Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Structure and Curriculum of Four-Year Multidisciplinary Degree (Honors/Research) Programme with Multiple Entry and Exit option

Undergraduate Programme of Science and Technology

B.Sc. (Honors/Research) in Physics

Board of Studies

in

Physics

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

[UG I Year]

w.e.f. June, 2026

(In Accordance with NEP-2020)

Academic Year 2026-27

Review Statement

The NEP Cell reviewed the Curriculum of **B.Sc. (Honors/Research) in Physics** Programme to be effective from the **Academic Year 2026-27.** It was found that, the structure is as per the NEP-2020 guidelines of Govt. of Maharashtra.

Date: 11/04/2026

Place: Latur

NEP Cell
Rajarshi Shahu Mahavidyalaya, Latur
Empowered Autonomous Institution

CERTIFICATE

I hereby certify that the documents attached are the Bonafide copies of the Curriculum of **B.Sc. (Honors/Research) in Physics** Programme to be effective from the **Academic Year 2026-27.**

Date: 11/04/2026

Place: Latur

(Dr A. A. Yadav)
Chairperson
Board of Studies in Physics
Rajarshi Shahu Mahavidyalaya, Latur
Empowered Autonomous Institution

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Members of Board of Studies in the Subject Physics

Under the Faculty of Science and Technology

Department of Physics and Electronics

Sr. No.	Name	Designation	In position
1	Dr A. A. Yadav Head, Department of Physics & Electronics, Rajarshi Shahu Mahavidyalaya, Latur (Empowered Autonomous Institution)	Chairperson	HoD
2	Dr Vikas B Patil, School of Physical Sciences, Punyashlok Ahilyadevi Holkar Solapur University, Solapur	Member	Academic Council Nominee
3	Dr Ram Kadam, Shrikrishna Mahavidyalaya, Gunjoti, Omerga	Member	Academic Council Nominee
4	Dr Pravinkumar Ramchandra Mirkute Professor, Department of Physics, Yeshwant Mahavidyalaya, Nanded.	Member	V.C. Nominee
5	Dr Shrinivas Narsimalu Keshatti Professor of Physics, Shri Shivaji College, Parbhani- 431401	Member	V.C. Nominee
6	Shri Gundu Sabde Relyon Industries, Pune	Member	Expert from Industry
7	Dr Pramod Watekar IIT, Kharagpur	Member	Expert from Industry
8	Dr Kamalakar N. Shivalkar Head, Department of physics, Mahatma Gandhi Mahavidyalaya, Ahmedpur Dist. Latur	Member	P.G. Alumni
9	Dr Rajaram Mane School of Physical Sciences, SRTMU, Nanded	Member	Expert from outside for Special Course
10	Miss Mayuri Hawaldar	Member	Member from same Faculty
11	Miss Vishakha Patil	Member	Member from same Faculty
12	Miss Harshda Nalage	Member	Member from same Faculty
13	Mr. Harshad Dalve	Member	Member from same Faculty

From the Desk of the Chairperson…

"Creativity is intelligence having fun" – Albert Einstein

I welcome you all. We have immense pleasure to share that our department is one of the star departments with the state-of-the-art facilities and has highly qualified and dignified faculty. The department addresses the critical challenges to face the society, industry and the academia. I take great pride in sharing that from the academic year 2023-24, development of our Physics curriculum is with the objectives and guidelines as per the National Education Policy 2020. National Education Policy 2020 is a comprehensive framework for education in India that aims to transform the existing education system. The NEP 2020 emphasizes a holistic and multidisciplinary approach to education, focusing on the overall development of students.

Our curriculum as per NEP 2020 reflects: A balanced mix of theoretical concepts, practical applications, and problem-solving skills. Incorporate interdisciplinary connections and encourage the integration of Physics with other subjects where appropriate. Inclusion of emerging topics and advancements in Physics, such as Quantum mechanics, Astrophysics, Nuclear Physics, Renewable Energy, etc. Design learning outcomes that emphasize conceptual understanding, critical thinking, analytical skills, and practical applications. Encourage project-based learning, hands-on experiments, and inquiry-based activities to foster active student engagement and exploration. Explore the integration of technology tools and resources. Promotes inclusivity, gender sensitivity, and addresses the needs of students with diverse backgrounds and abilities.

Our department organizes workshops, training programs, and seminars to update physics teachers about the revised curriculum, instructional strategies, and assessment methods. Encourage teachers to engage in professional development activities, research, and collaboration to enhance their pedagogical skills. Provide support and resources for teachers to integrate technology effectively into their teaching practices.

Our assessment methods are innovative, such as project portfolios, oral presentations, demonstrations, and performance-based assessments in addition to traditional written exams. Facilitate collaborations with research institutions, industries, and organizations to provide students with real-world exposure and opportunities for internships or mentor-ship programs.

Let me take the opportunity to thank and wish you all a great success.

(Dr A.A. Yadav)
Chairperson
Board of Studies in Physics

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Department of Physics and Electronics

Index

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Faculty of Science and Technology

Department of Physics and Electronics

Structure for Four Year Multidisciplinary Undergraduate Degree Programme in Physics

Multiple Entry and Exit (In accordance with NEP-2020)

Year & Level	Sem	Major		Minor	OE	VSC/ SEC (VSEC)	AEC/ VEC	OJT, FP, CEP, RP	Credit per Sem.	Cum./Cr. per exit
		DSC	DSE							
1	**2**	**3**		**4**	**5**	**6**	**7**	**8**	**9**	**10**
I 4.5	I	DSC I: 04 Cr. DSC II: 04 Cr.	NA	NA	OE-I: 04 Cr.	VSC-I: 02 Cr. SEC-I: 02 Cr.	AEC-I MIL: 02 Cr. VEC-I: 02 Cr.	CC-I: 02 Cr. (NSS, NCC, Sports, Cultural)/ CEP-I: 02 Cr. (SES-I)/ OJT: 02 Cr. / Mini Project: 02 Cr.	22	44 Cr. UG Certificate
	II	DSC III: 04 Cr. DSC IV: 04 Cr.	NA	NA	OE-II: 04 Cr.	VSC-II: 02 Cr. SEC-II: 02 Cr.	AEC-II MIL: 02 Cr. VEC-II: 02 Cr.	Generic IKS: 02 Cr.	22	
	Cum. Cr.	16	-	-	08	04+04=08	04+02+02=08	04	44	
Exit Option: Award of UG Certificate in Major with 44 Credits and Additional 04 Credits Core NSQF Course/Internship or continue with Major and Minor										

Abbreviations:

1. DSC : Discipline Specific Core (Major)
2. DSE : Discipline Specific Elective (Major)
3. DSM : Discipline Specific Minor
4. GE/OE : Generic/Open Elective
5. VSEC : Vocational Skill and Skill Enhancement Course
6. VSC : Vocational Skill Courses
7. SEC : Skill Enhancement Course
8. AEC : Ability Enhancement Course
9. MIL : Modern Indian Languages
10. IKS : Indian Knowledge System
11. FSRCE : Fostering Social Responsibility & Community Engagement
12. VEC : Value Education Courses
13. OJT : On Job Training
14. FP : Field Projects
15. CEP : Community Engagement and Service
16. CC : Co-Curricular Courses
17. RP : Research Project/Dissertation
18. SES : Shahu Extension Services

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Faculty of Science and Technology

Department of Physics and Electronics

B.Sc. (Honors/Research) in Physics

Year & Level	Semester	Course Code	Course Title	Credits	No. of Hrs.
I 4.5	I	101PHY1101 (DSC-I)	Mechanics and Properties of Matter	03	45
		101PHY1103	Lab Course-I	01	30
		101PHY1102 (DSC-II)	Heat and thermodynamics	03	45
		101PHY1104	Lab Course-II	01	30
		101PHY1501 (VSC-I)	Domestic Electrical Wiring	02	45
		OE-I	From Basket	04	60
		(SEC-I)	From Basket	02	45
		(AEC-I)	From Basket	02	30
		(VEC-I)	Constitution of India	02	45
		AIPC/OJT-I	Mini Project - I	02	60
	Total Credits			**22**	
	II	101PHY2101 (DSC-III)	Electricity and Magnetism	03	45
		101PHY2103	Lab Course-III	01	30
		101PHY2102 (DSC-IV)	Basic Electronics	03	45
		101PHY2104	Lab Course-IV	01	30
		101PHY2501 (VSC-II)	Weather Forecasting	02	45
		OE-II	From Basket	04	60
		(SEC-II)	From Basket	02	45
		(AEC-II)	From Basket	02	30
		CC	CC-I	02	30
		Generic IKS	Introduction to Indian Knowledge System	02	30
	Total Credits			**22**	
Total Credits (Semester I & II)				**44**	

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Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Faculty of Science & Technology

Department of Physics and Electronics

Programme Outcomes (POs) for B.Sc. Programme	
PO No.	Upon completion of this programme the students will be able to:
PO1	**Disciplinary Knowledge:** Demonstrate a comprehensive, in-depth understanding of core physics disciplines across classical, quantum, and modern physics, and execute this knowledge in specific study areas.
PO2	**Experimental & Instrumentation Skills:** Exhibit precision, analytical ability, and logical thinking while designing and conducting experiments using modern scientific instruments and lab-to-land techniques.
PO3	**Problem Solving & Analytical Skills:** Extract information from qualitative and quantitative data, formulate hypotheses, and apply mathematical/computational skills to solve complex physical problems systematically.
PO4	**Technological & Industrial Applications:** Apply physics principles to diverse and emerging technical fields such as electronics, renewable energy, nanotechnology, and photonics to meet industry needs.
PO5	**Research Aptitude & Innovation:** Execute independent field and research projects, interpret results, and develop a scientific temper for research, innovation, and technological development.
PO6	**Professional Competence & Ethics:** Perform jobs in diverse technical, industrial, and educational fields with human rationale, moral values, and strict professional ethics.
PO7	**Communication & Teamwork:** Discuss, debate, and communicate complex scientific phenomena logically and clearly, and cooperate effectively within multi-disciplinary teams.
PO8	**Self-Directed Life-Long Learning:** Engage in continuous self-learning to adapt to emerging scientific trends, achieve global competencies, and excel in competitive examinations or advanced postgraduate programs.

Programme Specific Outcomes (PSOs) for B.Sc. Physics (Honors/Research)	
PSO No.	Upon completion of this programme the students will be able to:
PSO1	**Core Physical Laws & Concepts:** Interpret and apply core physical laws in mechanics, thermodynamics, electrodynamics, and quantum physics to understand fundamental natural phenomena.
PSO2	**Mathematical & Computational Proficiency:** Utilize advanced mathematical methods and programming languages (Python, C, MATLAB, Fortran) to model, simulate, and analyze complex physical systems.
PSO3	**Applied Physics & Interdisciplinary Tech:** Operate advanced knowledge in specialized areas like solid-state physics, lasers, digital electronics, and nanomaterials for industrial problem-solving and the job market.
PSO4	**Experimental Competence:** Classify and execute experimental techniques, safely handling tools like interferometers, spectrometers, and transducers to validate theoretical physics concepts.
PSO5	**Environmental & Sustainable Physics:** Relate physical science to sustainable development by exploring solar energy, renewable resources, weather forecasting, and atmospheric physics.
PSO6	**Independent Research & Specialization:** Identify specialized areas of interest (e.g., astrophysics, nuclear physics, photonics) to carry out independent research work and prepare for advanced scientific roles.

Semester - I

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Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Faculty of Science & Technology

Department of Physics and Electronics

UG I Sem I

Course Type : DSC-I

Course Title : Mechanics and Properties of Matter

Course Code : 101PHY1101

Credits : 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objectives:

LO1. To make students familiar about the relation between gravitation, mass, gravitational energy and potential energy,

LO2. To enrich students with the knowledge of properties of fluids,

LO3. To develop understanding of elastic nature of materials,

LO4. To build up an understanding of fundamental physical principles,

Course Outcomes:

After completion of the course the student will be able to-

CO1. Apply Kepler's laws and the law of gravitation to analyze the motion of planets and satellites in elliptical orbits.

CO2. Describe and analyze simple harmonic motion and various forms of potential energy in oscillatory systems.

CO3. Use kinematic equations and Newton's laws to solve problems involving linear and accelerated motion.

CO4. Apply work-energy principles and rotational dynamics to solve problems involving conservative, non-conservative forces, and rotational motion.

Unit No.	Title of Unit & Contents	Hrs.
I	**Gravitation**	**11**
	1. Introduction, Kepler's Laws of planetary motion, Newton's Law of universal Gravitation, 2. Deduction of Kapler's laws from Newton's law of gravitation, 3. Gravitational field, Gravitation and Einstein theory of relativity 4. Gravitational Potential, Gravitational PE, Gravitational Potential at Point Distant r from a Body of Mass m, 5. Gravitational Potential due to a thin Spherical Shell: A) At a Point Outside the Shell, B) At a Point on The Surface of The Shell, C) At a Point Inside the Shell, Gravitational Potential due to a Solid Sphere. 6. Potential and attraction due to a solid sphere: i) Point outside the sphere ii) Point inside the sphere	

Unit No.	Title of Unit & Contents	Hrs.
	7. Density of the Earth, Mass of The Earth 8. Numerical Problems	
	Unit Outcomes: UO1. Demonstrate that all objects, regardless of mass, experience a uniform acceleration g during free fall at a given location. UO2. Calculate the total mechanical energy (sum of kinetic and gravitational potential energy) at various points in an object's path to show it remains constant during free fall.	
II	**Elasticity**	**12**
	1. Introduction To Elasticity 2. Load, Stress and Strain, Hooke's Law, Factors Affecting on Elasticity, 3. Three Types of Elasticity (Introduction): Young's Modulus, Bulk Modulus, Modulus of Rigidity 4. Work Done Per Unit Volume in Deforming a Body: I) Longitudinal Strain, Volume Strain, Shearing Strain, Angle of Twist and Angle of Shear, Twisting Couple on A Cylinder, Torsional Pendulum, 5. Determination Of Coefficient of Modulus of Rigidity of a Wire, Statistical Method: Horizontal Torsion Apparatus for A Rod, Dynamical Method: Maxwell's Needle 6. Bending of Beams, Bending Moment, Cantilever Loaded at Free End: When the Weight of The Beam is Ineffective and Effective, Beam Loaded at The Center 7. Numerical Problems.	
	Unit Outcomes: UO1. Validate Hooke's Law through the interpretation of stress-strain curves, identifying the limit of proportionality and elastic limit. UO2 Apply principles of torsion and bending to determine modulus of rigidity and bending moments using experimental methods and solve related numerical problems.	
III	**Surface Tension**	**11**
	1. Introduction 2. Explanation of Surface Tension, Surface Film and Surface Energy, Units and Dimensions of Surface Tension. Shape of the drop by the action of two forces: Force of gravity, Force of surface tension 3. Pressure difference across a curved Surface, Shape of Meniscus in Capillary Tube, Angle of Contact, Pressure Difference Across A Liquid Surface (Case of Drops and Bubbles). 4. Rise of Liquid in A Capillary Tube. 5. Experimental Determination of Surface Tension By I) Jaeger's Method and II) Ferguson Method,	

Unit No.	Title of Unit & Contents	Hrs.
	6. Factors Affecting Surface Tension. 7. Numerical Problems.	
	Unit Outcomes: UO1. Explain certain properties of water using the concept of cohesive forces and surface tension. UO2. Describe how surface tension encourages liquid droplets and soap films to minimize their surface areas.	
IV	**Viscosity**	**11**
	1. Introduction to Viscosity, Coefficient of Viscosity 2. Rate of Flow of Fluid, Lines and Tubes of Flow, Streamline and Turbulent Flow, Critical Velocity, 3. Reynolds Number, Significance of Reynolds Number, Reynolds Equation of Continuity of Flow, 4. Energy of Liquid, Coefficient of Viscosity, 5. Poiseuille's Equation for Flow of Liquid Through a Horizontal Capillary Tube, H By Poiseuille's Method, 6. Stoke's Law (Statement Only), Rotational Viscometer, Modified Rotational Viscometer for liquids of large viscosity: Searle's Viscometer. 7. Variation of Viscosity of a Liquid with Temperature and Pressure, 8. Numerical Problems	
	Unit Outcomes: UO1. Describe the physical significance of viscosity and the role of internal friction in fluid motion. UO2. Recognize that when there is an increase in temperature, the viscosity of liquids decreases. Whereas the viscosity of gases increases with the rise in temperature.	

Learning Resources:

1. Elements of Properties of Matter- D.S Mathur, Shyamlal charitable trust, New Delhi.
2. General Properties of Matter-J. C. Upadhyaya, Ram Prasad and Sons publishers.
3. Properties of Matter- Brijlal and Subramanyam, S. Chand and Co.
4. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker, Wiley India Pvt. Ltd (2016) Tenth Edition
5. University Physics with Modern Physics, Hugh D. Young, Roger A. Freedman, Pearson (2016) Fourteenth Edition
6. A Text Book of Mechanics and Properties of Matter, B. S. Agarwal and Dr R.N. Mishra, Kedar Nath Ram Nath (S.J Publications) Meerut
7. Concepts of Physics, H.C. Verma, Bharati Bhawan (Publishers & Distributors); Noida

8. Introduction to Classical Mechanics: With Problems and Solutions, David Morin (Publisher: Cambridge University Press).

Internal Examination Pattern:

CAT – I: Home Assignment

CAT – II: PPT Presentation/ Open Book Test/ Poster Presentation/ Seminar/ Online Quiz/ Descriptive Test

Mapping of POs, PSOs and COs:

COs/POs & PSOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	0	3	0	0	0	0	2	3	2	0	0	0	1
CO2	3	0	3	0	0	0	0	2	3	2	0	0	0	1
CO3	3	0	3	0	0	0	0	2	3	2	0	0	0	1
CO4	3	0	3	0	0	0	0	2	3	2	0	0	0	1

Scale: 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.

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Faculty of Science & Technology

Department of Physics and Electronics

UG I Sem I

Course Type : Lab Course
Course Title : Lab Course –I (Based on DSC-I)
Course Code : 101PHY1103
Credits : 01 **Max. Marks: 50** **Hours: 30**

Leaning Objectives

LO1. To expose students to the techniques of handling fundamental instruments to determine the mechanical and elastic properties of solid materials, including the acceleration due to gravity and moduli of elasticity.

LO2. To equip students with practical experimental skills for measuring essential fluid properties, specifically surface tension and the coefficient of viscosity, using various classical methods.

LO3. To train students in the precise operation and calibration of optical instruments, such as the spectrometer, for determining optical properties like the angle of a prism.

LO4. To develop students' analytical thinking, precision in measurement, and systematic data collection skills necessary to validate theoretical physics concepts through hands-on experimentation.

Course outcomes

After completion of course the student will be able to-

CO1. Determine the acceleration due to gravity and analyze the oscillatory dynamics of a mechanical system using a bar pendulum.

CO2. Evaluate the elastic parameters of solid materials, specifically Young's modulus and the modulus of rigidity, by utilizing techniques such as static torsion, Maxwell's needle, spring extension, and beam bending.

CO3. Measure and analyze the physical properties of fluids, including the coefficient of viscosity and surface tension, by employing Poiseuille's, Jaeger's, and Ferguson's methods.

CO4. Operate an optical spectrometer to perform precise instrument calibration and determine the angle of a prism, demonstrating proficiency in foundational optical measurements.

Practical No.	Unit
1	Determination of acceleration due to gravity by bar pendulum.
2	Y - by Flat Spiral Spring.
3	Determination of η by Static torsion method.

4	Viscosity of liquid by Poiseuille's method.
5	Surface tension of liquid by Jaeger's method.
6	Y-by bending of beam loaded at middle.
7	Angle of the prism using Spectrometer
8	Calibration of Spectrometer
9	'η' by Maxwell's needle
10	Surface tension by Ferguson's method.

Learning Resources:

1. Elements of Properties of Matter- D.S Mathur, Shyamlal charitable trust, New Delhi.
2. General Properties of Matter-J. C. Upadhyaya, Ram Prasad and Sons publishers.
3. Properties of Matter- Brijlal and Subramanyam, S. Chand and Co.
4. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker, Wiley India Pvt. Ltd (2016) Tenth Edition
5. University Physics with Modern Physics, Hugh D. Young, Roger A. Freedman, Pearson (2016) Fourteenth Edition
6. A Text Book of Mechanics and Properties of Matter, B. S. Agarwal and Dr R.N. Mishra, Kedar Nath Ram Nath (S.J Publications) Meerut
7. Concepts of Physics, H.C. Verma, Bharati Bhawan (Publishers & Distributors); Noida
8. Introduction to Classical Mechanics: With Problems and Solutions, David Morin (Publisher: Cambridge University Press).

Internal Examination Pattern:

CAT – I: Record Book Submission

CAT – II: Overall performance in the regular practical

Mapping of POs, PSOs and COs:

COs/POs & PSOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3	2	0	0	0	0	2	2	1	0	3	0	1
CO2	1	3	2	0	0	0	0	2	2	1	0	3	0	1
CO3	1	3	2	0	0	0	0	2	2	1	0	3	0	1
CO4	1	3	2	0	0	0	0	2	2	1	0	3	0	1

Scale: 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.

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Faculty of Science & Technology

Department of Physics and Electronics

UG I Sem I

Course Type : DSC-II
Course Title : Heat and Thermodynamics
Course Code : 101PHY1102
Credits : 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objective

LO1. To introduce the core principles of thermodynamics, including the Zeroth, First, Second, and Third laws, and the concept of entropy.

LO2. To develop an understanding of the kinetic theory of gases, transport phenomena, and the behaviour of real versus ideal gases.

LO3. To explain the mechanisms of reversible and irreversible processes and their impact on energy conversion systems.

LO4. To train students to apply Maxwell's thermodynamical relations to model physical processes like Joule-Thomson cooling and phase changes.

Course Outcomes

After completion of course, the student will be able to-

CO1. Articulate the fundamental laws of thermodynamics and differentiate between various forms of energy, heat, and work.

CO2. Analyze the behaviour of real gases, critical constants, and transport phenomena such as viscosity and thermal conductivity.

CO3. Evaluate the efficiency of heat engines and refrigerators using Carnot's cycle and the principles of entropy generation.

CO4. Apply thermodynamic potentials and Maxwell's relations to mathematically model and solve complex energy exchange processes.

Unit No.	Title of Unit & Contents	Hrs.
I	**Transport Phenomena in Gases**	**11**
	1. Introduction to Thermodynamics, 2. Molecular Collision, Mean Free Path, Sphere of Influence, Collision Cross-Section, 3. Expression for Mean Free Path, Maxwell's Formula, Three Transport Phenomena in Gases, 4. Viscosity, Effect of Temperature and Pressure on Coefficient of Viscosity, 5. Thermal Conductivity and Self-Diffusion of Gases,	

Unit No.	Title of Unit & Contents	Hrs.
	6. Effect of Temperature and Pressure on Mean Free Path, 7. Relation Between Coefficient of Viscosity and Coefficient of Thermal Conductivity, 8. Relation Between Three Transport Coefficients, Numerical Problems.	
	Unit Outcomes: UO1. Calculate the root-mean-square (rms), average, and most probable speeds of gas molecules using the Maxwell-Boltzmann distribution UO2. Analyze the behavior of gases under varying conditions by exploring viscosity, thermal conductivity, and diffusion, and solve related numerical problems using theoretical relationships.	
II	**Behavior of Real Gases**	**11**
	1. Introduction, Change of State, Continuity of State, 2. Andrew's Experiment on CO_2, 3. Critical Constants, Behavior of Gases at High Pressure, Boyle's Temperature, 4. Reasons for Modification of Gas Equation, Vander Wall's Equation of State, Comparison of Experimental P-V Curves, Estimation of Critical Constants, Constants for Vander Walls Equation, 5. Critical Coefficients, Reduced Equation of State, 6. Joule-Thomson Porous Plug Experiment & Its Applications 7. Relation Between the Boyle Temperature, Inversion Temperature and Critical Temperature, 8. Relation Between T_B, Ti And T_C, Numerical Problems.	
	Unit Outcomes: UO1. Apply the Van der Waals equation of state to predict the P-V-T behavior of real gases at high pressures and low temperatures. UO2. Analyze thermodynamic processes like the Joule-Thomson effect and interpret the relationships between Boyle temperature, inversion temperature, and critical temperature through experimental data and numerical problem-solving.	
III	**Thermodynamics**	**12**
	1. Introduction, Zeroth Law of Thermodynamics, Concept of Heat, 2. Thermodynamic Equilibrium, Work: A) A Path Dependent Function, B) Internal Energy, First Law of Thermodynamics, 3. Internal Energy as A State Function, Specific Heats of a Gas, Slopes of Adiabatic and Isothermal, Reversible and Irreversible Process, 3. Second Law of Thermodynamics, Work Done During Adiabatic and Isothermal Process,	

Unit No.	Title of Unit & Contents	Hrs.
	4. Carnot's Ideal Heat Engine and The Efficiency of Carnot's Cycle, Carnot's Theorem and Its Proof, Refrigerator, 5. Entropy, Entropy of Reversible and Irreversible Process, Third Law of Thermodynamics, 6. Numerical Problems.	
	Unit Outcome: UO1. Apply the First Law of Thermodynamics to calculate changes in internal energy, heat transfer, and work done during isothermal, adiabatic, isobaric, and isochoric processes. UO2. Analyze the functioning and efficiency of heat engines, refrigerators, and cyclic processes, and solve numerical problems related to the laws of thermodynamics.	
IV	**Thermodynamical Relations**	**11**
	1. Introduction, Extensive and Intensive Variables, 2. Maxwell's Thermodynamical Relations, 3. Applications of Thermodynamical Relations: A) Specific Heat Equation B) Joule-Thomson's Cooling, 4. T-Ds Equations, Claussius-Clapeyron's Latent Heat Equation Using Thermodynamical Relations, 5. Internal Energy, Helmholtz's Function, Enthalpy, Gibb's Function.	
	Unit Outcomes: UO1. Learn about Maxwell's thermodynamic relations. UO2. Comprehend the thermodynamic potentials and their physical interpretations.	

Learning Resources:

1. Heat, Thermodynamics and Statistical Physics- Brijlal, Dr. N. Subrahmanyam, P. S. Hemne, S. Chand and Co. Ltd.
2. Heat, Thermodynamics & Statistical Physics, S.L. Kakani, Sultan Chand & Sons. Publishing (2009) Revised Edition
3. Heat and Thermodynamics -Brijlal, N. Subrahmanyam, S. Chand and Co. Ltd.
4. Textbook of Heat and thermodynamics- D. S. Mathur.
5. Thermal and Statistical Physics- Brijlal & N. Subrahmanyam, S. Chand and Co. Ltd.
6. Thermal Physics: with Kinetic Theory, Thermodynamics and Statistical Mechanics, S.C. Garg, R.M. Bansal, C.K. Ghosh Tata Mcgraw Hill Education Private Limited (2017) Second Edition.
7. Engineering Thermodynamics, P.K. Nag (Publisher: McGraw-Hill Education)
8. A Textbook of Thermal Physics, R.K. Rajput (Publisher: S. Chand Publishing)
9. Introduction to Thermodynamics, Y.V.C. Rao (Publisher: Universities Press)

10. Thermodynamics and Statistical Physics, B.B. Laud (Publisher: New Age International Publishers)

Internal Examination Pattern:

CAT – I: Home Assignment

CAT – II: PPT Presentation/ Open Book Test/ Poster Presentation/ Seminar/ Online Quiz/ Descriptive Test

Mapping of POs, PSOs and COs:

COs/POs & PSOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	0	2	0	0	0	0	2	3	1	0	0	2	1
CO2	3	0	2	0	0	0	0	2	3	1	0	0	2	1
CO3	3	0	2	0	0	0	0	2	3	1	0	0	2	1
CO4	3	0	2	0	0	0	0	2	3	1	0	0	2	1

Scale: 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.

Shiv Chhatrapati Shikshan Sanstha's

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Empowered Autonomous Institution

Faculty of Science & Technology

Department of Physics and Electronics

UG I Sem I

Course Type : Lab Course

Course Title : Lab Course –II (Based on DSC-II)

Course Code : 101PHY1104

Credits : 01 **Max. Marks: 50** **Hours: 30**

Learning Objective

LO1. To familiarize students with the practical measurement of thermal conductivity in both good and bad conductors.

LO2. To provide hands-on experience in calibrating and utilizing temperature sensors like thermocouples and platinum resistance thermometers.

LO3. To develop experimental skills for observing heat transfer processes and tracking the cooling behaviour of hot bodies over time.

LO4. To train students in calculating fundamental physical constants through rigorous thermal and optoelectronic experiments.

Course Outcomes

After completion of course the student will be able to-

CO1. Determine the thermal conductivity of materials using Lee's disc, Forbes' method, and Searle's apparatus.

CO2. Analyze the temperature-dependent characteristics of materials and measure thermo-EMF using thermocouples and resistance thermometers.

CO3. Investigate heat transfer dynamics by recording and mathematically evaluating the cooling curves of objects as a function of time.

CO4. Execute precise experimental techniques to evaluate fundamental constants such as the mechanical equivalent of heat and Planck's constant.

Practical No.	Unit
1	Determination of thermal conductivity of bad conductor by Lee's disc method
2	Determination of thermal conductivity by Forbes method
3	To determine the coefficient of thermal conductivity of copper by Searle's Apparatus.
4	To determine the temperature co-efficient of resistance by Platinum resistance thermometer.
5	To study the variation of thermos emf across two junctions of a thermocouple with temperature.
6	Thermal conductivity of rubber tube
7	To record and analyze the cooling temperature of a hot object as a function

	of time using a thermocouple
8	Coefficient of Viscosity by Searle's viscometer at particular temperature
9	To determine Mechanical Equivalent of Heat
10	Measurement of Planck's constant by using solar cell

Learning Resources:

1. Heat, Thermodynamics and Statistical Physics- Brijlal, Dr. N. Subrahmanyam, P. S. Hemne, S. Chand and Co. Ltd.
2. Heat, Thermodynamics & Statistical Physics, S.L. Kakani, Sultan Chand & Sons. Publishing (2009) Revised Edition
3. Heat and Thermodynamics -Brijlal, N. Subrahmanyam, S. Chand and Co. Ltd.
4. Textbook of Heat and thermodynamics- D. S. Mathur.
5. Thermal and Statistical Physics- Brijlal & N. Subrahmanyam, S. Chand and Co. Ltd.
6. Thermal Physics: with Kinetic Theory, Thermodynamics and Statistical Mechanics, S.C. Garg, R.M. Bansal, C.K. Ghosh Tata Mcgraw Hill Education Private Limited (2017) Second Edition.
7. Engineering Thermodynamics, P.K. Nag (Publisher: McGraw-Hill Education)
8. A Textbook of Thermal Physics, R.K. Rajput (Publisher: S. Chand Publishing)
9. Introduction to Thermodynamics, Y.V.C. Rao (Publisher: Universities Press)
10. Thermodynamics and Statistical Physics, B.B. Laud (Publisher: New Age International Publishers)

Internal Examination Pattern:

CAT – I: Record Book Submission

CAT – II: Overall performance in the regular practical

Mapping of POs, PSOs and COs:

COs/POs & PSOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3	3	0	0	0	0	2	2	1	0	3	1	1
CO2	1	3	3	0	0	0	0	2	2	1	0	3	1	1
CO3	1	3	3	0	0	0	0	2	2	1	0	3	1	1
CO4	1	3	3	0	0	0	0	2	2	1	0	3	1	1

Scale: 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Faculty of Science & Technology

Department of Physics and Electronics

UG I Sem I

Course Type : VSC-I
Course Title : Domestic Electrical Wiring
Course Code : 101PHY1501
Credits : 02 **Max. Marks: 50** **Lectures: 45 Hrs.**

Learning Objectives:

LO1. To provide foundational knowledge about basic electrical concepts, wiring accessories, and the inner workings of domestic gadgets.

LO2. To instill a strong understanding of safety protocols, the importance of earthing, and the proper use of electrical maintenance tools.

LO3. To equip students with practical skills for planning, testing, and troubleshooting domestic electrical installations.

LO4. To train students in the dismantling, repairing, and reassembling of common household electrical appliances.

Course Outcomes:

After completion of course, the student will be able to-

CO1. Identify and utilize various electrical wiring accessories, cables, switches, and protective devices appropriately and safely.

CO2. Comprehend and map domestic wiring systems, including phase connections, series/parallel configurations, and standard I.E. rules.

CO3. Execute critical electrical testing, such as continuity, polarity, and insulation resistance tests, to ensure safe installations.

CO4. Perform hands-on maintenance, fault detection, and repair of everyday domestic appliances to build vocational employability.

Unit No.	Title of Unit & Contents	Hrs.
I	**Study & Use of Wiring Accessories**	**4**
	1. P.V.C Wire, Grade of Wire, Size of Wire, 2. Main Switch (ICDP, ICTP&N), Solid & Stranded Conductor, Single Pole & Double Pole Switch, 3. Different Types of Switches, Miniature Circuit Breaker (M.C.B) 4. Different Types of Fuses, Cut-Out, Fuse-Grip, Ceiling Rose, Lamp Holder, Different Types of Plugs, 5 Live Wire, Neutral Wire, Earth Wire, Switchboard, Various Symbols Associated with Various Components of Wiring.	
	Unit Outcomes:	

	UO1. Apply knowledge for the household or industrial wiring and what materials are essential for household or industrial wiring. UO2. Study of different types of switches, wiring and how it is done.	
II	**Testing of Electrical Installation**	**4**
	1. Continuity Test of Wiring, Continuity Test of Conduit, 2. Polarity Test of Single Pole Switch by Test Lamp, Polarity Test of Single Pole Switch, Earth Continuity Test, 3. In sulation Resistance Test Between Conductors, Insulation Resistance Test Between Conductor and Earth by Megger, 4. Study the Necessary I.E. Rules for Domestic Wiring and Earthing.	
	Unit Outcomes: UO1. Identify operations of wiring as continuity, UO2. Testing of Polarity, Analysis of Single-phase AC circuits, Representation of alternating quantities and examine the power in circuits.	
III	**To make Domestic Wiring**	**3**
	1. To make a wiring circuit using PVC wire and Conduit for one Lamp point, 2. One Fan point with regulator and one 3-pin plug point. 3. The wiring includes Main switch & Switchboard. 4. Prepare a chart for listing of the materials used with their specification and symbols.	
	Unit Outcomes: UO1. Use appropriate electrician tools, wires, protective devices and wiring accessories. UO2. Prepare different types of wiring joints.	
IV`	**Application of different types of switch connections**	**4**
	1. Control of a light/fan point using one switch, 2. Control of a light point from two different places, Control of a light point from more than two different places, 3. Switching of two or more lamps by a single switch, 4. Connection of bed switch, Series & Parallel connection of lamps.	
	Unit Outcomes: UO1. Rig up a circuit to control one lamp from two place using two-way switches. UO2. Rig up calling bell circuit with indicator to operate from three different places using push button switches.	
V	**Practical**	**30**
	1. To determine Gauge, Size of wire, grade of wire and Size of PVC pipe. 2. To determine Live wire, Neutral wire, Earth wire	

	3. To use appropriate electrician tools, wires, protective devices and wiring accessories. 4. To make Fan point with regulator 5. Make 3-pin plug point. 6. Control of a light/fan point using one switch, 7. The wiring of Main switch & Switchboard 8. Control of a light point from two different places	

Learning Resources:

1. Electrical Installation Estimating & Costing – J.B. Gupta – S.K. Kataria Publication.
2. Electrical Installation Estimating & Costing – S. Singh – Dhanpat Rai Publication.
3. Basic Electrical Engineering (Vol-I) – P.S. Dhogal, S.K. Mandal – Tata McGraw Hill Publication.
4. Electric Wiring – S. Samaddar – New Central Book Agency (P) Ltd.
5. Electrical Installation: Estimating and Costing, S.L. Uppal (Publisher: Khanna Publishers)
6. Electrical Wiring: Residential and Commercial, Sunita Halder (Publisher: Satya Prakashan)
7. Electrical Installation and Wiring, Sudhir Choudhary (Publisher: Firewall Media)
8. Domestic Wiring: Design, Installation, and Maintenance, S.K. Mandal (Publisher: S. Chand Publishing)
9. A Course in Electrical Installation Estimating and Costing, J.B. Gupta (Publisher: S.K. Kataria & Sons)
10. Domestic and Industrial Electrical Wiring, H.P. Garg (Publisher: Khanna Publishers)
11. Domestic Electric Wiring" by R.P. Singh (Publisher: Firewall Media)

Internal Examination Pattern:

CAT – I: Home Assignment

CAT – II: PPT Presentation/ Open Book Test/ Poster Presentation/ Seminar/ Online Quiz/ Descriptive Test

Mapping of POs, PSOs and COs:

COs/POs & PSOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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CO2	0	2	0	3	0	3	0	2	0	0	3	2	1	1
CO3	0	2	0	3	0	3	0	2	0	0	3	2	1	1
CO4	0	2	0	3	0	3	0	2	0	0	3	2	1	1

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Semester - II

Shiv Chhatrapati Shikshan Sanstha's

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Faculty of Science & Technology

Department of Physics and Electronics

UG I Sem II

Course Type : DSC-III
Course Title : Electricity and Magnetism
Course Code : 101PHY2101
Credits : 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objectives

LO1. To establish a comprehensive understanding of electrostatics, specifically focusing on the applications of Coulomb's and Gauss's laws.
LO2. To introduce the principles of electromagnetic induction, self/mutual inductance, and the working mechanisms of transformers.
LO3. To familiarize students with the construction, theory, and precise measurement applications of the Ballistic Galvanometer.
LO4. To develop analytical skills in magnetostatics, covering magnetic induction, the Biot-Savart law, Ampere's law, and magnetic hysteresis.

Course Outcomes

After completion of the course, the student will be able to-

CO1. Apply Coulomb's and Gauss's laws to calculate and analyze electric fields and potentials for various macroscopic charge distributions.
CO2. Evaluate the principles of electromagnetic induction to determine self and mutual inductance and analyze transformer efficiency and power loss.
CO3. Understand the construction and operational dynamics of a Ballistic Galvanometer to mathematically derive charge and current sensitivity.
CO4. Analyze the magnetic properties of materials, hysteresis losses, and calculate magnetic fields using the Biot-Savart and Ampere's laws.

Unit No.	Title of Unit & Contents	Hrs.
I	**Electrostatics**	**11**
	1. Introduction 2. Flux of Electric Field 3. Statement & Proof of Gauss's Law 4. Differential Form of Gauss's Law, Application of Gauss Law to Uniformly Charged Conducting Sphere 5. Coulombs Law, Coulombs Theorem 6. Derivation of Coulombs Law from Gauss's Law 7. Numerical Problems.	

Unit No.	Title of Unit & Contents	Hrs.
	Unit Outcomes: UO1: Define electric flux and its significance in electromagnetism. UO2: Explain the concept of Gauss's law in relation to electric flux.	
II	**Electromagnetic Induction**	**11**
	1. Introduction, Faraday's Laws of Electromagnetic Induction in Vector Form 2. Self-Induction, Self-Inductance of Long Solenoid 3. Self-Inductance by Anderson's Bridge 4. Mutual Induction, Experimental Determination of Mutual Inductance 5. Transformer: Principle with Current and Voltage Ratios, 6. Efficiency of Transformer, Power Loss in Transformer, 7. Numerical Problems.	
	Unit Outcomes: UO1: Interpret the Faraday's laws of electromagnetic induction and apply them to various scenarios. UO2: Analyze the factors influencing mutual inductance.	
III	**Ballistic Galvanometer**	**12**
	1. Introduction, 2. Moving Coil Type Ballistic Galvanometer: Construction & Theory, 3. Logarithmic Decrement, 4. Damping Correction, 5. Charge and Current Sensitivity, 6. Uses of B.G: Absolute Capacity of Condenser, 7. Comparison of Two Capacities, 8. Numerical Problems	
	Unit Outcomes: UO1: Explain the constructional details and the role of each component in the galvanometer UO2: Derive the mathematical expression for the charge sensitivity (Sq) of a ballistic galvanometer, relating the quantity of charge passed to the resulting first maximum throw.	
IV	**Magnetostatics**	**11**
	1. Introduction, Magnetic Induction, Magnetization 2. Relation Between B, H & M, 3. Magnetic Susceptibility and Permeability, 4. Hysteresis Curve, Experiment to Draw B-H Curve, Energy Loss Due to Hysteresis. 5. Force on Current Carrying Conductor, Lorentz Force, 6. Biot and Savart's Law & Its Applications to Straight Conductor	

Unit No.	Title of Unit & Contents	Hrs.
	and Circular Coil, 7. Amperes Law, 8. Numerical Problems.	
	Unit Outcomes: UO1: Explain the atomic origin of magnetism by relating the net magnetic moment to electron spin and orbital motion. UO2: Define hysteresis and its manifestation in a hysteresis curve.	

Learning Resources:

1. Electricity and Magnetism- R. Murugeshan, S.Chand & Company Ltd.
2. Foundations of Electromagnetic theory- John R. Reitz, Milford & R.W. Christy, IVth Edition
3. Fundamentals of Magnetism & Electricity-D.N.Vasudeva, S.Chand & Company Ltd.
4. Electricity and Magnetism-D.C.Tayal, Himalaya Publishing House
5. A text book of Electricity and Magnetism-Brijlal & Subrahmanyam
6. Electricity and Magnetism-A. S. Mahajan, A. A. Rangwala
7. Electricity and Magnetism- Navina Wadhwani
8. Electricity and Magnetism- D.L. Sehgal, K.L. Chopra, N.K. Sehgal.
9. Electricity and Magnetism with Electronics-K K Tewari.
10. Electricity and Magnetism- Edward M. Purcell.

Internal Examination Pattern:

CAT – I: Home Assignment

CAT – II: PPT Presentation/ Open Book Test/ Poster Presentation/ Seminar/ Online Quiz/ Descriptive Test

Mapping of POs, PSOs and COs:

COs/POs & PSOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	0	3	1	0	0	0	2	3	2	1	0	0	1
CO2	3	0	3	1	0	0	0	2	3	2	1	0	0	1
CO3	3	0	3	1	0	0	0	2	3	2	1	0	0	1
CO4	3	0	3	1	0	0	0	2	3	2	1	0	0	1

Scale: 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.

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Faculty of Science & Technology

Department of Physics and Electronics

UG I Sem II

Course Type : Lab Course
Course Title : Lab Course –III (Based on DSC-III)
Course Code : 101PHY2103
Credits : 01 **Max. Marks: 50** **Hours: 30**

Leaning Objectives

LO1. To train students in precision electrical measurements using classical instruments like potentiometers and ballistic galvanometers.

LO2. To develop practical skills for characterizing the electrical behaviour of basic semiconductor devices (diodes and transistors).

LO3. To provide hands-on experience in mapping and analyzing the magnetic fields generated by current-carrying conductors.

LO4. To familiarize students with alternating current measurements and the operational front panel of the Cathode Ray Oscilloscope (CRO).

Course Outcomes

After completion of the course, the student will be able to-

CO1. Measure electrical parameters such as low resistance and AC frequency using potentiometers and sonometers.

CO2. Analyze the V-I characteristics of Zener diodes, PN junction diodes, and the magnetic properties (I-H curves) of materials.

CO3. Determine the magnetic field distribution along the axis of a circular coil experimentally.

CO4. Calculate the absolute capacity of condensers and correctly estimate the figure of merit of a Ballistic Galvanometer.

Practical No.	Unit
1	Determination of low resistance by Potentiometer.
2	Zener diode Characteristics.
3	Field along the axis of a circular coil.
4	B.G.-Figure of Merit.
5	Comparison of capacities by De-Sauty's method.
6	Frequency of A.C. by Sonometer.
7	Electrical conductivity of Graphite rod.

8	I-H curve by magnetometer method.
9	Absolute capacity of condenser.
10	Study of C.R.O. front panel board.

Learning Resources:

1. B.Sc. Practical Physics--- Harnam Singh, S. Chand comp.
2. Practical physics--- Gupta Kumar, Pragati Prakashan.
3. A Laboratory Course in Physics, D.P. Khandelwal.
4. Practical Physics, Dr. H.C. Verma.
5. Laboratory Manual in Physics, Dr. N. D. Joshi.
6. Experiments in Physics, B. Biswas and Arun Kumar.
7. Laboratory Manual of Physics, A. K. Singh

Internal Examination Pattern:

CAT – I: Record Book Submission

CAT – II: Overall performance in the regular practical

Mapping of POs, PSOs and COs:

COs/POs & PSOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3	2	2	0	0	0	2	2	1	2	3	0	1
CO2	1	3	2	2	0	0	0	2	2	1	2	3	0	1
CO3	1	3	2	2	0	0	0	2	2	1	2	3	0	1
CO4	1	3	2	2	0	0	0	2	2	1	2	3	0	1

Scale: 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.

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Faculty of Science & Technology

Department of Physics and Electronics

UG I Sem II

Course Type : DSC-IV
Course Title : Basic Electronics
Course Code : 101PHY2102
Credits : 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objectives

LO1. Develop understanding about basic electronic components and devices,

LO2. Equip students with simple electrical circuits and application of semiconductor components in these electrical circuits,

LO3. Enrich measuring ability semiconductor components,

LO4. Empower the students to design, working and analysis of BJT amplifiers using appropriate equivalent models.

Course Outcomes

After completion of course, the student will be able to-

CO1. Characterize and analyze the working principles of semiconductors, diodes, transistors, amplifiers, and oscillators, including the role of negative feedback.

CO2. Design and construct analog electronic circuits, including sinusoidal oscillators, and compare experimental results with theoretical predictions.

CO3. Demonstrate proficiency in identifying and using electronic components and measuring instruments such as digital multimeters and cathode ray oscilloscopes.

CO4. Apply mathematical concepts to solve problems related to electronic devices and systems in practical laboratory settings.

Unit No.	Title of Unit & Contents	Hrs.
I	**Electronic Components and Instruments**	**11**
	1. Introduction, 2. Brief Idea of Resistor and Its Types, 3. Resistor Color Code, 4. Inductor and Its Types, 5. Inductance of An Inductor, Reactance of An Inductance, 6. Capacitor and Its Types, Reactance of Capacitor. 7. The Multimeter and Its Applications, 8. C.R.O. Block Diagram and Its Applications, 9. Numerical Problems.	

Unit No.	Title of Unit & Contents	Hrs.
	Unit Outcomes: UO1. Specify electronic components, UO2. Identify functions of Digital Multimeter, Cathode Ray Oscilloscope in the measurement of physical variables,	
II	**Semiconductor Devices**	**11**
	1. Introduction, 2. P-N Junction Diode: Construction, Working and Characteristics, 3. Half Wave Rectifier, 4. Centre Tap Full Wave Rectifier, 5. Full Wave Bridge Rectifier (Qualitative Analysis) 6. Special Purpose Diodes: Zener Diode, 7. LED, 8. Photodiode and Their Characteristics, 9. Zener Diode as A Voltage Regulator, 10. Numerical Problems.	
	Unit Outcomes: UO1. Identify the diodes. UO2. Use special purpose diodes in various applications.	
III	**Transistors**	**12**
	1. Introduction, 2. PNP And NPN Transistors and Their Symbols, 3. Action of Transistor, 4. C-B, C-E And C-C Transistor Configurations and Their Characteristics, 5. Transistor Biasing, 6. Hybrid Parameters of Transistor in C-E Mode, 7. Single Stage C-E Amplifier and Its Equivalent Circuit (Calculation of Gains), 8. Numerical Problems.	
	Unit Outcomes: UO1. Design, construct, and take measurement of various analog circuits to compare experimental results in the laboratory with theoretical analysis. UO2. Use the transistor as an amplifier	
IV	**Sinusoidal Oscillators**	**11**
	1. Introduction, 2. Positive and Negative Feedback, 3. Requirement of An Oscillator, 4. Block Diagram of An Oscillator, 5. Barkhausen Criterion,	

Unit No.	Title of Unit & Contents	Hrs.
	6. Hartley and Colpitts Oscillator, 7. RC Phase Shift Oscillator (Qualitative Analysis), 8. Numerical Problems.	
	Unit Outcomes: UO1. Identify the importance of negative feedback in amplifiers UO2. Design Sinusoidal oscillators for different frequencies,	

Learning Resources:

1. Basic Electronics solid state (Multi color illustrative edition)- B. L. Thereja, S. Chand and Company, 5th Edition.
2. Principles of Electronics (Multi color illustrative edition)-V. K. Mehta, Rohit Mehta, S. Chand and Company Ltd, 9th Edition
3. Electronic Principles- Albert Malvino, David J. Bates, 7th Edition
4. A text book of Applied Electronics-R.S. Sedha, S. Chand and Company Ltd.
5. Basic Electronics- Bernard Grob, 9th Edition
6. Electronic Fundamentals and Applications- John D. Ryder, 5th edition
7. Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky, Pearson (2016) Eleventh Edition
8. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker, Wiley India Pvt. Ltd (2016) Tenth Edition
9. University Physics with Modern Physics, Hugh D. Young, Roger A. Freedman, Pearson (2016) Fourteenth Edition

Internal Examination Pattern:

CAT – I: Home Assignment

CAT – II: PPT Presentation/ Open Book Test/ Poster Presentation/ Seminar/ Online Quiz/ Descriptive Test

Mapping of POs, PSOs and COs:

COs/POs & PSOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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CO2	2	2	3	3	0	1	0	2	1	1	3	2	0	2
CO3	2	2	3	3	0	1	0	2	1	1	3	2	0	2
CO4	2	2	3	3	0	1	0	2	1	1	3	2	0	2

Scale: 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.

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Department of Physics and Electronics

UG I Sem II

Course Type : Lab Course
Course Title : Lab Course –IV (Based on DSC-IV)
Course Code : 101PHY2104
Credits : 01 **Max. Marks: 50** **Hours: 30**

Leaning Objective

LO1. To equip students with the hands-on ability to plot and interpret the V-I characteristics of various semiconductor diodes.

LO2. To provide practical training in assembling and analyzing the performance of bipolar junction transistors in the Common Emitter (CE) configuration.

LO3. To develop experimental skills in constructing, testing, and troubleshooting continuous-wave sinusoidal oscillator circuits.

LO4. To foster an understanding of frequency response, signal processing, and resonance behaviour in complex analog L-C-R circuits.

Course Outcomes

After completion of the course, the student will be able to-

CO1. Analyze the characteristics and applications of semiconductor devices such as PN junction diodes, Zener diodes, photodiodes, and photo transistors.

CO2. Examine the input and output characteristics of BJTs in common emitter configuration and understand their behavior in amplification.

CO3. Study and evaluate the working of different types of oscillators including Hartley, Colpitts, and RC phase shift oscillators.

CO4. Investigate the behavior of L-C-R circuits and demonstrate the use of semiconductor devices in voltage regulation and signal processing.

List of Experiments

Practical No.	Unit
1	Zener diode as a Voltage Regulator.
2	PN junction diode Characteristics.
3	Study of CE amplifier.
4	Photodiode Characteristics.
5	Characteristics of Photo Transistor.
6	BJT transistor characteristics (CE mode)
7	Study of Hartley Oscillator
8	Study of Colpitts Oscillator
9	Study of RC phase shift Oscillator
10	Study of L-C-R circuit

Learning Resources:

1. Basic Electronics solid state (Multi color illustrative edition)- B. L. Thereja, S. Chand and Company, 5th Edition.
2. Principles of Electronics (Multi color illustrative edition)-V. K. Mehta, Rohit Mehta, S. Chand and Company Ltd, 9th Edition
3. Electronic Principles- Albert Malvino, David J. Bates, 7th Edition
4. A text book of Applied Electronics-R.S. Sedha, S. Chand and Company Ltd.
5. Basic Electronics- Bernard Grob, 9th Edition
6. Electronic Fundamentals and Applications- John D. Ryder, 5th edition
7. Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky, Pearson (2016) Eleventh Edition
8. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker, Wiley India Pvt. Ltd (2016) Tenth Edition
9. University Physics with Modern Physics, Hugh D. Young, Roger A. Freedman, Pearson (2016) Fourteenth Edition

Internal Examination Pattern:

CAT – I: Record Book Submission

CAT – II: Overall performance in the regular practical

Mapping of POs, PSOs and COs:

COs/POs & PSOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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CO2	1	3	3	3	0	0	0	2	1	1	3	3	0	2
CO3	1	3	3	3	0	0	0	2	1	1	3	3	0	2
CO4	1	3	3	3	0	0	0	2	1	1	3	3	0	2

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Faculty of Science & Technology

Department of Physics and Electronics

UG I Sem II

Course Type : VSC-II
Course Title : Weather Forecasting
Course Code : 101PHY2501
Credits : 02 **Max. Marks: 50** **Lectures: 45 Hrs.**

Learning Objective:

LO1. To introduce the structural and compositional layers of the Earth's atmosphere and their physical variations with altitude.

LO2. To impart knowledge of standard meteorological instruments and techniques used to measure essential weather parameters.

LO3. To develop an understanding of the core causes, mechanisms, and environmental consequences of global climate change and air pollution.

LO4. To train students in the practical collection, analysis, and interpretation of real-world meteorological data and synoptic charts.

Course Outcomes:

After completion of the course, the student will be able to:

CO1. Acquire basic knowledge of the elements of the atmosphere, its composition at various heights, variation of pressure and temperature with height.

CO2. Know simple techniques to measure wind speed and its directions, humidity and Rainfall.

CO3. Interpret synoptic charts, weather reports, and understand the working principles of weather stations to analyze atmospheric conditions.

CO4. Collect, observe, and evaluate meteorological data such as temperature, humidity, rainfall, and sunshine duration to study seasonal and directional weather variations.

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Atmosphere**	08

	1. Elementary Idea of Atmosphere: Physical Structure and Composition; 2. Compositional Layering of the Atmosphere; 3. Variation of Pressure and Temperature with Height; Air Temperature; 4. Requirements to Measure Air Temperature; 5. Temperature Sensors and Its Types.	
	Unit Outcomes: UO1.Identify and categorize the various layers of the Earth's atmosphere (Troposphere, Stratosphere, Mesosphere, Thermosphere, and Exosphere) based on their physical characteristics. UO2. Interpret the vertical temperature gradient (Lapse Rate) to explain why temperature typically decreases with height in the troposphere.	
II	**Climate and Climate Change**	**07**
	1. Climate: Its Classification; 2. Causes of Climate Change; 3. Global Warming and Its Outcomes; 4. Air Pollution; Aerosols, Ozone Depletion, Acid Rain, Environmental Issues Related to Climate.	
	Unit Outcomes: UO1. Predict the long-term environmental consequences of global warming, such as glacier retreat, rising sea levels, and the disruption of global weather patterns. UO2. Investigate the chemical reactions in the atmosphere that lead to the formation of acid rain and photochemical smog.	
III	**Practical**	**30**
	1. Study of Synoptic Charts and Weather Reports, Working Principle of Weather Station. 2. To Calculate the Sunniest Time of The Year. 3. To Study the Variation of Rainfall Amount and Intensity by Wind	

	Direction. 4. To Observe the Sunniest/Driest Day of The Week. 5. To Examine the Maximum and Minimum Temperature throughout The Year. 6. To Evaluate the Relative Humidity of The Day. 7. To Examine the Rainfall Amount Month Wise.	

Learning Resources:

1. Aviation Meteorology, by I.C. Joshi, 3rd Edition (2014), Himalayan Books.

2. The Weather Observers Hand Book, by Stephen Burt, (2012), Cambridge University Press.

3. Meteorology, by S.R. Ghadekar, (2001), Agromet Publishers, Nagpur.

4. Text Book of Agrometeorology, by S.R. Ghadekar, (2005), Agromet Publishers, Nagpur.

5. Why the Weather, by Charles Franklin Brooks, (1924), Chapraman & Hall, London.

6. Atmosphere and Ocean, John G. Harvey, 1995, the Artemis Press.

Internal Examination Pattern:

CAT – I: Home Assignment

CAT – II: PPT Presentation/ Open Book Test/ Poster Presentation/ Seminar/ Online Quiz/ Descriptive Test

Mapping of POs, PSOs and COs:

COs/POs & PSOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	2	2	1	2	0	1	2	1	1	0	2	3	2
CO2	2	2	2	1	2	0	1	2	1	1	0	2	3	2
CO3	2	2	2	1	2	0	1	2	1	1	0	2	3	2
CO4	2	2	2	1	2	0	1	2	1	1	0	2	3	2

Scale: 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.

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UG First Year

Extra Credit Activities

Sr. No.	Course Title	Credits	Hours T/P
1	MOOCs	Min. of 02 credits	Min. of 30 Hrs.
2	Certificate Courses	Min. of 02 credits	Min. of 30 Hrs.
3	IIT Spoken Tutorial Courses	Min. of 02 credits	Min. of 30 Hrs.

Guidelines:

Extra -academic activities

1. All extra credits claimed under this heading will require sufficient academic input/ contribution from the students concerned.
2. Maximum 04 extra credits in each academic year will be allotted.
3. These extra academic activity credits will not be considered for calculation of SGPA/CGPA but will be indicated on the grade card.

Additional Credits for Online Courses:

1. Courses only from SWAYAM and NPTEL platform are eligible for claiming credits.
2. Students should get the consent from the concerned subject Teacher/Mentor/Vice Principal and Principal prior to starting of the course.
3. Students who complete such online courses for additional credits will be examined/verified by the concerned mentor/internal faculty member before awarding credits.
4. Credit allotted to the course by SWAYAM and NPTEL platform will be considered as it is.

Additional Credits for Other Academic Activities:

1. One credit for presentation and publication of paper in International/National/State level seminars/workshops.
2. One credit for measurable research work undertaken and field trips amounting to 30 hours of recorded work.
3. One credit for creating models in sponsored exhibitions/other exhibits, which are approved by the concerned department.
4. One credit for any voluntary social service/Nation building exercise which is in collaboration with the outreach center, equivalent to 30 hours
5. All these credits must be approved by the College Committee.

Additional Credits for Certificate Courses:

1. Students can get additional credits (number of credits will depend on the course duration) from certificate courses offered by the college.
2. The student must successfully complete the course. These credits must be approved by the Course Coordinators.
3. Students who undertake summer projects/ internships/ training in institutions of repute through a national selection process, will get 2 credits for each such activity. This must be done under the supervision of the concerned faculty/mentor.

Note:

1. The respective documents should be submitted within 10 days after completion of Semester End Examination.
2. No credits can be granted for organizing or for serving as office bearers/ volunteers for Inter-Class / Associations / Sports / Social Service activities.
3. The office bearers and volunteers may be given a letter of appreciation by the respective staff coordinators. Besides, no credits can be claimed for any services/activities conducted or attended within the college.
4. All claims for the credits by the students should be made and approved by the mentor in the same academic year of completing the activity.
5. Any grievances of denial/rejection of credits should be addressed to Additional Credits Coordinator in the same academic year.
6. Students having a shortage of additional credits at the end of the third year can meet the Additional Credits Coordinator, who will provide the right advice on the activities that can help them earn credits required for graduation.

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Examination Framework

Theory:

40% Continuous Assessment Tests (CATs) and 60% Semester End Examination (SEE)

Practical:

50% Continuous Assessment Tests (CATs) and 50% Semester End Examination (SEE)

Course	Marks	CAT & Mid Term Theory				CAT Practical		Best Scored CAT & Mid Term	SEE	Total
1	2	3				4		5	6	5 + 6
		Att.	CAT I	Mid Term	CAT II	Att.	CAT			
DSC/DSE/ GE/OE/Minor	100	10	10	20	10	-	-	40	60	100
DSC	75	05	10	15	10	-	-	30	45	75
Lab Course/AIPC/ OJT/FP	50	-	-	-	-	05	20	-	25	50
VSC/SEC/ AEC/VEC/CC	50	05	05	10	05	-	-	20	30	50

Note:

1. All Internal Exams are compulsory
2. Out of 02 CATs best score will be considered
3. Mid Term Exam will be conducted by the Exam Section
4. Mid Term Exam is of Objective nature (MCQ)
5. Semester End Exam is of descriptive in nature (Long & Short Answer)
6. CAT Practical (20 Marks): Lab Journal (Record Book) 10 Marks, Overall Performance 10 Marks.