Concept of Ensemble: Concept of Gibb's ensemble, postulate of ensemble average, Micro Canonical, Canonical & Grand Canonical ensembles. Thermodynamic Probability, Postulate of Equilibrium and Boltzmann Entropy relation. Phase space, Phase trajectory, Volume element in phase space, Quantization of phase space and number of accessible microstates for free particle in 1D, free particle in 3D.			15

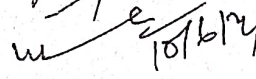








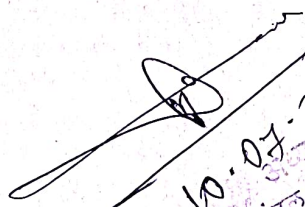
III	Transition to quantum statistics: h as a natural constant and its implications, cases of particle in 1D and 1Dimensional harmonic oscillator, Quantum Statistical Distribution Laws: In-distinguishability of particles and its consequences, Bose-Einstein & Fermi Dirac statistics. Comparison of statistical distribution laws and their physical significance. Canonical Distribution Law: Boltzmann's Canonical Distribution Law, Boltzmann's Partition Function, Proof of Equipartition Theorem (Law of Equipartition of energy) and relation between Partition function and Thermodynamic potentials.	15
IV	Bose-Einstein Distribution Law and its Applications: Bose-Einstein Statistics: Heat capacity, Bose Einstein condensation, Radiation as a photon gas, Quantum Theory of Radiation: Spectral Distribution of Black Body Radiation. Planck's Quantum Postulates. Planck's Law of Blackbody Radiation: Deduction of (1) Wien's Distribution Law, (2) Rayleigh-Jeans Law, (3) Stefan-Boltzmann Law, (4) Wien's Displacement law from Planck's law Fermi-Dirac Distribution Law and its Applications: Free electrons in a metal, Definition of Fermi energy, Determination of Fermi energy at absolute zero, Kinetic energy of Fermi gas at absolute zero and concept of Density of States, Specific Heat of Metals (Density of Orbitals).	15
Keywords	Macrostate & Microstate, ensemble, distribution laws, Bose-Einstein Statistics, Fermi-Dirac Statistics	

Name and Signature of Convener & Members of CBoS:





 10.07.25
 अध्यक्ष मंडल
 शहीद नंदकुमार पटेल
 विश्वविद्यालय, रायगढ़ (छ.ग.)

PART-C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended –

1. Unified Physics –II, R P Goyal, Shivalal Agrawal & Sons Publication
2. Unified Physics-II, Yugbodh Prakashan
3. Unified Physics-II, Navbodh Prakashan

Reference Books Recommended–

1. F. Reif, "Statistical Physics (In SI Units): Berkeley Physics Course Vol 5", McGraw Hill, 2017
2. B.B. Laud, "Fundamentals of Statistical Mechanics", New Age International Private Limited, 2020
3. B.K. Agarwal, M. Eisner, "Statistical Mechanics", New Age International Private Limited, 2007

Online Resources–e-Resources / e-books and e-learning portals

1. MIT Open Learning - Massachusetts Institute of Technology, <https://ocw.mit.edu/courses/8-333-statistical-mechanics-i-statistical-mechanics-of-particles-fall-2013/>
2. National Programme on Technology Enhanced Learning (NPTEL), <https://archive.nptel.ac.in/courses/115/103/115103113/>,
3. https://onlinecourses.nptel.ac.in/noc19_ph10/preview,
4. <https://archive.nptel.ac.in/courses/115/106/115106126/>
5. Uttar Pradesh Higher Education Digital Library, <http://heecontent.upsdc.gov.in/SearchContent.aspx>
6. Swayam Prabha - DTH Channel, <https://www.swayamprabha.gov.in/index.php/program/current/he/8>

PART-D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment(CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA):			70 Marks
Continuous Internal Assessment(CIA): (By Course Teacher)	Internal Test / Quiz-(2):	20 & 20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/Seminar-	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 =20Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40Marks		

Name and Signature of Convener & Members of CBoS:

[Signatures of Convener and Members of CBoS]

10-07-25
अध्यक्ष
अध्ययन मंडल
अध्ययन मंडल अध्यक्ष पदार्थ
पदार्थ (उ.प्र.)

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

PART-A: INTRODUCTION			
Program: Bachelor in Science (Diploma /Degree/Honors)		Semester - IV	Session: 2024-2025
1	Course Code	PHSE-02	
2	Course Title	Mathematical Physics-I	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes(CLO)	➤ Revise and apply the knowledge of calculus, vectors, vector calculus, probability and probability distributions in various cases. ➤ Illustrate proficiency in writing and solving Differential equation and solving them for a given physical system. ➤ Apply and interpret the curvilinear coordinates in problems with spherical and cylindrical symmetries. ➤ Use Dirac Delta function for various physical situation, especially in quantum mechanical approaches.	
6	Credit Value	4 Credits	Credit = 15 Hours -learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40

PART -B: CONTENT OF THE COURSE

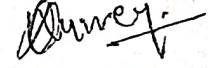
Total No. of Teaching-learning Periods(01 Hr. per period) – 60 Periods (60 Hours)		
Unit	Topics (Course Contents)	No. of Period
I	Calculus: Recapitulation: Limits, continuity, average and instantaneous quantities, differentiation. Plotting functions, Intuitive ideas of continuous, differentiable, etc. functions and plotting of curves. Approximation: Taylor and binomial series (statements only). Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration. Constrained Maximization using Lagrange Multipliers. Origin and Evolution of Mathematical concepts in Ancient India: Bhaskaracharya, the Inventor of Calculus: some examples on calculus	16
II	First Order and Second Order Differential equations: First Order Differential Equations and Integrating Factor. Homogeneous Equations with constant coefficients. Wronskian and general solution. Statement of existence and Uniqueness Theorem for Initial Value Problems. Particular Integral. Orthogonal Curvilinear Coordinates: Orthogonal Curvilinear Coordinates. Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems.	16

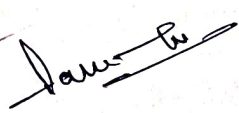
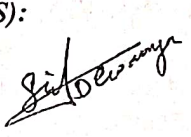
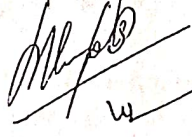
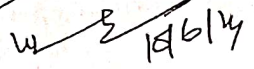
The bottom of the page contains several handwritten signatures and a purple official stamp. The signatures appear to be from faculty members or administrative staff. The stamp is from the Department of Physics, featuring a logo and text in both English and Hindi.

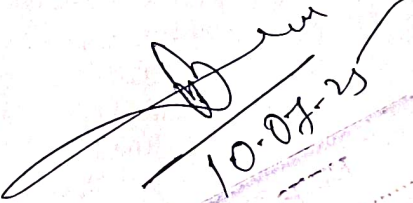
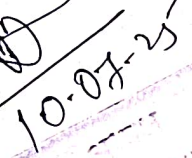
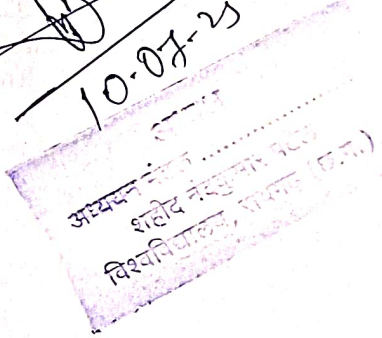
III	Introduction to probability: Independent random variables: Probability distribution functions; binomial, Gaussian, and Poisson, with examples. Mean and variance. Dependent events: Conditional Probability. Bayes' Theorem and the idea of hypothesis testing.	15
IV	Dirac Delta function and its properties: Definition of Dirac delta function. Representation as limit of a Gaussian function and rectangular function. Properties of Dirac delta function. Problems based on dirac-delta function and its application	13
Keywords	Calculus, Lagrange Multipliers, Homogeneous Equations, Particular Integral, Probability distribution, Dependent events, Dirac delta function	

Signature of Convener & Members (CBoS):



PART-C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended –

1. Advanced Engineering Mathematics, D.G. Zill and W.S. Wright, 5 Ed., 2012, Jones and Bartlett Learning
2. Mathematical Physics, Goswami, 1st edition, Cengage Learning
3. Engineering Mathematics, S. Pal and S.C. Bhunia, 2015, Oxford University Press
4. Advanced Engineering Mathematics, Erwin Kreyszig, 2008, Wiley India.
5. Essential Mathematical Methods, K. F. Riley & M.P. Hobson, 2011, Cambridge Univ. Press.
6. Mathematical Physics, H.K. Dass and R. Verma, S. Chand & Company

Reference Books Recommended–

1. Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, F.E. Harris, 2013, 7th Edn., Elsevier.
2. An introduction to ordinary differential equations, E.A. Coddington, 2009, PHI learning
3. Differential Equations, George F. Simmons, 2007, McGraw Hill.
4. Mathematical Tools for Physics, James Nearing, 2010, Dover Publications.

Online Resources–e-Resources / e-books and e-learning portals

1. NPTEL online Courses: <https://archive.nptel.ac.in/courses/115/105/115105097/>
2. NPTEL online Courses: <https://nptel.ac.in/courses/115103036>
3. e-gyankosh- <https://egyankosh.ac.in/handle/123456789/97951>
4. Origin and Evolution of Calculus in India: <http://mathematical-forum.org/wp-content/uploads/2021/01/Paper-1.pdf>
5. <https://iks.iitgn.ac.in/wp-content/uploads/2016/02/Development-of-Calculus-in-India-K-Ramasubramanian-MD-Srinivas-2010.pdf>
6. Indian Mathematics: NPTEL Course : <https://nptel.ac.in/courses/111101080>

PART-D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

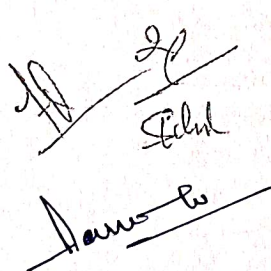
Continuous Internal Assessment (CIA): 30 Marks

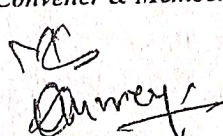
End Semester Exam (ESE): 70 Marks

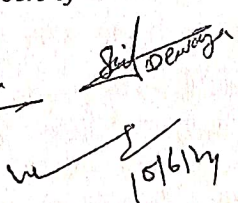
Continuous Internal Assessment(CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 & 20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/Seminar- 10 Total Marks - 30	

End Semester Exam (ESE):	Two section – A & B
	Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit-4x10=40Marks

Name and Signature of Convener & Members of CBoS:

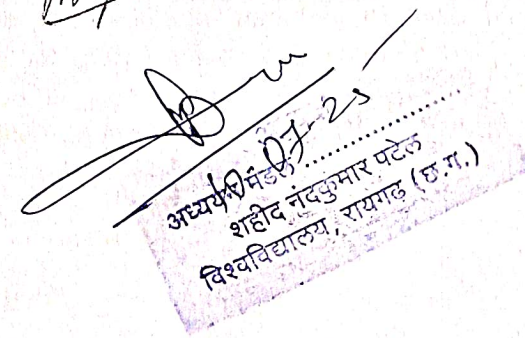

Convener


Member


Member


Member


Member

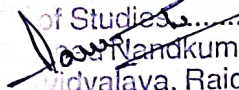

Member

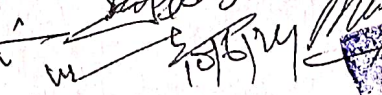
अध्यक्ष/सदस्य
शहीद नंदकुमार पटेल
विश्वविद्यालय, रायगढ़ (छ.ग.)

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

COURSE CURRICULUM			
PART – A: INTRODUCTION			
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: ➤ Energy crisis at national and international scenario. ➤ Renewable sources of energy and their importance. ➤ Availability of renewable energy resources in India. ➤ Knowledge about energy harvesting technology.	
6	Credit Value	02 Credits	1 Credit = 15 Hours- Learning & Observation
7	Total Marks	Maximum Marks: 50	Minimum Pass Marks: 20
PART – B: CONTENT OF THE COURSE			
Total No. of Teaching–learning Periods (01 Hr. per period) - 30 Periods (30 Hours)			
Unit	Topics		No. of Period
I	Fossil fuels and Alternate Sources of energy: 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. Geo thermal Energy: Geothermal Resources, Geo thermal Technologies.		07
II	Solar energy: 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. Hydro Energy: Hydro power resources, hydro power technologies, environmental impact of hydro power sources.		08
III	Biomass energy: 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. Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices.		08
IV	Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines. grid interconnection topologies. Piezoelectric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect, piezoelectric materials, Piezoelectric Energy harvesting applications.		07
Keywords:	Fossil fuel, Renewable energy sources, Solar energy, Biomass energy, Electromagnetic Energy Harvesting, Piezoelectric Energy harvesting.		

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.)


 अध्यक्ष निदेश
 शाहीद नन्दकुमार पटेल
 विश्वविद्यालय (छ.ग.)
 रायगढ़
 दिनांक 10.07.25

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
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/uY3x7Tycvps>

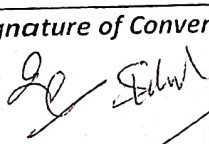
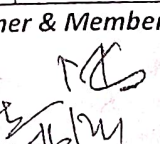
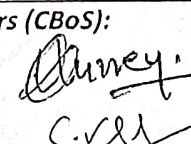
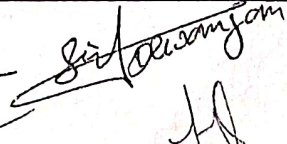
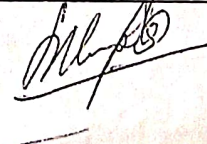
PART – D: ASSESSMENT AND EVALUATION

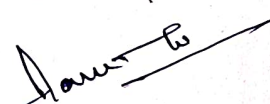
Suggested Continuous Evaluation Methods:

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

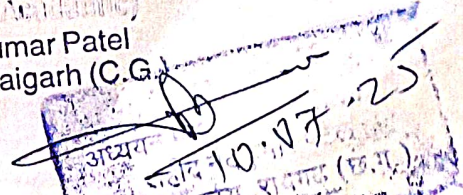
Continuous Internal Assessment (CIA): (By course teacher)	Internal Test/ Quiz- (2):	10 + 10	Better marks out of the two Test / Quiz + marks obtained in Assignment shall be considered against 15 Marks.
	Assignment/ Seminar+ Attendance-	05	
	Total Marks-	15	
End Semester Examination (ESE):	Two section – 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
 of Studies
 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

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



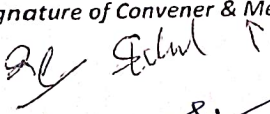
FOUR YEARS UNDERGRADUATE PROGRAM (2024-28)

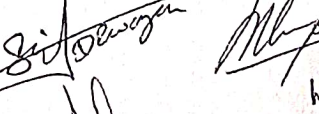
DEPARTMENT OF PHYSICS

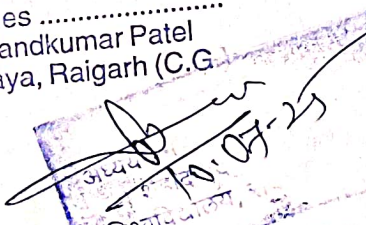
COURSE CURRICULUM

PART – A: INTRODUCTION			
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: II/ IV/V/ VI	Session: 2024-25
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: ➤ Understanding importance of accuracy in measuring physical quantities. ➤ Using basic mechanical tools. ➤ Using various measuring instruments. ➤ Fault finding and repairing simple domestic appliances	
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
PART – B: CONTENT OF THE COURSE			
Total No. of Teaching-learning Periods: Theory – 15 Periods (15 Hrs) and Lab. or Field learning/Training 30 Periods (30 Hours)			
Module	Topic (Course Contents)		No. of Period
I	Measurement: Idea about accuracy in measurement, measuring devices for commonly used physical quantities (Length, Mass, Density, Temperature, Power, Current, Voltage, Resistance, capacitance, inductance, frequency etc). D.C. Circuit: Ohms law, Series and parallel resistance circuit, Kirchhoff's law & their application, Primary and secondary cells, maintenance of secondary cells. A.C. Circuits: Generation of AC voltage, wave shape, frequency, peak, average, instantaneous & RMS values, idea about R, L, C circuits Heating & Lighting effects of current: Joule's law of electric heating and its domestic applications, idea of commonly used lighting bulb, tube, CFL, LED. Working: Working principle of Domestic appliances like electric fan, Cooler, Inverters, Mixer, Electric heater etc Safety measurements- Safety measurements in working with mechanical and electrical tools, testing and repair of electrical appliances.		15
II	Laboratory Work: (i) Use of basic tools: Screwdriver, Pliers, Wrench, Hacksaw, Spanner, Hand and electric drill, Soldering iron etc. (ii) Use of Voltmeter, Current meter, electronic balance. (iii) Use of Multimeter, CRO. (iv) Design & Construction of extension board (v) Fan repairing and its study (vi) Mixer repairing and its study (vii) Electric kettle repairing and its study (viii) Electric press repairing and its study (ix) Cooler repairing and its study (x) Gezeer repairing and its study (xi) Inverter repairing and its study		30

Signature of Convener & Members (CBOS):


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


 Officer-In-Charge
 Shaheed Nandkumar Patel
 Bhawidyalaya, 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. I, 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
- Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India

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/108/108/108_108076/
3. Basic Instrumentation Skills – Selfstudy Institute
4. physics.iisuniv.ac.in
5. 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):

[Handwritten signatures of Convener and Members]

Chairman

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

[Handwritten signature and official stamp]

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

शहीद नंदकुमार पटेल विश्वविद्यालय, रायगढ़ (छ.ग.)

(छत्तीसगढ़ विश्वविद्यालय अधिनियम 1973 द्वारा स्थापित राजकीय विश्वविद्यालय)



राष्ट्रीय शिक्षा नीति – 2020

के तहत V एवं VI सेमेस्टर

नवीन पाठ्यक्रम

(सत्र 2026–27)

भौतिकी

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
HSC- 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		
PHSC- 04 P	Lab Course	PHSE- 04 P	Lab Course	PHVAC- 01	Renewable Energy and Energy Harvesting
PHSC- 05 T	Introduction to Quantum Mechanics	PHSE- 05	Mathematical Physics-II		
PHSC- 05 P	Lab Course				
PHSC- 06 T	Solid State Physics &SolidStateDevices	PHSE- 06	Classical Electrodynamics & Electromagnetic theory	SEC	
PHSC- 06 P	Lab Course				
PHSC- 07	Classical Mechanics	PHSE- 07 T	Digital Electronics		
		PHSE- 07 P	Lab Course		
PHSC- 08	Quantum Mechanics	PHSE- 08 T	Operational Amplifier& Its Applications		
		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):

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10

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

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

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28/06/2024
28/06/2024

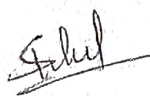
Program Outcomes (PO):

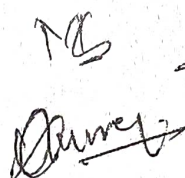
The learning outcomes of the undergraduate degree course in physics are as follows:

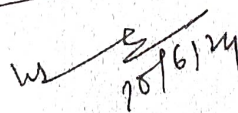
- **In-depth disciplinary knowledge:** The student will acquire comprehensive knowledge and understanding of the fundamental concepts, theoretical principles and processes in the main and allied branches of physics.
- **Hands-on/ Laboratory Skills:** Comprehensive hands-on/ laboratory exercises will 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.

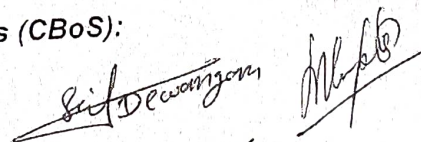
Signature of Convener & Members (CBoS):



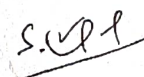




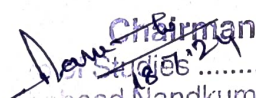
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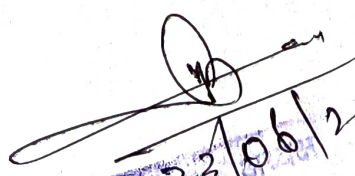







Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

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


22/06/2024
शाहीद नंदकुमार पटेल
विश्वविद्यालय (उ.प.)
रायगढ़

FOUR YEARS UNDERGRADUATE PROGRAM (2024-28)

DEPARTMENT OF PHYSICS

COURSE CURRICULUM

1

PART – A: INTRODUCTION

Program: Bachelor in Science (Degree/ Honors)		Semester: V	Session: 2024-25
1	Course Code	PHSC-05T	
2	Course Title	Introduction to Quantum Mechanics	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: ➤ Explain the basic postulates of quantum mechanics ➤ Explain the concept of the wave packet ➤ Describe the principle of Heisenberg's uncertainty principle and its applications ➤ Gain knowledge about physical quantities as operators ➤ Apply the Schrodinger equation to various quantum systems	
6	Credit Value	03 Credits	1 Credit = 15 Hours - 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	No. of Period
I	Wave-particle duality: Limits of classical mechanics, Theoretical and experimental consequences and their explanation such as black body radiation, Planck's law, Photoelectric effect, Compton's effect, Specific heat of solids at low temperatures, wave-particle duality and demonstration of matter waves, Bohr's complementary principle and correspondence principle, Concept of the wave packet and its spread with time, Gaussian wave packet, Phase and Group velocity, de-Broglie wavelength using phase velocity and group velocity.	12
II	Uncertainty principle: Heisenberg uncertainty principle (Uncertainty relations involving Canonical pair of variables), Experiments for the verification of uncertainty principle, mathematical derivation of uncertainty principle for the one-dimensional wave packet, Applications and consequences of the uncertainty principle.	10
III	Schrodinger equation: Representation of dynamic variables by operators (operators for the position, momentum, energy, angular momentum), Schrodinger's wave equation, Wave function, Probabilistic interpretation of wave function, Probability current densities in one dimension, Equation of continuity, Normalization of wave function, Orthogonality property of wave function, Expectation value of dynamical variables, Ehrenfest's theorem, Postulates of Quantum Mechanics.	11
IV	Application of Schrodinger wave-equation Solution for free particle, Free particle in a box and density of states, Transmission through potential step, Rectangular potential barrier and tunnelling phenomena, Linear harmonic oscillator with the concept of zero-point energy and parity, Schrodinger equation in spherical polar co-ordinates, spherical symmetric potential, energy states of hydrogen using Schrodinger equation.	12
Keywords: Black body radiation, Planck's, Photoelectric effect, de-Broglie wavelength, Uncertainty principle, Schrodinger equation.		

Signature of Convener & Members (CBoS):

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PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended

1. Unified Physics- III, R. P. Goyal, Shivalal Agrawal Publications
2. Unified Physics- III, Navbodh Publications

Reference Books Recommended

1. Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co.
2. Modern Physics, G. Kaur and G.R. Pickrell, 2014, McGraw Hill
3. Quantum Mechanics: Theory & Applications, A.K. Ghatak & S. Lokanathan, 2004, Macmillan

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 textbook in PDF https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yy6xK1s0Kma0VR0AWGlicRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAyD_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
6. Quantum Mechanics <https://archive.nptel.ac.in/courses/115/101/115101107/>
7. Quantum Mechanics <https://nptel.ac.in/courses/115106066>

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
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x 1 = 10 Mark; Q2. Short answer type- 5x4 = 20 Marks Section B: Descriptive answer type, 1 out of 2 from each unit- 4x10 = 40 Marks	

Signature of Convener & Members (CBOS):

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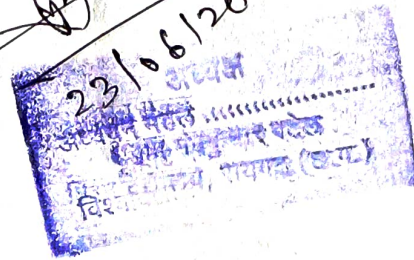
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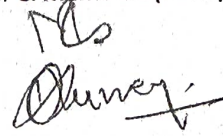
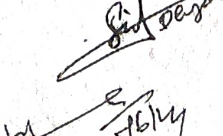
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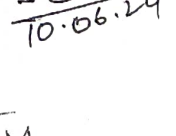


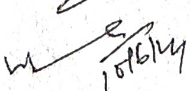
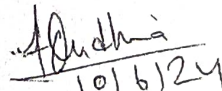
FOUR YEARS UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

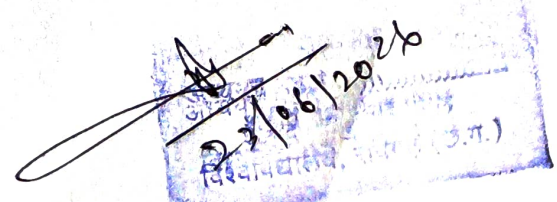
PART – A: INTRODUCTION				
Program : Bachelor in Science (Degree/ Honours)		Semester: V		Session: 2024-25
1	Course Code	PHSC- 05 P		
2	Course Title	Introduction to Quantum Mechanics		
3	Course Type	Discipline Specific Course		
4	Pre-requisite (if any)	As per Program		
5	Course Learning Outcomes (CLO)	After the completion of the course, get opportunity to perform the following experiments on measurement and verification basic concepts of Quantum mechanics. The students are expected to: ➤ Assemble required parts/devices and arrange them to perform experiments. Record/ observe data as required by the experimental objectives. ➤ Analyze recorded data and formulate it to get desired results. ➤ Interpret results and check for attainment of proposed objectives related to laws of Quantum Mechanics and its applications ➤ Apply the learnt concepts for different problems in laser systems, nuclear physics and EMW related problems.		
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	Measurement of Planck's constant using black body radiation and photo-detector			30
2	Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light			
3	To determine work function of material of filament of directly heated vacuum diode.			
4	To determine the Planck's constant using LEDs of at least 4 different colours.			
5	To determine the wavelength of H-alpha emission line of Hydrogen atom.			
6	To determine the ionization potential of mercury.			
7	To determine the absorption lines in the rotational spectrum of Iodine vapour.			
8	To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.			
9	To setup the Millikan oil drop apparatus and determine the charge of an electron.			
10	To show the tunneling effect in tunnel diode using I-V characteristics.			
Keywords:		Planck's constant, tunneling effect, Photo-electric effect, spectrum –Rotational and vibrational, e/m		

Signature of Convener & Members (CBOS) :





PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended-

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal
4. Practical Physics B. Sc III : R P Goyal, Shivlal Publications

Reference Books Recommended-

1. Practical Physics by Dr. Giasuddin Ahmad and Md. Shahabuddin
2. Practical Physics by Dr. Harnam Singh
3. Practical Physics by R. K. Shukla and N. K.

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

1. Virtual Lab : <https://vlab.amrita.edu/?sub=1&brch=195>
2. <https://mpv-au.vlabs.ac.in/>
3. https://mpv-au.vlabs.ac.in/modern-physics/Hall_Effect_Experiment/
4. <https://www.falstad.com/qmatomrad/>
5. <https://www.falstad.com/mathphysics.html> : Quantum mechanics

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 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:

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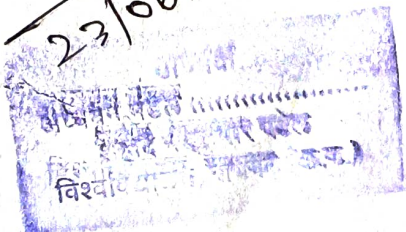
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PART – A: INTRODUCTION			
Program: Bachelor in Science (Degree/ Honors)		Semester: VI	Session: 2024-25
1	Course Code	PHSC-06 T	
2	Course Title	Solid State Physics and Solid State Devices	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: ➤ To give knowledge of some basic electronic components and circuits. Understand the basic principles and industrial applications of semiconductor diode, Zener diode and transistor ➤ Use diodes and transistors in electronic circuits ➤ Understand the construction working and applications of transistor ➤ Understand the construction and working principles of various instruments that are used in the physics laboratory ➤ Gain knowledge on importance of filter a circuit. Describe the working of oscillators	
6	Credit Value	03 Credits	1 Credit = 15 Hours- Learning & Observation
7	Total Marks	Maximum Marks: 100	Minimum Pass Marks:40

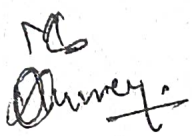
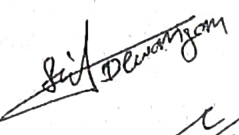
PART – B: CONTENTS OF THE COURSE		
Total No. of Teaching-learning Periods (01 Hr. per period) – 45 Periods (45 Hours)		
Unit	Topics	No. of Period
I	India Semiconductor Mission Vision, objectives and schemes of India Semiconductor Mission (ISM). Crystallography Amorphous and crystalline solids, Elements of symmetry, seven crystal system, Cubic lattice, crystal planes, Miller indices, Laue's equation for X-ray diffraction, Bragg's law, Bonding in solids, Classification, Cohesive energy of solids, Madelung constant, evaluation of parameters, vibrational modes of one-dimensional monoatomic lattice, Dispersion relation, Brillouin Zone.	11
II	Introduction to semiconductors Intrinsic and extrinsic semiconductors, concept of Fermi level, generation and recombination of electron hole pairs in semiconductors, Mobility of electrons and holes, drift and diffusion currents, Carrier Concentration at Normal Equilibrium in Intrinsic Semiconductors, Dependence of Fermi Level on Temperature and Doping Concentration, Temperature Dependence of Carrier Concentrations. Semiconductor Diodes p and n type semiconductors, Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode, PN junction and its characteristics, depletion width and potential barrier, junction capacitance, Structure and working of Zener diode and Tunnel diode.	12

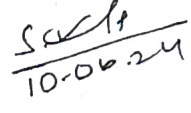
working of Zener diode and Tunnel diode.

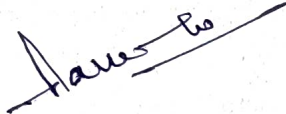
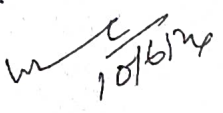
III	Opto-electronic devices Construction, working and applications of LEDs, Photodiode and Solar cell. Power Supply Half-wave Rectifier, Full-wave Rectifiers, Central-tapped and Bridge rectifier, Calculation of Ripple Factor and Rectification Efficiency, Zener diode as voltage regulator. Basic idea about capacitor filter, L-section filter and π -section filter.	10
IV	Transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Active, Cutoff, and Saturation Regions. Current gains α , β and γ . Relations between α , β and γ . Load Line analysis of Transistors. DC Load line and Q-point, FET, Bipolar transistor as amplifier: h-parameters (low frequency), h-parameter equivalent circuit (CE small signal amplifier), Classification of Amplifiers: Class A, B, and C Sinusoidal Oscillator Barkhausen's criterion for Self-sustained oscillations, Determination frequency of RC oscillator. Wein Bridge Oscillator, Hartley oscillator and Phase shift oscillator.	12
Keywords:		Crystalline solids, Miller indices, Bragg's law, semiconductors, Fermi level, junction diodes, transistors, filter circuits, amplifiers, oscillators

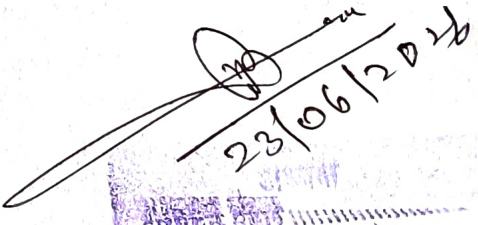
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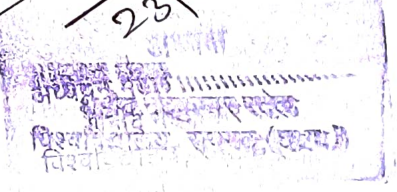








PART – C: LEARNING RESOURCES**Text Books, Reference Books and Others****Text Books Recommended-**

1. Basic electronics (Solid state), B L Thareja
2. Electronics: Fundamentals and Applications, D Chattopadhyay, PC Rakshit
3. Basic Electronics A Simplified Approach, Raghunandan G. H, Chaithanya G. H.
4. Basic Electronics, D.P. Kothari, I. Nagrath
5. Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
6. Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, Tata Mc-Graw Hill.

Reference Books Recommended-

1. Fundamentals of Solid State Physics by B.S. Saxena, R.C. Gupta, P.N. Saxena
2. Solid State Physics by S.O. Pillai
3. Semiconductor Physics and Devices by K. Purushothaman
4. Electronic Devices and Circuits by S. Salivahanan, N. Suresh Kumar
5. Optoelectronics and Optical Communication by B.P. Singh, Rekha Singh
6. Basic Electronics and Linear Circuits by N.N. Bhargava, D.C. Kulshreshtha, S.C. Gupta
7. Electronic Devices and Circuits by J.B. Gupta
8. Principles of Electronics by V.K. Mehta, Rohit Mehta

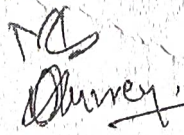
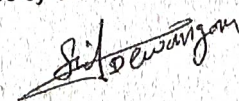
Online Resources (e-books/ learning portals/ other e-resources)

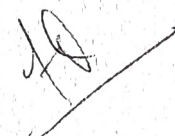
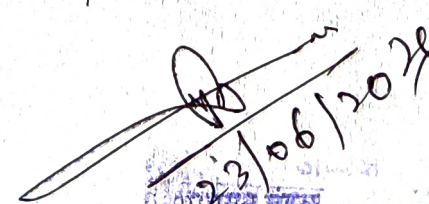
1. <https://nptel.ac.in/courses/122106025>
2. <https://archive.nptel.ac.in/courses/108/101/108101091/>
3. <http://www.digimat.in/nptel/courses/video/117103063/L31.html>
4. <https://archive.nptel.ac.in/courses/117/103/117103063/>

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- 4x10 =40 Marks	

Name and Signature of Convener & Members of CBOS:

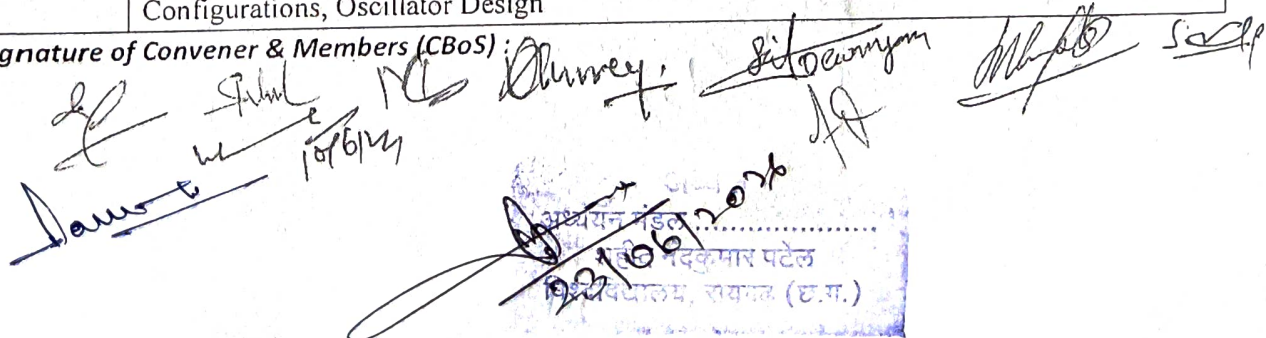



23/06/2024
 श्रीविवेक नंदकुमार पटेल
 विरमचिंतालय, रायगढ़ (छ.ग.)

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

PART – A: INTRODUCTION				
Program: Bachelor in Science (Degree/ Honors)			Semester: VI	Session: 2024-25
1	Course Code	PHSC- 06 P		
2	Course Title	Solid State Physics and Solid State Devices		
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, the students are expected to: ➤ Assemble required parts/devices and arrange them to perform experiments. Record/ observe data as required by the experimental objectives. ➤ Analyse recorded data and formulate it to get desired results. ➤ Interpret results and check for attainment of proposed objectives related to theory of semiconductors. ➤ Apply theory and principle of semiconductors for various device applications ➤ Verify various I/P, O/P and other characteristics of various semiconductor (solid state) devices and interpret the phenomena.		
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 Periods
1	To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150°C) and to determine its band gap.			30
2	To determine the Hall coefficient of a semiconductor sample.			
3	To study V-I characteristics of PN junction diode, and Light emitting diode.			
4	To study the V-I characteristics of a Zener diode and its use as voltage regulator.			
5	Study of V-I & power curves of solar cells, and find maximum power point & efficiency.			
6	To study the characteristics of a Bipolar Junction Transistor in CE configuration.			
7	To study the various biasing configurations of BJT for normal class A operation.			
8	To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias.			
9	To study the frequency response of voltage gain of a RC-coupled transistor amplifier.			
10	To design and study a Wien bridge oscillator.			
11	To design a phase shift oscillator of given specifications using BJT.			
12	To study the Colpitt's oscillator.			
Keywords:		Semiconductor Resistivity, Hall Coefficient, Diode Characteristics, Zener Diode Voltage Regulation, Solar Cell Efficiency, Bipolar Junction Transistor (BJT), BJT Biasing Configurations, Oscillator Design		

Signature of Convener & Members (CBoS):



 22/06/2024
 अध्यक्ष महोदय, सचिव महोदय, सदस्य महोदय (उ.ग.)

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
3. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Ed., 2011, Kitab Mahal
4. Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India.
5. Practical Physics B.Sc III : R P Goyal, Shivalal Agrawal Publications

Reference Books Recommended-

1. Semiconductor Physics and Devices by Donald A. Neamen
2. Electronic Devices and Circuit Theory by Robert L. Boylestad and Louis Nashelsky
3. Microelectronic Circuits by Adel S. Sedra and Kenneth C. Smith
4. Practical Electronics for Inventors by Paul Scherz and Simon Monk

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

1. Virtual Lab : <https://vlab.amrita.edu/?sub=1&brch=282>
2. <https://vlab.amrita.edu/index.php?sub=1&brch=282&sim=370&cnt=3>
3. <https://bop-iitk.vlabs.ac.in/exp/energy-band-gap/simulation.html>
4. <http://vlabs.iitkgp.ac.in/ssd/index.html#>
5. <http://vlabs.iitkgp.ac.in/psac/newlabs2020/ssds/#>
6. <https://ae-iitr.vlabs.ac.in/List%20of%20experiments.html>
7. <https://da-iitb.vlabs.ac.in/List%20of%20experiments.html>

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

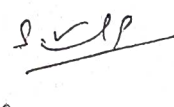
End Semester Exam (ESE): 35 Marks

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 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

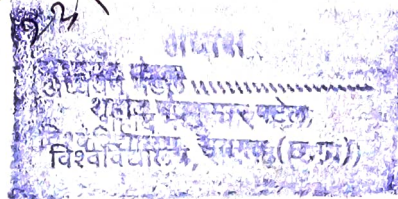
Name and Signature of Convener & Members of CBoS:







22/06/2024



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

PART-A: INTRODUCTION			
Program: Bachelor in Science (Degree/Honors)		Semester - V	Session: 2024-2025
1	Course Code	PHSE-03	
2	Course Title	Nuclear Physics	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	➤ Describe nuclear constituents and their intrinsic properties. Analyze binding energy variations with mass number and understand the N/Z plot. ➤ Explain and apply nuclear models for clear understanding of stability of nuclei and nuclear processes. Differentiate alpha, beta, and gamma decay and interpret energy spectra. ➤ Apply conservation laws to compute Q-values, and analyze reaction mechanism. Explain significance of scattering and reaction cross section. ➤ Calculate and compare nuclear fission and fusion energy. Describe nuclear detectors and particle accelerators. ➤ Gain insights into cutting-edge research, accelerator technology, and interdisciplinary applications and apprehend the role of accelerators in advancing scientific knowledge and contributing to societal well-being.	
6	Credit Value	4 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: CONTENT OF THE COURSE			
Total No. of Teaching-learning Periods (01 Hr. per period) – 60 Periods (60 Hours)			
Unit	Topics (Course Contents)		No. of Period
I	General Properties of Nuclei: Constituents of nucleus and their Intrinsic properties, quantitative facts about mass, radii, charge density (matter density), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot, angular momentum, parity, magnetic moment, electric moments.		15
II	Nuclear Models: Liquid drop model approach, semi empirical mass formula and, significance of its various terms, condition of nuclear stability, two nucleon separation energies, Fermi gas model, evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field.		15

[Signatures: Dr. Anurag, Dr. S. K. Singh, Dr. P. K. Singh, Dr. S. K. Singh, Dr. S. K. Singh]

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III	Nuclear decay and Reactions: Alpha, beta, gamma decay, energy spectrum, Geiger-Nuttel law, disintegration energy, quantum theory of alpha decay, types of beta decay and energy spectrum, Pauli's prediction of neutrino. Types of Reactions, Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct Reaction, resonance reaction, Coulomb scattering (Rutherford scattering). Nuclear Energy Reactions: Nuclear Fission, Calculation of energy released, Nuclear fusion, Energy released in Fusion, Comparison of Fission and fusion energy, Fusion as source of stellar Energy, Nuclear reactors in India, Contribution of nuclear energy in total energy requirement.	15
IV	Nuclear Detector and Particle Accelerators: Interaction of charge particle through matter, Gas detectors: estimation of electric field, mobility of particle, for ionization chamber and GM Counter. Basic principle of Scintillation, Detectors and construction of photo-multiplier tube (PMT), Semiconductor Detectors. Accelerator facility available in India: Van-de Graaff generator, Pelletron accelerator, Linear accelerator, Cyclotron accelerator Nuclear Accelerators in India: RRCAT, VECC, BARC TIFR Pelletron Facility, IUC : working, evolution and contribution.	15
Keywords	Properties of Nucleus, Nuclear forces, Nuclear Models, Decay reaction, detectors and accelerators	

Signature of Convener & Members (CBoS) :

[Signature]
S. Lal

[Signature]
Shrey

[Signature]
S. Dewangan

[Signature]
Anurag

[Signature]
06/06/2020
अध्यक्ष नंदकुमार पटेल
राष्ट्रीय नंदकुमार पटेल
विश्वविद्यालय, रायगढ़ (छ.ग.)

[Signature]
S. Lal

PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

1. Introduction to Nuclear and Particle Physics V.K. Mittal, R. C. Verma, S. C. Gupta, Eastern Economy Edition.
2. Basic ideas and concepts in Nuclear Physics - An Introductory Approach by K. Heyde (IOP-Institute of Physics Publishing, 2004)
3. Nuclear Physics by S.N. Ghoshal, S. Chand Publishing, 2019
4. Unified Physics-III by R P Goyal, Shivlal Agrawal & Sons Publication
5. Nuclear Physics -6Ed by D. C. Tayal, Himalaya Publishing House

Reference Books Recommended –

1. Introductory nuclear Physics by Kenneth S. Krane (Wiley India Pvt. Ltd., 2008).
2. Concepts of nuclear physics by Bernard L. Cohen. (Tata Mc-Graw Hill, 1998).
3. Introduction to the physics of nuclei & particles, R.A. Dunlap. (Thomson Asia, 2004).
4. Nuclear Physics An Introduction S. B. Patel New Age International Publishers.

Online Resources– e-Resources / e-books and e-learning portals

1. NPTEL :: Physics - NOC:Nuclear and Particle Physics
2. NPTEL :: Physics - Nuclear Physics: Fundamentals and Applications
3. Fundamentals of Nuclear Power Generation - Course (nptel.ac.in)
4. eGyanKosh: Unit-13 Nuclear Physics
5. eGyanKosh: Block-4 Nuclear Physics
6. NPTEL :: Physics - Nuclear Science & Engineering
7. Official Websites of Raja Ramanna Centre for Advanced Technology (RRCAT), Variable Energy Cyclotron Centre (VECC), BARC-TIFR Pelletron Facility, Inter-University Accelerator Centre (IUAC)

PART -D: Assessment and Evaluation**Suggested Continuous Evaluation Methods:**

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

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

End Semester Exam (ESE):	Two section – A & B
	Section A: Q1. Objective – 10 x 1 = 10 Mark; Q2. Short answer type- 5x4 = 20 Marks
	Section B: Descriptive answer type qts., 1 out of 2 from each unit-4x10=40 Marks

Name and Signature of Convener & Members of CBoS:

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 10/6/2019
 अध्यक्ष मंडल
 शहीद गुरु पटेल
 विश्वविद्यालय, रायगढ़ (छ.ग.)

13

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

PART-A: INTRODUCTION

Program : Bachelor in Science (Degree/Honors)		Semester - VI	Session: 2024-2025
1	Course Code	PHSE-04 T	
2	Course Title	Numerical Methods and C Programming	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite(if,any)	As per Program	
5	Course Learning Outcomes(CLO)	At the end of this course, the students will be able to: ➤ Analyse the convergence of solutions to numerical methods. Understand the principles of Gaussian elimination, pivoting, and iterative methods to solve linear systems ➤ Use interpolation methods, Perform numerical differentiation and integration using Newton-Cotes formulae ➤ Explain the roles of compilers, interpreters, and operating systems, Learn the basics of C programming	
6	Credit Value	3 Credits	Credit = 15 Hours -learning & Observation
7	Total Marks	Max. Marks : 100	Min Passing 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 Period
I	Methods for determination of zeroes of linear and nonlinear algebraic equations and transcendental equations, convergence of solutions. Solution of simultaneous linear equations, Gaussian elimination, pivoting, iterative method, matrix inversion, Finite differences, interpolation with equally spaced and unevenly spaced points, curve fitting, polynomial least squares and cubic spline fitting. Numerical differentiation and integration, Newton-Cotes formulae, error estimates, Gauss method.	13
II	Numerical solution of ordinary differential equations, Euler and Runge-Kutta methods, Solution of related problems, Predictor-corrector method, Solution of related problems, Elementary ideas of solutions of partial differential equations	10
III	Problem analysis and solving scheme. Computational procedure, programming outline, flow chart. Branching and looping writing. Character set, constants, (numeric string) variables (numeric string) rules for arithmetic expressions and hierarchy of operators, rational expressions, logical expressions, and operators, library functions. Identifiers, qualifiers, define statements, value Initialized variables, operators, and expressions. Operator precedence and associativity. scanf with specifier, search set arrangements and suppression Character, format specifier for scanf. Control structure, if statement, if else statement, multiway decision, compound statement.	10
IV	Loops: for loop, while loop, do while loop, break statement, compound statement continue statement, go to statement, Function - function main, function accepting more than one parameter, user defined and library function concept associatively with functions, function parameter, return value, recursion comparison. Arrays, strings, multidimensional array, array of strings function in string	12
Keywords	Transcendental equations, Ordinary differential equations, Numerical integration, Numerical differentiation, Flow charts, C - Statement.	

Signature of Convener & Members (CBoS):

[Handwritten signatures of Convener and Members]

[Handwritten date: 22/06/2024]

PART-C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended -

1. Numerical Methods for Scientists and Engineers by R. W. Hamming
2. Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale
3. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, and R. K. Jain
4. Programming in ANSI C by E. Balagurusamy
5. Let Us C" by Yashavant Kanetkar
6. Numerical Methods and Programming by P. B. Patil and U. P. Verma
7. Numerical Methods with Programs in C by T. Veerarajan and T. Ramachandran
8. Numerical Methods by B S Grewal

Reference Books Recommended -

1. Sastry: Introductory Methods of Numerical Analysis
2. Rajaraman: Numerical Analysis
3. Numerical Methods by Dr. P. Kandasamy, Dr. K Thilagavathy, Dr. K. Gunvanthi
4. Fundamentals of Numerical Methods by Rajeev K Bansal

Online Resources-

e-Resources / e-books and e-learning portals

1. Numerical methods <https://archive.nptel.ac.in/courses/111/107/111107105/>
2. Numerical analysis <https://archive.nptel.ac.in/courses/111/101/111101165/>
3. Numerical Methods for Engineers <https://archive.nptel.ac.in/courses/127/106/127106019/>
4. Introduction to Numerical Methods <https://nptel.ac.in/courses/105105043>

PART-D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

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

Continuous Internal Assessment (CIA):
 (By Course Teacher)

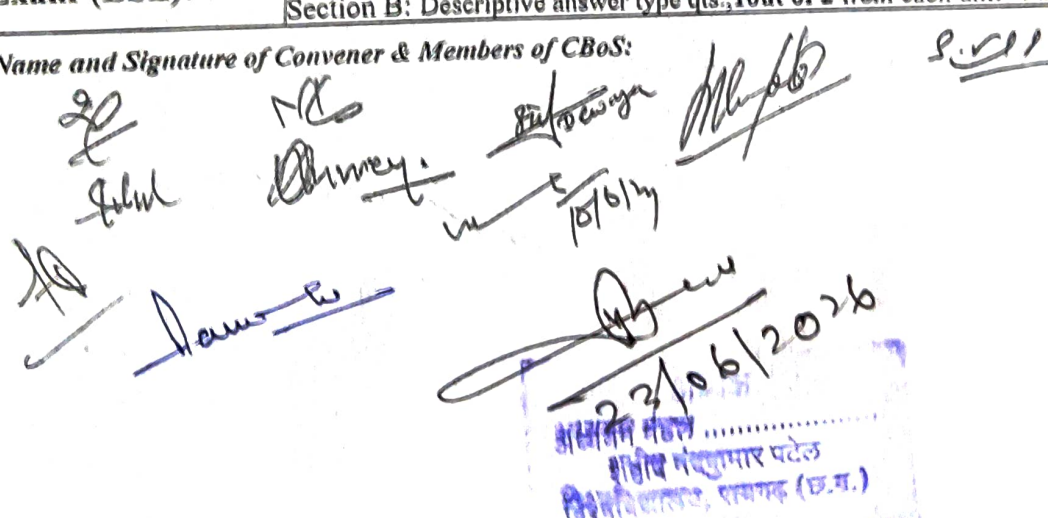
Internal Test / Quiz-(2): 20 +20
 Assignment/Seminar- 10
 Total Marks - 30

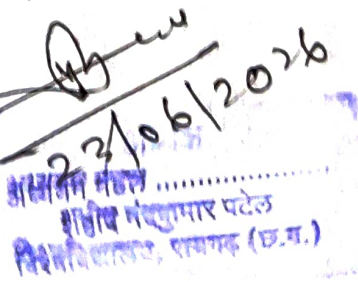
Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks

End Semester Exam (ESE):

Two section - A & B
 Section A: Q1. Objective - 10 x1 = 10 Mark; Q2. Short answer type- 5x4 = 20 Marks
 Section B: Descriptive answer type qts. 1 out of 2 from each unit- 4 x 10 = 40 Marks

Name and Signature of Convener & Members of CBOS:



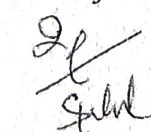
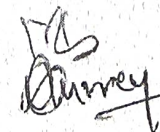
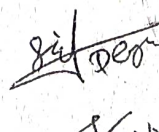
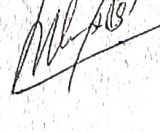
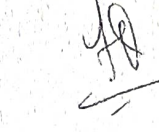


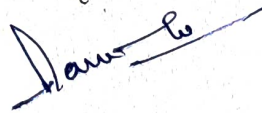
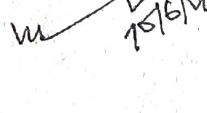
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION			
Program : Bachelor in Science (Degree/Honors)		Semester - VI	Session: 2024-2025
1	Course Code	PHSE-04 P	
2	Course Title	Numerical Methods and C Programming	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes(CLO)	At the end of this course, the students will be able to: ➤ Get experimental Knowledge of computational methods in physics ➤ Learn C language ➤ Use C programming to solve various equations ➤ Perform Interpolation and curve fittings through various tools.	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks:50	Min Passing Marks:20
PART -B: CONTENT OF THE COURSE			
Total No. of learning-Training/performance Periods- 30 Periods (30 Hours)			
Module	Topics (Course Contents) At least 10 of the following or related Experiments		No. of Period
Lab./ Experiment Contents of Course	Any 8 program from the list given below or similar program. - To solve Simultaneous Linear equation by Gauss Elimination Method - To calculate the root of Transcendental equation by Newton-Raphsons Method - Solving the system of Linear simultaneous equation by Gauss-Serdel Method - Numerical Integration by Simposon's 1/3 rule - Solving simultaneous Linear equation by Gauss-Jordan method - Solution of differential equation by Euler's Method - To invert a given Matrix by Gauss-Jordan Method - Solution of differential equation by Runge-Kutte Method - To fit the given data in straight line by Linear Regression Method - Write a program to find the largest of n number of series. - To calculate the standard deviation of a given set of data - To write a program to compute the complex roots of a given polynomial of Nth degree by Graffe's method - To write a program to compute the Eigen Values a given Matrix - To integrate a given function by - Trapezoidal method or by - Gauss quadrature - To find solutions of first order, ordinary differential equation by Taylor method		30
Keywords	Gauss Elimination, Newton-Raphson, Numerical Integration, Euler's Method, Runge-Kutta, Linear Regression, Eigenvalues, Differential Equations		

Signature of Convener & Members (CBoS):


23/06/2024
 विश्वविद्यालय

PART-C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended –

1. Introductory Methods of Numerical Analysis: Sastry:
2. Numerical Analysis : Rajaraman
3. Numerical methods : Antia
4. Numerical Methods by Dr. P. Kandasamy, Dr. K Thilagavathy, Dr. K. Gunvanthi
5. Fundamentals of Numerical Methods by Rajeev K Bansal
6. Numerical Methods in Engineering & Science: with Programs in C, C++, and MATLAB by B S Grewal
7. Raja Raman: FORTRAN programming

Reference Books Recommended –

1. Numerical Methods: Problems and Solutions by M.K. Jain, S. R. K. Iyengar, and R. K. Jain
2. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, and R. K. Jain
3. Numerical Methods: Principles, Analysis, and Algorithms by A. Singaravelu
4. Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale

Online Resources–

e-Resources / e-books and e-learning portals

1. Numerical methods <https://archive.nptel.ac.in/courses/111/107/111107105/>
2. Numerical analysis <https://archive.nptel.ac.in/courses/111/101/111101165/>
3. Numerical Methods for Engineers <https://archive.nptel.ac.in/courses/127/106/127106019/>
4. Introduction to Numerical Methods <https://nptel.ac.in/courses/105105043>

PART-D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

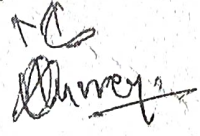
Maximum Marks: 50 Marks

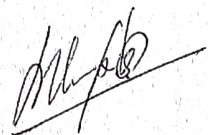
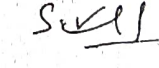
Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

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 + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar + Attendance-	05	
	Total Marks -	15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment		Managed by Course teacher as per lab. status
	A. Performed the Task based on lab. work - 20 Marks		
	B. Spotting based on tools& technology (written) – 10 Marks		
	C. Viva-voce (based on principle/technology) - 05 Marks		

Name and Signature of Convener & Members of CBoS:



28/06/2024
 श्रीविवेक नंदकुमार पटेल
 विश्वविद्यालय, रायगढ़ (छ.ग.)

(17)

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

PART – A: INTRODUCTION

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: ➤ Energy crisis at national and international scenario. ➤ Renewable sources of energy and their importance. ➤ Availability of renewable energy resources in India. ➤ Knowledge about energy harvesting technology.	
6	Credit Value	02 Credits	1 Credit = 15 Hours- Learning & Observation
7	Total Marks	Maximum Marks: 50	Minimum Pass Marks: 20

PART – B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods (01 Hr. per period) - 30 Periods (30 Hours)		
Unit	Topics	No. of Period
I	Fossil fuels and Alternate Sources of energy: 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. Geo thermal Energy: Geothermal Resources, Geo thermal Technologies.	07
II	Solar energy: 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. Hydro Energy: Hydro power resources, hydro power technologies, environmental impact of hydro power sources.	08
III	Biomass energy: 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. Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices.	08
IV	Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines. grid interconnection topologies. Piezoelectric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect, piezoelectric materials, Piezoelectric Energy harvesting applications.	07
Keywords:	Fossil fuel, Renewable energy sources, Solar energy, Biomass energy, Electromagnetic Energy Harvesting, Piezoelectric Energy harvesting.	

Signature of Convener & Members (CBoS):

[Signature]
Chairman

[Signature]
Nandkumar Patel
Dyalaya, Raigarh (C.G.)

[Signature]
Officer-In-Charge

[Signature]
Shaheed Nandkumar Patel
Dyalaya, Raigarh (C.G.)

अध्यक्ष मंडल
शहीद नंदकुमार पटेल
रा. (प्र.ग.)
10.07.25

PART – C: Learning Resources

18

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 Assesment 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
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/uY3x7Tycyps>

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):

[Signatures of Convener and Members]

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

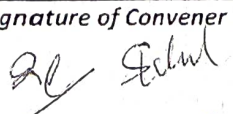
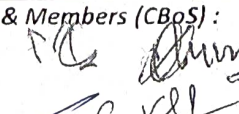
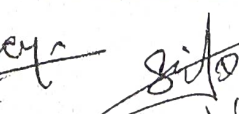
Officer-In-Charge
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

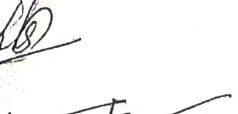
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FOUR YEARS UNDERGRADUATE PROGRAM (2024-28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION			
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: II/ IV/V/ VI	Session: 2024-25
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: > Understanding importance of accuracy in measuring physical quantities. > Using basic mechanical tools. > Using various measuring instruments. > Fault finding and repairing simple domestic appliances	
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
PART – B: CONTENT OF THE COURSE			
Total No. of Teaching-learning Periods: Theory – 15 Periods (15 Hrs) and Lab. or Field learning/Training 30 Periods (30 Hours)			
Module	Topic (Course Contents)		No. of Period
I	Measurement: Idea about accuracy in measurement, measuring devices for commonly used physical quantities (Length, Mass, Density, Temperature, Power, Current, Voltage, Resistance, capacitance, inductance, frequency etc). D.C. Circuit: Ohms law, Series and parallel resistance circuit, Kirchhoff's law & their application, Primary and secondary cells, maintenance of secondary cells. A.C. Circuits: Generation of AC voltage, wave shape, frequency, peak, average, instantaneous & RMS values, idea about R, L, C circuits Heating & Lighting effects of current: Joule's law of electric heating and its domestic applications, idea of commonly used lighting bulb, tube, CFL, LED. Working: Working principle of Domestic appliances like electric fan, Cooler, Inverters, Mixer, Electric heater etc Safety measurements- Safety measurements in working with mechanical and electrical tools, testing and repair of electrical appliances.		15
II	Laboratory Work: (i) Use of basic tools: Screwdriver, Pliers, Wrench, Hacksaw, Spanner, Hand and electric drill, Soldering iron etc. (ii) Use of Voltmeter, Current meter, electronic balance. (iii) Use of Multimeter, CRO. (iv) Design & Construction of extension board (v) Fan repairing and its study (vi) Mixer repairing and its study (vii) Electric kettle repairing and its study (viii) Electric press repairing and its study (ix) Cooler repairing and its study (x) Gezeer repairing and its study (xi) Invertor repairing and its study		30

Signature of Convener & Members (CBoS) :



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

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

28/06/2026

10-07-25

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.I, 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
5. 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	Evaluation by Coordinator
	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	

Signature of Convener & Members (CBoS):

22/06/2020
Chairman
Shaheed Nandkumar Patel
Shwavidyalaya, Raigarh (C.G.)

10-07-2020
Shaheed Nandkumar Patel
Shwavidyalaya, Raigarh (C.G.)

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

23/06/2020