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

(Autonomous)

[UG I Year]

w.e.f. June, 2023

(In Accordance with NEP-2020)

Academic Year 2023-24

Review Statement

The NEP Cell reviewed the Curriculum of **B.Sc. (Honors/Research) in Physics** Programme to be effective from the **Academic Year 2023-24.** It was found that, the structure is as per the NEP-2020 guidelines of Govt. of Maharashtra.

Date: 09/08/2023

Place: Latur

NEP Cell
Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)

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 2023-24.**

Date: 14/07/2023

Place: Latur

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

Shiv Chhatrapati Shikshan Sanstha's
Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)
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 (Autonomous), Latur	Chairperson	HoD
2	**Prof. Dr. V. P. Pawar,** Head, Department of Physics, Maharashtra Udayagiri Mahavidyalaya, Udgir Dist: Latur	Member	V.C. Nominee
3	**Dr R. H. Kadam,** Shrikrishna Mahavidyalaya, Gunjoti, Omerga	Member	Academic Council Nominee
4	**Mrs Shyamala Bodhane** Head, Department of Physics, Xt. Xaviers College, Mumbai	Member	Expert from outside for Special Course
5	**Shri Gundu Sabde** Relyon Industries, Pune	Member	Expert from Industry
6	**Dr K. N. Shivalkar** Head, Department of physics, Mahatma Gandhi Mahavidyalaya, Ahmedpur Dist. Latur	Member	P.G. Alumni
7	**Dr D. G. Palke** Head, Department of Chemistry,	Member	Faculty Member
8	**Dr Dayanand Raje**	Member	Member from same Faculty
9	**Mr Swapnil Undalkar**	Member	Member from same Faculty
10	**Mr Atul More**	Member	Member from same Faculty
11	**Miss Mayuri Hawaldar**	Member	Member from same Faculty
12	**Miss Vishakha Patil**	Member	Member from same Faculty
13	**Mr. Suraj Gund**	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
(Autonomous)
Department of Physics and Electronics
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Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)
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=0 8	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. **OE**   **: 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. **VEC**   **: Value Education Courses**
12. **OJT**   **: On Job Training**
13. **FP**   **: Field Projects**
14. **CEP**   **: Fostering Social Responsibility & Community Engagement (FSRCE)**
15. **CC**   **: Co-Curricular Courses**
16. **RP**   **: Research Project/Dissertation**
17. **SES**   **: Shahu Extension Services**

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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**	

Programme Outcomes (POs) for B.Sc. Programme	
PO No.	Upon completion of this programme the students will be able to
PO1	Distinguish core knowledge on various courses of Physics.
PO2	Recognize the concepts which help them in understanding physical phenomenon in nature
PO3	Classify skills and competencies to conduct scientific experiments related to Physics.
PO4	Identify their area of interest and further specialize in the Physics.
PO5	Operate advanced knowledge and skills in job market for various technical industries.
PO6	Relate their knowledge and skills in carrying out independent work
PO7	Analyze situations, search for truth and extract information, formulate and solve problems in a systematic and logical manner.
PO8	Discuss debate and communicate in a clear and logical way, with graduates in Physics and other fields
PO96	Demonstrate relevant generic skills and global competencies.

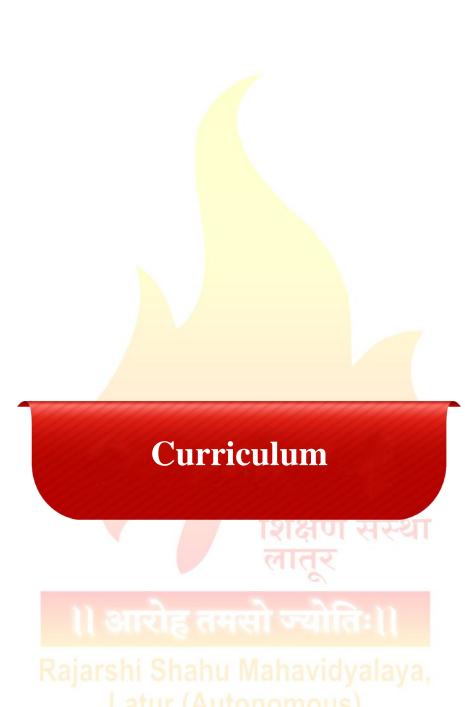| Programme Specific Outcomes (PSOs) for B.Sc. Physics (Honors/Research)	
PSO No.	Upon completion of this programme the students will be able to
PSO1	Distinguish core knowledge on various courses of Physics.
PSO2	Recognize the concepts which help them in understanding physical phenomenon in nature.
PSO3	Classify skills and competencies to conduct scientific experiments related to Physics.
PSO4	Identify their area of interest and further specialize in the Physics.
PSO5	Operate advanced knowledge and skills in job market for various technical industries.
PSO6	Relate their knowledge and skills in carrying out independent work.
PSO7	Analyze situations, search for truth and extract information, formulate and solve problems in a systematic and logical manner.
PSO8	Discuss debate and communicate in a clear and logical way, with graduates in Physics and other fields.
PSO9	Demonstrate relevant generic skills and global competencies.

Curriculum

Major and VSC Courses

Semester - I

Shiv Chhatrapati Shikshan Sanstha's
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Faculty of Science & Technology
Department of Physics and Electronics

Course Type: DSC-I

Course Title: Mechanics and Properties of Matter

Course Code: 101PHY1101

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

Learning Objectives:

LO 1.   To make students familiar about the relation between gravitation, mass, gravitational energy and potential energy,

LO 2.   To enrich students with the knowledge of properties of fluids,

LO 3.   To develop understanding of elastic nature of materials,

LO 4.   To build up an understanding of fundamental physical principles,

Course Outcomes:

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

CO 1.   Apply Kepler's laws and the law of gravitation to analyze the motion of planets and satellites in elliptical orbits.

CO 2.   Describe and analyze simple harmonic motion and various forms of potential energy in oscillatory systems.

CO 3.   Use kinematic equations and Newton's laws to solve problems involving linear and accelerated motion.

CO 4.   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	

Unit No.	Title of Unit & Contents	Hrs.
	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	
	7. Density of the Earth, Mass of The Earth	
	8. Numerical Problems	
	Unit Outcomes:	
	UO1. Understand that all objects, irrespective of their mass, experience the same acceleration 'g' when falling freely under the influence of gravity at the same point on the Earth.	
	UO2. Understand that if gravity is the only force acting on an object, the sum of kinetic energy and gravitational energy is constant.	
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. Understand the fundamental concepts of elasticity, including stress, strain, Hooke's law, and types of elasticity, and analyze the mechanical behavior of materials under various forces.	
	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**

Unit No.	Title of Unit & Contents	Hrs.
	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,	
	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. Understand simple principles of fluid flow and the equations governing	

Unit No.	Title of Unit & Contents	Hrs.
	fluid dynamics.	
	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).

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)
Faculty of Science & Technology
Department of Physics and Electronics

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

Learning Objective

LO 1. To expose U.G. Students to the techniques of handling simple instruments and make use of them in determining certain mechanical and thermal properties of matter.

Course outcomes

After completion of course the student will be able to-

CO 1. Determine acceleration due to gravity of earth,

CO 2. Determine elastic properties (Young's modulus and Modulus of rigidity) of material,

CO 3. Determine and know the properties of liquid like Viscosity, Surface tension,

CO 4. Determine thermal conductivity of bad conductor.

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).

शिव छत्रपती
शिक्षण संस्था
लातूर

॥ आरोह तमसो ज्योतिः॥

Rajarshi Shahu Mahavidyalaya,
Latur (Autonomous)

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

Learning Objective

LO 1. The course introduces the concepts of reversible and irreversible processes, Carnot cycles, entropy generation and the second law of thermodynamics.

Course Outcomes

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

CO 1. Know the Zeroth law, First Law, Second law and Third law of Thermodynamics.

CO 2. Define heat, work, efficiency and the difference between various forms of energy.

CO 3. Explain entropy changes of the thermodynamic system.

CO 4. Describe 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,	
	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:	
	UO 1. Understand the fundamental concepts of thermodynamics and molecular theory of gases, including molecular collisions, mean free	

Unit No.	Title of Unit & Contents	Hrs.
	path, and transport phenomena.	
	UO 2. 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:	
	UO 1. Understand the behavior of real gases through concepts such as continuity of state, critical constants, and modifications to the ideal gas law, including Van der Waals equation.	
	UO 2. 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. Understand the fundamental laws of thermodynamics, including concepts of heat, work, internal energy, entropy, and their applications to various thermodynamic 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:	
	UO 1. 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)

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Department of Physics and Electronics

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

LO 1.   To expose Students to the techniques of handling simple instruments and make use of them in determining certain thermal properties of matter.

Course Outcomes

After completion of course the student will be able to-

CO 1.   Determine the thermal conductivity of various materials using different experimental methods such as Lee's disc, Forbes method, and Searle's apparatus.

CO 2.   Analyze temperature-dependent properties of materials through experiments involving thermocouples, platinum resistance thermometers, and thermal EMF measurements.

CO 3.   Evaluate fluid properties by determining the coefficient of viscosity using Searle's viscometer and study heat transfer processes including the cooling of objects over time.

CO 4.   Apply experimental techniques to determine fundamental physical constants, such as the mechanical equivalent of heat and Planck's constant using a solar cell.

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)

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Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)
Faculty of Science & Technology
Department of Physics and Electronics

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

Learning Objectives:

LO 1. To provide knowledge about the electrical gadgets and their working principles.

LO 2. To introduce about the electrical wiring systems at domestic and household appliances.

LO 3. To provide hands on experiments for electrical installations, maintenance and wiring repairs.

Course Outcomes:

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

CO 1. Gain knowledge of various electrical gadget installations at domestic levels.

CO 2. Understand wiring systems and electrical connections of different phases at household appliances.

CO 3. Perform electrical installations, maintenance and wiring repairs.

CO 4. Take assignments of domestic electrical wirings and thereby it may generate the employment   for them.

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:	
	UO 1. Apply knowledge for the household or industrial wiring and what materials are essential for household or industrial wiring.	

	UO 2. 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. Insulation 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: UO 1. 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)

Semester - II

Course Type: DSC-III
Course Title: Electricity and Magnetism
Course Code: 101PHY2101

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

Learning Objectives

LO 1. To expose the undergraduate students to the fundamental laws of electricity, magnetism and their applications in day-to-day life,

LO 2. To make aware students about Gauss's and Coulomb's Law,

LO 3. To develop understanding among the students about principles of electromagnetic induction,

LO 4. Acquaint students with basics of magnetostatics.

Course Outcomes

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

CO 1. Apply Coulomb's Law and Gauss's Law to analyze electric fields for various charge distributions and identify the appropriate method for solving electrostatic problems.

CO 2. Understand and calculate magnetic fields using Biot-Savart Law and Ampere's Law, and compare their applications in different physical scenarios.

CO 3. Analyze the behavior of magnetic dipoles in magnetic fields, including torque calculations and related phenomena.

CO 4. Determine the ballistic constant and understand the damping behavior of a ballistic galvanometer through experiments involving steady deflection and logarithmic decrement.

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	

Unit No.	Title of Unit & Contents	Hrs.
	6. Derivation of Coulombs Law from Gauss's Law 7. Numerical Problems.	
	Unit Outcomes: UO 1: Define electric flux and its significance in electromagnetism. UO 2: 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: UO 1: Explain the constructional details and the role of each component in the galvanometer UO 2: Understand the relationship between charge sensitivity and galvanometer performance.	
IV	**Magnetostatics**	**11**
	1. Introduction, Magnetic Induction, Magnetization 2. Relation Between B, H & M,	

Unit No.	Title of Unit & Contents	Hrs.
	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 and Circular Coil,	
	7. Amperes Law,	
	8. Numerical Problems.	
	Unit Outcomes:	
	UO 1: Understand how magnetic materials respond to external magnetic fields.	
	UO 2: 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.

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Rajarshi Shahu Mahavidyalaya, Latur

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Faculty of Science & Technology

Department of Physics and Electronics

Course Type: Lab Course

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

Course Code: 101PHY2103

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

Learning Objectives

LO 1. To handle and make use of simple equipment's in electricity for making error free measurements and to determine some unknown quantities

LO 2. To study the magnetic field produced during flow of current through the conducting wire.

Course Outcomes

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

CO 1. Determine the resistance of given metal wire, frequency of ac flowing through it,

CO 2. Study the characteristics of Zener diode, PN junction diode, CE transistor,

CO 3. Determine the magnetic field produced along the axis of circular coil,

CO 4. Estimate the figure of merit (i/d) of B.G.

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.

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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

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Faculty of Science & Technology

Department of Physics and Electronics

Course Type: DSC-IV

Course Title: Basic Electronics

Course Code: 101PHY2102

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

Learning Objectives

LO 1.   Develop understanding about basic electronic components and devices,

LO 2. Equip students with simple electrical circuits and application of semiconductor components in these electrical circuits,

LO 3.   Enrich measuring ability semiconductor components,

LO 4. 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.	

Unit No.	Title of Unit & Contents	Hrs.
	7. The Multimeter and Its Applications,	
	8. C.R.O. Block Diagram and Its Applications,	
	9. Numerical Problems.	
	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.	

Unit No.	Title of Unit & Contents	Hrs.
	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, 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

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Faculty of Science & Technology

Department of Physics and Electronics

Course Type: Lab Course

Course Title: Lab Course –IV

Course Code: 101PHY2104

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

Learning Objective

LO 1.   To handle and make use of simple equipment's in Basic electronics for making error free measurements and to determine some unknown quantities

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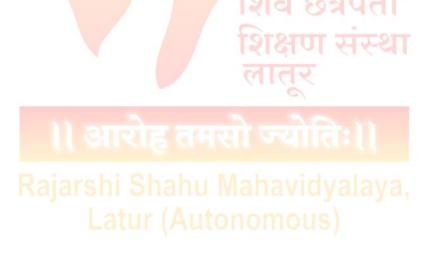
After completion of the course, the student will be able to-

CO 1.   Analyze the characteristics and applications of semiconductor devices such as PN junction diodes, Zener diodes, photodiodes, and photo transistors.

CO 2.   Examine the input and output characteristics of BJTs in common emitter configuration and understand their behavior in amplification.

CO 3.   Study and evaluate the working of different types of oscillators including Hartley, Colpitts, and RC phase shift oscillators.

CO 4.   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

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Faculty of Science & Technology

Department of Physics and Electronics

Course Type: VSC-II

Course Title: Weather Forecasting

Course Code: 101PHY2501

Credits: 02	**Max. Marks: 50**	**Lectures: 45 Hrs.**

Learning Objective:

LO 1. To impart theoretical knowledge to the students and enable them to develop awareness and understanding regarding the causes and effects of different weather phenomenon.

Course Outcomes:

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

CO 1. Acquire basic knowledge of the elements of the atmosphere, its composition at various heights, variation of pressure and temperature with height.

CO 2. Know simple techniques to measure wind speed and its directions, humidity and Rainfall.

CO 3. Interpret synoptic charts, weather reports, and understand the working principles of weather stations to analyze atmospheric conditions.

CO 4. 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. Understand Atmosphere and Its Composition	
	UO2. Understand That Temperature of Surroundings Changes with Variation in Atmospheric Conditions	

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.Understand the effect of Global warming UO2. Understand the causes of air pollution	
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.

Open Elective Courses Offered by the Department

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Department of Physics and Electronics

Course Type: OE

Course Title: Energy Sources

Course Code: 101PHY1401/101PHY2401

Credits: 04	**Max. Marks: 100**	**Lectures: 60 Hrs.**

Learning Objective:

LO 1.   To facilitate the students to achieve a clear conceptual understanding of technical and commercial aspects of Sources of Energy.

Course Outcomes:

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

CO 1.   Describe sources and uses of energy.

CO 2.   Differentiate between renewable and non-renewable sources of energy.

CO 3.   Differentiate between conventional and non-conventional sources of energy

CO 4.   Provide examples of common types of renewable and non-renewable resources.

Unit No.	Title of Unit & Contents	Hrs.
I	**Renewable Energy Sources**	**15**
	1. Introduction to Renewable Energy Sources, 2. Energy Concept-Sources in General, Its Significance & Necessity, 3. Classification of Energy Sources: Primary and Secondary Energy, Commercial and Non-Commercial Energy, 4. Renewable and Nonrenewable Energy, Conventional and Non-Conventional Energy. 5. Importance of Non-Commercial Energy Resources. 6. Renewable Energy Sources: Need of Renewable Energy, Nonconventional Energy Sources, an Overview of Developments in Offshore Wind Energy, 7. Tidal Energy, Wave Energy Systems, Ocean Thermal Energy Conversion, 8. Solar Energy, Biomass, Biochemical Conversion, Biogas Generation, Geothermal Energy Tidal Energy, Hydroelectricity.	
	Unit Outcomes: UO1. Identify renewable energy supplies reduce the emission of greenhouse gases significantly if replaced with fossil fuels**.** UO2. Recognize renewable energy supplies are obtained naturally from ongoing flows of energy in our surroundings.	
II	**Conventional Energy Sources**	**15**
	1. Conventional Energy Sources: Fossil Fuels & Nuclear Energy production & Extraction, 2. Usage Rate and Limitations,	

	3. Impact on Environment and Their Issues & Challenges, 4. Overview of Indian & World Energy Scenario with Latest Statistics-Consumption & Necessity, 5. Need of Eco-Friendly & Green Energy & Their Related Technology		
	Unit Outcomes: UO1. Understand the extraction, production, and usage of conventional energy sources such as fossil fuels and nuclear energy, along with their limitations and environmental impacts. UO2: Analyze global and national energy scenarios, identify challenges, and recognize the importance of transitioning towards eco-friendly and green energy technologies.		
III	**Solar Energy**		**15**
	1. Solar Energy: Solar Energy-Key Features, Its Importance, 2. Merits & Demerits of Solar Energy, Applications of Solar Energy, 3. Solar Water Heater, Flat Plate Collector, Solar Distillation, 4. Solar Cooker, Solar Green Houses, Solar Cell -Brief Discussion of Each, 5. Need and Characteristics of Photovoltaic (PV) Systems, PV Models and Equivalent Circuits, and Sun Tracking Systems		
	Unit Outcomes: UO1. Outline the technologies that are used to harness the power of solar Energy. UO2. Explain the principles that underlie the ability of various natural phenomena to deliver solar energy.		
IV	**Wind Energy**		**15**
	1. Fundamentals of Wind Energy, 2. Wind Turbines and Different Electrical Machines in Wind Turbines, 3. Power Electronic Interfaces, and Grid Interconnection Topologies, 4. Ocean Energy Potential against Wind and Solar, 5. Wave Characteristics and Statistics, Wave Energy Devices, 6. Tide Characteristics and Statistics, Tide Energy Technologies 7. Ocean Thermal Energy.		
	Unit Outcomes: UO1. Employ Wind turbines to make electricity. UO2. Predict tidal power uses the moment of water to push a turbine to generate electricity.		

Learning Resources:

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. Renewable Energy, Power for a sustainable future, Godfrey Boyle, 2004, Oxford University Press, in association with The Open University.
5. Solar Energy: Resource Assessment, Dr. P Jayakumar, Handbook, 2009
6. Photovoltaics, J. Balfour, M. Shaw and S. Jarosek, Lawrence J Goodrich (USA).
7. Biomass Regenerable Energy, D D Hall and R P Grover Wiley; 1st edition (May 18, 1987).

8.   Introduction to Renewable Energy Technology: A Year Long Science and Technology Course, United States Department of Energy

9.   Introduction to Renewable Energy (Energy and the Environment), Vaughn Nelson, CreateSpace Independent Publishing Platform (February 3, 2015).

10.   Renewable Energy Integration (Green Energy and Technology), Jahangir Hossain and Apel Mahmud, Springer; 2014th edition (February 14, 2014).

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Rajarshi Shahu Mahavidyalaya,
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Skill Enhancement Courses Offered by the Department

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(Autonomous)
Faculty of Science & Technology
Department of Physics and Electronics

Course Type: SEC
Course Title: Physics Workshop Skill
Course Code: 101PHY1601

| Credits: 02 | Max. Marks: 50 | Lectures: 30 Hrs. |

Learning Objective:

LO 1. The course focusses on developing hands-on proficiency in using physics laboratory equipment and techniques, understanding experimental procedures, and applying physics principles to real-world scenarios

Course Outcomes:

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

CO 1. Determine radius and diameter of thin wires, sheets using laboratory gauge

CO 2. Measure the dimensions of various bodies,

CO 3. Perform accurate measurements of physical dimensions such as length, thickness, diameter, and volume using precision instruments like vernier calipers, screw gauges, and multimeters.

CO 4. Demonstrate basic workshop and electrical skills including drilling, cutting, filing, welding of metals, and electrical testing using standard tools and instruments.

Unit No.	Title of Unit & Contents	Hrs.
I	**Measuring Units and Mechanical skill**	07
	1. Introduction: Measuring units, Conversion to SI and CGS, 2. Familiarization with meter scale, Vernier calliper, Screw gauge and their utility, 3. Measure the dimension of a solid block, volume of cylinder/ beaker, 4. Diameter of a thin wire, thickness of metal sheet, etc. 5. Study of common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood, Concept of machine processing.	
	Unit Outcomes: UO1. Identify Physical quantities with their international system of units and perform conversions among SI units using Scientific notations. UO2. Employ measuring skills to use them to design and build useful products.	
II	**Use of Multimeters**	08
	1. Overview of multimeters: types, features, and applications. 2. Understanding electrical measurements: voltage, current, and resistance. 3. Operation of oscilloscope, Making regulated power supply, 4. Timer circuit, electronic switch using transistor and relay.	
	Unit Outcomes: UO1. Understand the working principles and applications of multimeters and oscilloscopes for accurate measurement of electrical parameters such as voltage, current, and resistance. UO2. Develop and analyze basic electronic circuits including regulated power supplies, timer circuits, and electronic switches using transistors and relays.	

III	Practical	15
	1. To determine radius, diameter, cross sectional area of various thin wires 2. To determine thickness, breadth of metal sheets and wooden blocks using Vernier caliper and screw gauge. 3. To measure various types of boxes and package dimensions 4. To determine Volume of cylindrical beaker/glass 5. Drilling of holes of different diameters in metal sheet and wooden block 6. Similar and Dissimilar metal welding 7. Cutting of the metal sheet and smoothening of cutting-edge using file. 8. Use of multimeters for continuity testing, AC and DC current and Voltage measurement and Resistance measurements.	

Learning Resources:

1. Problems in General Physics, I.E. Irodov (Publisher: CBS Publishers & Distributors)
2. Engineering Physics, R.K. Gaur and S.L. Gupta (Publisher: Dhanpat Rai Publications)
3. Principles of Physics, V.K. Mehta (Publisher: S. Chand Publishing)
4. Problems in General Physics, I.E. Irodov (Publisher: CBS Publishers & Distributors)
5. A Textbook of Engineering Physics" by Avadhanulu and P.G. Kshirsagar (Publisher: S. Chand Publishing)
6. Electrical Installation Estimating & Costing, J.B. Gupta, S.K. Kataria Publication.
7. Electrical Installation Estimating & Costing, S. Singh, Dhanpat Rai Publication.
8. Basic Electrical Engineering (Vol-I), P.S. Dhogal, S.K. Mandal, Tata McGraw Hill Publication.
9. Concepts of Physics, H.C. Verma (Publisher: Bharati Bhawan Publishers)

General Physics Laboratory Experiments, Gopalan Srinivasan, Rao Bidthanapally, Kendall Hunt Pub Co; 5th edition (June 30, 2019).

Rajarshi Shahu Mahavidyalaya, Latur

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UG First Year

Basket I: Open Elective (OE)

(OEs offered to the Science & Technology students)

(GEs offered to the Science and Technology students in Sem.-I& II)

Sr. No.	BoS Proposing OE	Course Title	Credits	Hrs.
1	Commerce	Fundamentals of Statistics	04	60
2	Commerce	Personal Financial Management	04	60
3	Music	Indian Vocal Classical & Light Music	04	60
4	Sports	Counselling and Psychotherapy	04	60
5	English	English for Science and Technology	04	60
6	Geography	General Geography	04	60
7	Marathi	स्पर्धा परीक्षा आणि मराठी भाषा	04	60
8	Political Science	Human Rights	04	60
9.	Sanskrit	Ayurveda in Everyday life	04	60

Note: Student can choose any one OE from the basket.

Basket II: Skill Enhancement Courses (SEC)

(SEC offered to the Science & Technology students)

Basket II: Skill Enhancement Courses (SEC)

Sr. No.	BoS Proposing SEC	Course Title	Credits	Hrs.
1	Commerce	Office Management	02	30
2	Computer Science	Data Analysis and Computer Application	02	30-45
3	English	Proof Reading and Editing	02	30
4	English	Communication Skills	02	30
5	Geography	Tourism & Travel Management	02	30-45
6	Information Technology	PC Assemble and Installation	02	30-45
7	Marathi	कथा/पटकथालेखन	02	30
8	English	Leadership and Personality Development	02	30
9	Zoology	Bee Keeping	02	30-45
10	Biotechnology	Food Processing Technology	02	30-45
11	Commerce	Financial Literacy	02	30
12	Botany	Mushroom Cultivation Technology	02	30
13	Chemistry	Pesticides and Green Chemistry	02	30
14.	Commerce	Investment Management	02	30
15.	Computer Science	Cyber Security	02	30
16.	Information Technology	Python Technology	02	30
17.	Physics	Physics Workshop Skills	02	30

Note: Student can choose any one SEC from the basket.

UG First Year Sem I

Basket III: Ability Enhancement Courses (AEC)

(AEC offered to the Science & Technology students in Sem.-I)

Sr. No.	BoS Proposing AEC	Code	Course Title	Credits	Hrs.
1	Marathi	101MAR1701	भाषिक कौशल्य भाग – १	02	30
2	Hindi	101HIN1701	हिंदी भाषा शिक्षण भाग – १	02	30
3	Sanskrit	101SAN1701	व्यावहारीक व्याकरण व नितिसुभाषिते	02	30
4	Pali	101PAL1701	उपयोजित व्याकरण	02	30

UG First Year Sem II

Basket III: Ability Enhancement Courses (AEC)

(AEC offered to the Science & Technology students in Sem.-II)

Sr. No.	BoS Proposing AEC	Code	Course Title	Credits	Hrs.
1	Marathi	101MAR2701	ललित वाङ्मय	02	30
2	Hindi	101HIN2701	हिंदी भाषा शिक्षण एवं अनुवाद	02	30
3	Sanskrit	101SAN2701	व्यावहारीक व्याकरण व नितिसुभाषिते भाग – २	02	30
4	Pali	101PAL2701	निवडक गद्य व पद्य	02	30

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

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
		3				4				
1	2	Att.	CAT I	Mid Term	CAT II	Att.	CAT	5	6	5 + 6
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.