



Rayat Shikshan Sanstha's
Karmaveer Bhaurao Patil Mahavidyalaya, Pandharpur
(Autonomous)

NAAC Reaccredited "A+" grade, CGPA: 3.51

Affiliated to the
Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Program : B.Sc. Part-I

Course : Physics

Semester : I and II

Pattern : NEP 2020

Syllabus to be implemented from July, 2023 onward

Rayat Shikshan Sanstha's
Karmaveer Bhaurao Patil Mahavidyalaya, Pandharpur
(Autonomous)
Department of Physics
B.Sc. Part-I NEP- 2020

(w.e.f. 2023-24)

1. **Title:** Physics
2. **Year of Implementation:** The syllabus will be implemented from July, 2023 onwards.
3. **Preamble:**

This syllabus is framed to give sound knowledge with understanding of Physics to undergraduate students at first year of three years of B.Sc. degree course. Students learn Physics as a separate subject from B.Sc. - I. The goal of the syllabus is to make the study of Physics popular, interesting and encouraging to the students for higher studies including research with vigor and depth. At the same time precaution is taken to make the syllabus comparable to the syllabi of other universities and the needs of industries and research.

The syllabus is prepared after discussion at length with number of faculty members of the subject and experts from industries and research fields. The units of the syllabus are well defined, taking into consideration the level and capacity of students.

General objectives of the course:

- I. The students are expected to understand the fundamentals, principles, physical concepts and recent developments in the subject area.
 - II. The practical course is framed in relevance with the theory courses to improve the understanding of the various concepts in Physics.
 - III. It is expected to inspire and boost interest of the students towards Physics as the main subject.
 - IV. To develop the power of appreciations, the achievements in Physics and role in nature and society.
 - V. To enhance student sense of enthusiasm for Physics and to involve them in an stimulating experience of learning in a supportive environment.
4. **Duration:** The course shall be a full time.
 5. **Pattern:** Semester examination.
 6. **Medium of Instruction:** English.

7. Credit Distribution Structure for Three Year Honours(NEP-2020):

Level	Sem.	Subject-1 Major				Subject-2 Minor			Subject-3 OE/GE			VSEC			AEC, VEC, IKS				OJT, FP, CEP, CC, RP, RM				Total
		Mandatory DSC		Elective DSE		T	P	T	P	T	P	VSC	SEC	AEC	VEC	IKS	OJT/FP	FP	CEP	CC	RM		
		T	P	T	P																	T	
4.5	I	4	2	-	-	2	2	2	2	-	-	-	2	2	2	-	-	-	2	-	-	22	
	II	4	2	-	-	2	2	2	2	-	-	2	2	2	2	-	-	-	2	-	-	22	
5.0	III	4	2	-	-	4	2	2	-	1+1	2	2	2	2	-	-	-	-	2	-	-	22	
	IV	4	2	-	-	4	2	2	-	1+1	2	2	2	2	-	-	-	-	2	-	-	22	
5.5	V	4	4	4	2	-	-	-	-	2+2	-	-	-	-	-	-	-	2	2	-	-	22	
	VI	4	4	4	2	-	-	-	-	1+1	-	-	-	-	-	4	2	-	-	-	-	22	
6.0	VII	8	4	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	22	
	VIII	8	4	4	2	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	22	
Total		40	24	16	8	12	8	8	4	10	6	16	8	4	2	8	4	2	8	4	4	176	
																						176	

Abbreviations:

- DSC: Department Specific core
- DSE: Department Specific Elective
- OE/GE: Open Elective/ Generic Elective
- VSC: Vocational Skill Course
- CC: Co-Curricular Courses
- SEC: Skill Enhancement Course
- AEC: Ability Enhancement Course
- VEC: Value Education Course
- IKS: Indian Knowledge System
- RM: Research Methodology
- OJT: On Job Training
- RP: Research Project
- FP: Field Project
- CEP: Community Engagement Programme

For theory 1 credit = 15 lectures (60 min)
 For Practical's 1 credit = 30 lectures (60 min)

Physics Basket:

Subject	Semester-I	Semester-II
Major Course	Mechanics (2 credit)	Heat and thermodynamics (2 credit)
	Fundamentals of Optics (2 credit)	Electromagnetism and Electronics (2 credit)
	Practical Lab-I (2 credit)	Practical Lab-II (2 credit)
Minor Course	General Physics -I (2 credit)	General Physics -II (2 credit)
	Practical Lab-I (2 credit)	Practical Lab-II (2 credit)
	Introduction of Universe (अंतरिक्ष अवकाशाची) (2 credit)	Amazing world of light (प्रकाश विश्व) (2 credit)
OE/GE	Practical Lab-I (2 credit)	Practical Lab-II (2 credit)
VSC	Electronic Technician (1+1 credit) (B.Sc.II)	Introduction to Python/Electronics Instrumentation (1+1 credit) (B.Sc.II)
SEC		Maintenance and Repairing of Household Electrical Appliances (2 credit)
VEC	Digital and Technological Solutions (2 credit)	Environmental Science (2 credit)
IKS	Ancient to modern Indian Astrophysics (2 credit)	

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[Autonomous]
Department of Physics
Physics Basket (NEP-2020)

Subject	Semester-I	Semester-II
Major Course	Mechanics (2 credit)	Heat and thermodynamics (2 credit)
	Fundamentals of Optics (2 credit)	Electromagnetism and Electronics (2 credit)
	Practical Lab-I (2 credit)	Practical Lab-II (2 credit)
Minor Course	General Physics -I (2 credit)	General Physics -II (2 credit)
	Practical Lab-I (2 credit)	Practical Lab-II (2 credit)
OE/GE	Introduction of Universe (औद्युख अवकाशाची) (2 credit)	Amazing world of light (प्रकाश विश्व) (2 credit)
	Practical Lab-I (2 credit)	Practical Lab-II (2 credit)
VSC	Electronic Technician (1+1 credit)(B.Sc.II)	Introduction to Python/Electronics Instrumentation (1+1 credit) (B.Sc.II)
SEC		Maintenance and Repairing of Household Electrical Appliances (2 credit)
VEC	Digital and Technological Solutions (2 credit)	Environmental Science (2 credit)
IKS	Ancient to modern Indian Astrophysics (2 credit)	

**Major Course B.Sc. Part-I NEP-2020
Level 4.5 (Semester- I)**

Paper- I: Mechanics

Code: PHY-DSCT-I

Theory: 30 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will able to-

- expose students to study Newton's laws of motions and applications.
- revise and learn rotational motion and M. I. of various bodies.
- familiarize students to study Mechanical Properties of solids
- introduce students to gain knowledge of Mechanical Properties of fluids

Unit I: Newton's Laws of Motions

(06)

Newton's first, second and third laws of motion and their explanation, applications using Newton's first law: Particles in equilibrium; using Newton's second law: Dynamics of Particles, Frictional forces, Pseudo forces, Inertial and Non-Inertial frames of reference, Newtonian Principle of Relativity, Numerical Problems.

Unit II: Rotational Motion

(06)

Analogy between Rotational motion and Translational motion (Angular velocity, Angular Momentum and Torque), Kinetic energy of motion, Moment of Inertia of i) Circular disc ii) Rectangular Lamina iii) Spherical shell iv) Flywheel; Numerical Problems.

Unit III: Pendulums

(05)

Introduction, Theory of Compound Pendulum, Bar Pendulum, Kater's Pendulum, Bifilar Pendulum, Torsional Pendulum, Numerical Problems.

Unit IV: Mechanical Properties of Solids

(06)

Properties of the Materials, Review of Elastic constants Y, η, K and σ ; Equivalence of shear strain to compression and extension strains, Relation between elastic constants, Poisson's ratio of rubber tube (Theory and Experimental method), Numerical Problems.

Unit V: Mechanical Properties of Fluids

(07)

Review of Surface Tension, Relation between excess pressure and surface tension, Excess pressure inside a liquid drop and soap bubble, Jaeger's method to determine surface tension, Newton's laws of viscosity, Equation of continuity, Poiseuille's equation, Bernoulli's Theorem and its applications to i) Venturimeter ii) Automiser, Numerical Problems.

Learning Outcomes:

After completion of course students will-

- Realize the knowledge of inertial and non-inertial frame of reference.
- Understand physical significance and applications of Newton's laws of motion.
- Know the rolling motion of spherical shell and solid cylinder and calculate the M.I. of a given body about axis of rotation.
- Explain acceleration due to gravity by using different types of pendulum
- Recognize mechanical properties of solids- Young's modulus, Bulk modulus, Modulus of rigidity, Poisson's ratio
- Realize mechanical properties of fluids - surface tension, viscosity and their applications

Reference Books:

1. *Fundamental of Physics (Extended)* -D. Halliday, R. Resnick & J. Walker, John Wiley & Sons Publications (9th Ed. 2010)
2. *Physics for Degree Students* - C. L. Arora & P. S. Hemne, S. Chand Publication (1st Ed.2010)
3. *Elements of Properties of Matter* - D. S. Mathur, S. Chand Publication
4. *Mechanics* - H. S. Hans & S. P. Puri, Tata McGraw Hill (2nd Ed. 2008)

Major Course B.Sc. Part-I NEP-2020

Level 4.5 (Semester- I)

Paper- II: Fundamentals of Optics

Code: PHY-DSCT-II

Theory: 30 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will able to-

- expose students to study various types of optical instruments
- prepare students to study the different types of aberrations
- introduce students to study interference phenomenon and its applications
- introduce students to study types of diffraction and its application to determine wavelength

Unit I: Interference of Light

(06)

Introduction of interference of light, Classification of interference, Young's experiment, Coherence length and Coherence time, Biprism and Fresnel's Biprism, Measurement of wavelength of light by Fresnel's Biprism.

Unit II: Interference in thin film and Newton's Rings

(06)

Interference in parallel faced thin film, Wedge shaped film, Classification of fringes, Fringes of equal thickness, Newton's rings and its applications, Numerical Problems.

Unit III: Diffraction

(06)

Types of diffraction, Plane diffraction grating and its elementary theory, its application to determine wavelength, Comparison between prism and grating spectra, Numerical Problems.

Unit IV: Ray Optics

(06)

Fermat's Principle, Deduction of laws of Reflection and Refraction by Fermat principle, Chromatic and Spherical aberrations, Numerical Problems.

Unit V: Optical Instruments

(06)

Introduction of Resolution, Magnification, Resolving power and Magnifying power of optical instruments; Types of eye-piece, Gauss eye-piece, Ramsden's eye-piece, Huygen's eye-piece, Construction, Working and application of spectrometer, Numerical Problems.

Learning Outcomes:

After completion of course students will be -

- understand construction, working and applications of optical instruments.
- explain different types of aberrations.
- understand interference phenomenon, experimental determination of wavelength by using Newton's rings.
- explain diffraction phenomenon, plane diffraction grating and its theory.

Reference Books:

1. *Introduction to geometrical and physical optics*.- B. K. Mathur, Gopal Printing, 1967, 1962
2. *A Textbook of Optics* - Brijlal & Subrahmanyam S .Chand Publication, (New Ed.)
3. *LASER & OPTICS* - B.B. Laud, Wiley, (2ndEd.)
4. *Fundamentals of Optics* - Franis A. Jankins, Harvey E. White, TATA McGraw - Hill Publication (4th Ed.)

Major Course B.Sc. Part-I NEP-2020

Level 4.5 (Semester- I)

Paper- III: PHYSICS PRACTICAL

Code: PHY-DSCP-III

Theory: 60 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will able to

- develop students to learn measuring skills in practical.
- prepare students to determine M. I. and acceleration due to gravity.
- introduce students to understand the measurement of electrical quantities by using Multimeter.
- familiarize students to determine high resistance, capacitances and impedance.

Experiments:

1. Measurements of Length (Vernier caliper, Micrometer Screw gauge, Travelling Microscope)
2. Bar pendulum
3. Bifilar's pendulum
4. Torsional pendulum
5. γ by vibration
6. γ by bending
7. Moment of Inertia of disc by annular ring
8. Poisson's ratio by rubber tube
9. Surface Tension liquid drop method
10. To determine Young's Modulus by using flat spiral spring
11. Viscosity of water by Poiseuille's method
12. Viscosity by Stoke's method
13. Frequency of AC mains by magnetic and nonmagnetic wire
14. Coupled Oscillations

***Note: Minimum Ten experiments from above group must be completed.**

Learning Outcomes:

After completion of course students will-

- handle various instruments.
- explain measuring skills in practical.
- correlate theoretical concepts with experiments.
- develop awareness of minimizing errors.

Reference books:

1. *Advanced level Practical Physics* – Nelkon, Pearson Education Limited; Revised edition
2. *B.Sc. Practical physics* - C.L. Arora, S.Chand Publications.
3. *Practical Physics* - P R Sasi Kumar, PHI Learning Private Limited.

Minor Course B.Sc. Part-I NEP-2020

Level 4.5 (Semester- I)

Paper- I: General Physics - I

Code: PHY-MNRT-I

Theory: 30 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will able to -

- distinguish the scalar and vector triple product
- understand motion and laws of motion
- study conservation of energy.
- define the viscous force and viscosity.
- understand the concept of surface tension and their applications.

Unit I: Vectors

(06)

Scalar and vector triple product, Scalar and vector fields, Del operator, Gradient of a scalar, Divergence of a vector and their physical significance, curl of vector and their physical significance, Problem.

Unit II: Motion

(06)

Introduction to motion, Types of motion, Inertia, Newton's laws of motion with their explanations, various types of forces in nature, Frames of reference (Inertial and Non inertial), Laws of motion and it's real life applications.

Unit III: Work and Energy

(06)

Kinetic energy, Work Energy Theorem, Work done with constant force, Work done with varying force (spring force), Conservative and Non conservative forces, Potential energy, Law of energy conservation, Gravitational potential energy.

Unit IV: Viscosity

(06)

Concept of viscous force and viscosity, Coefficient of viscosity, Steady and Turbulent flow, Reynolds number, Equation of continuity, Bernoulli's Principle, Applications of Bernoulli's Principle (Ventury Meter, PitotTube), Applications of viscous fluids.

Unit V: Surface Tension

(05)

Surface tension, Angle of contact, Factors affecting surface tension, Jaeger's method for determination of surface tension, Applications of surface tension.

Learning Outcomes:

Student will able to -

- solve problems on scalar and vector triple product
- know motion and laws of motion.
- understand work energy theorem and conservation of energy.
- compare Steady and Turbulent flow
- understand surface tension and their factor affecting on surface tension .

Reference Books:

1. Mathematical Physics – Rajput & Gupta, Vikas publishing House Ltd.
2. Mechanics- D. S. Mathur, S. Chand and Company, New Delhi.
3. Elements of Properties of Matter- D. S. Mathur, S. Chand, New Delhi.
4. Concepts of Physics- H. C. Verma, Bharati Bhavan Publisher.
5. Fundamentals of Mechanics- J C Upadhyaya, Himalaya Publishing House.
6. Mechanics- D. S. Mathur, Revised by P. S. Hemne, S. Chand and Company, New Delhi.

Minor Course B.Sc. Part-I NEP-2020

Level 4.5 (Semester- I)

Paper- III: PHYSICS PRACTICAL

Code: PHY-MNRP-II

Theory: 60 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will be able to

- develop students to learn measuring skills in practical.
- prepare students to determine M. I. and acceleration due to gravity.
- introduce students to understand the measurement of electrical quantities by using Multimeter.
- familiarize students to determine high resistance, capacitances and impedance.

Experiments:

1. Measurements of Length (Vernier caliper, Micrometer Screw gauge, Travelling Microscope)
2. Bar pendulum
3. Bifilar's pendulum
4. Torsional pendulum
5. Y by vibration
6. Y by bending
7. Moment of Inertia of disc by annular ring
8. Poisson's ratio by rubber tube
9. Surface Tension liquid drop method
10. To determine Young's Modulus by using flat spiral spring
11. Viscosity of water by Poiseuille's method
12. Viscosity by Stoke's method
13. Frequency of AC mains by magnetic and nonmagnetic wire
14. Coupled Oscillations

***Note: Minimum Ten experiments from above group must be completed.**

Learning Outcomes:

Student will be able to

- explain measuring skills in practical.
- understand theoretical concepts by performing experiments.
- develop awareness of minimizing errors.
- handle various instruments.

Reference books:

1. *Advanced level Practical Physics* – Nelkon. Pearson Education Limited; Revised edition
2. *B.Sc. Practical physics* - C.L. Arora, S.Chand Publications.
3. *Practical Physics* - P R Sasi Kumar, PHI Learning Private Limited.

Open Elective B.Sc. Part-I NEP-2020

Level 4.5 (Semester- I)

Paper- I: Introduction to Universe

Code: PHY-OET-I

Theory: 30 Lectures

Marks: 50 (Credits: 2)

Course Objectives:

Students will be able to,

- explain planetary motion
- understand the properties and classification of galaxies
- explain the properties, composition, and origin of comets, asteroids, and meteors within the solar system.
- differentiate meteors, meteoroids, & meteorites
- explore the concept and historical significance of constellations, including both Indian and Greek constellations.

Unit I: Solar system

(06)

Solar System, sun and structure of sun, the earth & moon, planetary properties and its satellites: Mercury, Venus. Earth, Mars, Jupiter. Saturn, Uranus, Neptune and dwarf planets.

Unit II Galaxies

(06)

Types of galaxies, dwarf galaxies, colliding galaxies, galactic cannibalization (CD galaxies), anomalously luminous galaxies, properties of Milky Way galaxy, the spiral structure of the galaxy.

Unit III Comets and Asteroids

(06)

Origin of comets, size & composition of comets, types of comets, Definition & origin of asteroids, size & composition of asteroids, characteristics of asteroids, types of asteroids.

Unit IV Meteors

(06)

Definition & origin of meteors, meteoroids, & meteorites, composition of meteors, meteoroids, & meteorites, characteristics of meteors, size & composition of meteors.

Unit V Constellation

(06)

Definition and historical significance of constellations. Indian constellations, Greek constellation: Orion, Ursa Major, Big Dipper, Auriga, Taurus, Pisces, Cassiopeia.

Course Outcomes:

Students should be able to,

- demonstrate a comprehensive understanding of the structure of the solar system, including the sun, planets, and their satellites.
- classify different types of galaxies
- explain the composition, origin, and types of asteroids.
- distinguish meteors, meteoroids, & meteorites
- identify the major Indian and Greek constellations.

Reference books:

1. *Astronomy Fundamentals and Frontiers*- R. Jastrow, M. H. Thomson, , (John Wiley and Sons Publications, 4th revised edition 1984).
2. *Introduction to Astronomy* - Thomas T. Army, Exploration (Mosley-Year Book Inc,
3. *The Earth to the Universe*- Jay M, Astronomy - (Pasachoff Books/Cole Thomson Course. WB Saunders Co Ltd; 4 th revised edition 1992)
4. *An Introduction to Astrophysics*, Baidhnath Basu, (New Delhi, PHI Course Pvt. Ltd. 2nd edition, 2014.)
5. *Fundamental Astronomy*- Hannu Karttunen, Pekka Kröger, Heikki Oja, Markku Poutanen. Karl Johan Donner. (Springer; 5th edition, 9 August 2007)

Open Elective B.Sc. Part-I NEP-2020

Level 4.5 (Semester- I)

Paper- I: ओळख अवकाशाची

Code: PHY-OET-I

Theory: 30 Lectures

Marks: 50 (Credits: 2)

Course Objectives:

Students will be able to,

- explain planetary motion
- understand the properties and classification of galaxies
- explain the properties, composition, and origin of comets, asteroids, and meteors within the solar system.
- differentiate meteors, meteoroids, & meteorites
- explore the concept and historical significance of constellations, including both Indian and Greek constellations.

Unit I) सूर्यमाला (6)

सूर्यमाला, सूर्य आणि सूर्याची रचना, पृथ्वी आणि चंद्र, ग्रहांचे गुणधर्म आणि त्याचे उपग्रह: बुध, शुक्र, पृथ्वी, मंगळ, गुरू, शनि, युरेनस, नेपच्यून आणि बटूग्रह.

Unit II) आकाशगंगा (6)

आकाशगंगांचे प्रकार, बटू आकाशगंगा, आदळणाऱ्या आकाशगंगा, गॅलेक्टिक कॅनिबालायझेशन (CD आकाशगंगा), विसंगत चमकदार आकाशगंगा, आकाशगंगांचे गुणधर्म, आकाशगंगांची सर्पिल रचना.

Unit III) धूमकेतू, लघुग्रह (6)

धूमकेतूची उत्पत्ती, धूमकेतूचा आकार आणि रचना, धूमकेतूचे प्रकार लघुग्रहांची उत्पत्ती, लघुग्रहांची व्याख्या आणि उत्पत्ती, लघुग्रहांचा आकार आणि रचना, लघुग्रहांची वैशिष्ट्ये, लघुग्रहांचे प्रकार

Unit IV) उल्का (6)

meteors, meteoroids, & meteorites ची व्याख्या, meteors, meteoroids, meteorites ची उत्पत्ती, meteors, meteoroids, meteorites ची वैशिष्ट्ये, आकार आणि रचना.

Unit V) नक्षत्र**(6)**

नक्षत्रांची व्याख्या आणि ऐतिहासिक महत्त्व, भारतीयनक्षत्र, ग्रीकनक्षत्र: ओरियन, उर्समिजर, बिगडिपर, ऑरिगा, टॉरस, मीन, कॅसिओपिया.

Course Outcomes:

Students should be able to,

- demonstrate a comprehensive understanding of the structure of the solar system, including the sun, planets, and their satellites.
- classify different types of galaxies
- explain the composition, origin, and types of asteroids.
- distinguish meteors, meteoroids, & meteorites
- identify the major Indian and Greek constellations.

Reference books:

1. *Astronomy Fundamentals and Frontiers*- R. Jastrow, M. H. Thomson, , (John Wiley and Sons Publications, 4th revised edition 1984).
2. *Introduction to Astronomy* - Thomas T. Army, Exploration (Mosley-Year Book Inc,
3. *The Earth to the Universe*- Jay M, Astronomy - (Pasachoff Books/Cole Thomson Course. WB Saunders Co Ltd; 4 th revised edition 1992)
4. *An Introduction to Astrophysics*, Baidhnath Basu, (New Delhi, PHI Course Pvt. Ltd. 2nd edition, 2014.)
5. *Fundamental Astronomy*- Hannu Karttunen, Pekka Kröger, Heikki Oja, Markku Poutanen. Karl Johan Donner. (Springer; 5th edition, 9 August 2007)

Open Elective Practical B.Sc. Part-I NEP-2020

Level 4.5 (Semester- I)

Paper- I: PHYSICS PRACTICAL

Code: PIY-OEP-I

Theory: 60 Lectures

Marks: 50 (Credits: 2)

Course Objectives:

Students will be able to,

- develop skills in taking readings/observations obtained from these instruments.
- learn how to analyse and interpret experimental data, including error analysis,
- understand graphical representation.
- perform calculations to obtain the experimental results.
- test whether the experimental results hold good with theoretical results.

List of Experiments

1. To determine the approximate size of Sun.
2. Night Sky Observation: Exploring the Celestial Wonders
3. To observe and track the apparent movement of the Sun across the sky.
4. To observe and understand the different phases of the Moon
5. To study Lunar eclipse using simulation.
6. To study Solar eclipse using simulation.
7. Determining Light Intensity.
8. To simulate and visualize the different regions of the electromagnetic spectrum using a software-based simulation tool.
9. To test knowledge about mythology associated with Orion constellation.
10. To test knowledge about mythology associated with Ursa Major constellation.
11. To test knowledge about mythology associated with Hercules constellation.
12. To use Cassiopeia constellation for navigation and orientation in night sky.

Additional Activities

1. Educational tour and its report equivalent to two experiments
2. Hobby project

Course Outcomes:

Students should be able to

- exhibit practical skills in comparing intensities of different bulbs
- resolving technical challenges that may arise during experiments
- analysing experimental observations/readings using numerical calculations, graphical representation to interpret and draw conclusion.
- discuss and correlate their Planetary properties and concepts.

Value Education Course (VEC) B.Sc. Part-I NEP-2020

Level 4.5 (Semester- I)

Paper- I: Digital and Technological Solutions

Code: PHY-VEC-1

Theory: 30 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will be able to

- learn the concept of digital technology, its types, uses and advantages.
- interpret working principle of communication system.
- aware about various digital financial tools.
- understand the latest emerging technologies and its applications.
- Explain cyber security, threats, significance and challenges.
- understand the importance of precautions, safety measures and tools of cyber security

Unit- I. Digital technology and ICT (6)

Introduction and evolution of digital system, Digital technology: concept, types, uses, advantages, ICT and ICT tools: importance, advantages and disadvantages, Applications.

Unit- II. Computer, communication system and Internet (6)

Computer system and its working, software and its types, Communication system: Block diagram, working principle, Internet: concept and applications, WWW, web browsers, search engines, messaging, E-mail, blogs, social media.

Unit- III. Digital Financial Tools (6)

OTP, QR, UPI (Unified payment interface), AEPS (Aadhar enabled payment system), USSD, credit/debit cards, eWallets, Internet banking, NEFT/RTGS and IMPS, Online bill payments and PoS (Point of Sale).

Unit- IV. Emerging Technology and their applications (6)

Overview of Artificial Intelligence (AI), Block chain, cloud computing, data analytics, Internet of things, Robotics and 3-D printing, future of digital technologies.

Unit- V. Cyber security (6)

Introduction of cyber security, threats, significance and challenges, precautions, safety measures and tools.

Learning Outcomes:

After completion of the unit, Students will able to-

- understand the concept of digital technology.
- describe working principle of communication system.
- understand the latest digital technologies.
- interpret AI, block chain, cloud computing, data analytics, internet of things, robotics and 3-D printing.
- bring awareness about cyber security and its importance.

Reference books:

1. *Digital & Technological Solutions* - R. Gupta, Er. Arvind Kumar (S. Vinesh & Co.), 1 January 2022.
2. *Emerging Technologies in Computing: Theory, Practice and Advances* - P. Kumar, A. Tomar and R. Sharmila, 1st edition, 2021.
3. *Essentials of cloud computing* -K. Chandra shekharan, CRC press, 2014.
4. *Blockchain: Blueprint for a new economy* - M. Swan, OReilly Media, 2015.

Indian Knowledge System (IKS) B.Sc. Part-I NEP-2020

Level 4.5 (Semester- I)

Paper- I: Ancient to modern Indian Astrophysics

Code: PHY-IKS- I

Theory: 30 Lectures

Marks: 50 (Credits: 2)

Course Objective:-

Students will be able to

- understand motion of sun, moon and equinoxes, solstices
- describe basic of planetary model of Aryabhata
- aware astronomical endeavor's of Indian scholars
- understand different types of eclipses

Unit I: Ancient Astronomy in India

(09)

Ancient records of the observation of the motion of celestial bodies in the Vedic corpus. Sun, Moon, Nakshatra & Graha, Astronomy as the science of determination of time, place and direction by observing the motion of the celestial bodies. The motion of the Sun and Moon, Motion of equinoxes and solstices, Elements of Indian calendar systems as followed in different regions of India.

Unit II: Planetary Model of Aryabhata

(10)

Important texts of Indian Astronomy, Basic ideas of the planetary model of Aryabhata and its revision by Nilakantha, Large corpus of inscriptions recording observation of eclipses, Astronomical instruments, Astronomical endeavours of Jaisingh, Sankaravarman, Chandrasekhara Samanta.

Unit III: Contribution of Indian Physicist in Science, Astronomy and Mathematics

(11)

History and Culture of Astronomy, Sun, Earth, Moon, and Eclipses, Earth is Spherical and Rotation of Earth, Concepts of Zero and Pi, Number System, Pythagoras Theorem, and Vedic Mathematics.

Contribution of Indian Physicist : C.V.Raman, S.N. Bose, J.C. Bose, Meghnad Saha, S. Chandrasekhar, H.J. Bhabha, Vikram Sarabhai, Abdul Kalam, Raja Ramanna, Indian Nuclear Program, Indian Space Program

Course Outcomes:

Students should be able to

- describe fundamental concepts of Indian astronomy
- outline development of Indian astronomy in ancient times
- elaborate contribution of astronomical endeavor's of Indian scholars
- explain planetary model of Aryabhata.

References:

1. *A Concise History of Science in India*- D. M. Bose, S. N. Sen and B. V. Subbarayappa, Eds., 2nd Ed., Universities Press, Hyderabad, 2010.
2. *History of Astronomy in India*-S. N. Sen and K. S. Shukla, 2nd Ed., INSA, Delhi, 2001.
3. *Indian Astronomy An Introduction*- S. Balachandra Rao, Universities Press, Hyderabad, 2000
4. *History of Astronomy: A Handbook*-K. Ramasubramanian, AniketSule and MayankVahia, SandHI, IIT Bombay, and T.I.F.R. Mumbai, 2016.
5. *Tantrasangraha of Nilakantha Somayāji, Translation and Notes*- K. Ramasubramanian and M.S. Sriram, Hindustan Book Agency, New Delhi 2011 (Rep. Springer, New York 2011).
6. *History of Science in India*-Volume-1, Part-I, Sibaji Raha, Bikash Sinha, Dilipkumar Sinha and S.P. Mukharjee, The National Academy of Sciences, India (NASI) and The Ramkrishna Mission Institute of Culture, Kolkata
7. *Pride of India: A Glimpse into India's Scientific Heritage*-Ed. by R.M. Pujari, Pradeep Kohle and N.R. Kumar, Samskrita Bharati
8. *Vedic Physics*- Keshav Dev Verma, Motilal Banarsidass Publishers
9. *India's Glorious Scientific Tradition*-Suresh Soni, Ocean Books Pvt. Ltd.

Major Course B.Sc. Part-I NEP-2020
Level 4.5 (Semester- II)
Paper- IV: Heat and Thermodynamics

Code: PHY-DSCT-IV
Theory: 30 Lectures
Marks: 50 (Credits: 2)

Learning Objectives:

- Students will be able to-
- understand kinetic theory of gases and concept of Transport phenomena.
 - know principle of Joule-Thomson effect.
 - understand thermo-dynamical state, thermodynamic equilibrium, various thermodynamic processes and first law of thermodynamics.
 - understand second and third laws of thermodynamics, Carnot's theorem, working of Carnot's engine, Otto engine and diesel engine and concept of entropy.

Unit I: Transport Phenomenon **(06)**

Introduction, mean free path, Claussius expression for mean free path (Collision cross section), Transport Phenomenon, Coefficient of Viscosity, Thermal Conductivity and its dependence on temperature and pressure.

Unit II: Liquefaction of Gases **(06)**

Liquefaction of gases by J-T effect, Linde's air liquefier, cooling by adiabatic demagnetization and expression for fall in temperature, experimental setup for adiabatic demagnetization of paramagnetic substances, properties of liquid helium, numerical problems.

Unit III : Thermodynamics **(07)**

Thermodynamic functions; Laws of thermodynamics, Reversible and Irreversible processes, Isothermal and adiabatic processes, Adiabatic relations, work done during isothermal and adiabatic processes, Entropy change in reversible and irreversible processes, Numerical Problems.

Unit IV: Heat engines **(07)**

Introduction, Carnot's heat engine and its efficiency; Otto cycle and its efficiency, Diesel cycle and its efficiency, comparison between Otto and Diesel engine, Numerical Problems.

Unit V: Refrigerator **(04)**

General principle, refrigeration cycle, coefficient of performance of refrigerator, vapor compression refrigerator, air conditioning (principle and applications).

Learning Outcomes:

After completion of course students will -

- understand kinetic theory of gases and concept of transport phenomena.
- explain principle of Joule-Thomson effect.
- explain thermo-dynamical state, thermodynamic equilibrium, various thermodynamic processes and first law of thermodynamics.
- explain second and third laws of thermodynamics, Carnot's theorem, working of Carnot's engine, Otto engine and diesel engine and concept of entropy

Reference Books:

1. *Heat and Thermodynamics* - Brijlal and N. Subramanyam, S. Chand and company LTD.
2. *Fundamentals of heat* - D.S.Mathur, S.Chand and Sons publisher.
3. *Text book of heat* - J.B. Rajam, S. Chand and company Ltd .
4. *A treatise on Heat* - MeghnadSaha and B.N. Srivastava, Indian Press
5. *Heat and Thermodynamics* (8th Ed) - M.W. Zemansky and R.Dittman, McGraw Hill
6. *Heat Thermodynamics and Statistical physics* - J.P. Agrawal and Satya Prakash, Pragati Prakashan

Major Course B.Sc. Part-I NEP-2020
Level 4.5 (Semester- II)
Paper- V: Electromagnetism and Electronics

Code: PHY-DSCT-V
Theory: 30 Lectures
Marks: 50 (Credits: 2)

Learning Objectives:

- Students will be able to -
- prepare students to study complex number with J-operator, LCR Circuits
 - introduce students to study magneto statics and ballistic galvanometer
 - expose students to understand electromagnetic induction laws
 - familiarize students to study various electronic components and devices
 - introduce students to study construction and working of transistor

Unit I: A. C. Circuits

(06)

Complex number, J-Operator and its applications to AC circuits, Reactance, Susceptance, Impedance, Admittance and power factor, L-C-R circuit, series resonance circuits, sharpness of resonance and quality factor, AC bridge (Owen's bridge), Numerical Problems.

Unit II: Magnetostatics

(06)

Introduction (Concept of Magnetic Field, Definition and Properties of Magnetic Field), Biot and Savart's law & its application to determine magnetic induction at a point on the axis of current carrying coil of single turn and Solenoid; Construction, theory and working of Ballistic Galvanometer, Constants of B G, Numerical Problems.

Unit III: Magnetic Materials

(07)

The Nature of Magnetism, Magnetic Molecule Alignment of a Piece of Iron and a Magnet, Magnetic Flux Density, Classification of Magnetic Materials, brief introduction of dia, para, and ferro magnetic materials, Properties of Magnetic materials– Magnetic intensity, magnetic induction, permeability, susceptibility, Numerical Problems.

Unit IV: Electronic circuit components

(06)

Study of passive and active components (Resistor, Capacitor, Inductor, Transformer, Switches, Relays, Diodes, Transistor, FET, SCR, UJT and IC) with their symbol and specification. Bridge rectifier with Pie-Filter, Clippers, Clampers, Zener diode and its application as a voltage regulator.

Unit V: Bipolar Junction Transistor

(05)

Construction and working of transistor, input-output and transfer characteristics of CE & CB mode, Relation between α and β . Transistor as amplifier (CE mode), Numerical Problems.

Learning Outcomes:

After completion of course students will -

- explain complex number with J-operator, LCR Circuits
- understand magnetostatics and ballistic galvanometer
- understand electromagnetic induction laws
- explain various electronic components and devices
- explain construction and working of transistor

Reference Books

1. *Principles of Electronics* - V.K. Mehta, S. Chand Publications (1st Ed.)
2. *Electronics Principles* – Malvino, McGraw-Hill Inc. (7th Ed.)
3. *Basic electronics & linear circuits* - N. N. Bhargava, D. C. Kulshreshtha & S.C.Gupta, Tata McGraw- Hill Education,
4. *Electricity and Magnetism* - D. Chattopadhyay, P.C. Rakshit New Central Book Agency (7th Ed.)
5. *Electromagnetics* - B.B. Laud, A Halshet Press Book (2nd Ed.)

Major Course B.Sc. Part-I NEP-2020

Level 4.5 (Semester- II)

Paper- VI: PHYSICS PRACTICAL

Code: PHY-DSCP-VI

Theory: 60 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will be able to -

- develop students to learn measuring skills in practical.
- prepare students to determine M. I. and acceleration due to gravity.
- introduce students to understand the measurement of electrical quantities by using Multimeter.
- familiarize students to determine high resistance, capacitances and impedance.

Experiments:

1. Use of Multimeter
2. Use of Spectrometer to determine Angle of prism
3. Dispersive power of prism
4. Diffraction grating to determine its grating element
5. LASER (to determine its wavelength of LASER beam by using diffraction grating)
6. Newton's ring (to determine Wavelength and Radius of curvature of Plano-convex lens)
7. Diode characteristics (Forward and reverse bias)
8. Charging and discharging of capacitor
9. Single Stage CE Amplifier
10. Bridge rectifier with π filter
11. Out Put Characteristics Transistor amplifier in CE mode: determination of β
12. Zener diode as a voltage regulator
13. Impedance of series LCR Circuit
14. Sharpness of Series/Parallel LCR Circuit.
15. Liquid lens to determine the refractive index of any liquid

***Note: Minimum Ten experiments from above group must be completed.**

Learning Outcomes:

After completion of course students will

- explain measuring skills in practical.

- understand theoretical concepts by performing experiments.
- develop awareness of minimizing errors.
- handle various instruments.

Reference books:

1. *Advanced level Practical Physics* – Nelkon, Pearson Education Limited; Revised edition
2. *B.Sc. Practical physics* - C. L. Arora, S.Chand Publications.
3. *Practical Physics* - P R Sasi Kumar, PHI Learning Private Limited.

Minor Course B.Sc. Part-I NEP-2020

Level 4.5 (Semester- II)

Paper- III: General Physics- II

Code: PHY-MNRT-III

Theory: 30 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will able to-

- learning electrostatic field, electrostatic theorem and electrolytic capacitors.
- study dielectric medium and three electric vectors.
- understand the Carnot's theorem and working of Carnot's engine.
- define the heat engine and coefficient of performance of refrigerator

Unit I – Electrostatics

(07)

Electrostatic field, electric flux, Gauss's theorem of electrostatics, Electric potential as line Integral of electric field, Potential due to point charge, electric dipole, uniformly charged Spherical shell, Calculation of electric field from potential, capacitance of an isolated spherical conductor, Parallel plate, energy density in electrostatic field, problems.

Unit II - Dielectrics

(07)

Dielectric medium, Polarization, displacement vector, Gauss's theorem in dielectrics, parallel plate capacitor completely filled with dielectrics. Relation between three electric vectors \vec{D} , \vec{E} and \vec{P} .

Unit III – Thermodynamics

(06)

Laws of thermodynamics, Reversible and Irreversible processes, Isothermal and adiabatic process, Adiabatic relations, work done during isothermal and adiabatic processes, Entropy change in reversible and irreversible processes.

Unit IV – Heat engines

(06)

Introduction, Carnot's heat engine and its efficiency; Heat engine, Otto cycle and its efficiency Diesel cycle and its efficiency, comparison between Otto and diesel

engine.

Unit V -Refrigerator

(04)

General principle, Refrigeration Cycle, coefficient of performance of refrigerator,
Vapor compression Refrigerator, Air conditioning (principle and applications)

Learning Outcomes:

Students will be able to

- understand basic concept of electrostatic field, electric flux and electric dipole
- define dielectric medium, polarization and displacement vector.
- study the Carnot's theorem, working of Carnot's engine,
- comparison between Otto and diesel engine.

Reference Books:

- 1) *Electricity and Magnetism*- D. C. Tayal, 1988, Himalaya Publishing House
- 2) *Fundamentals of heat*- D.S.Mathur, S.Chand and Sons publisher.
- 3) *Text book of heat*- J.B. Rajam, S. Chand and company Ltd.
- 4) *A treatise on Heat*- Meghnad Saha and B.N. Srivastava, Indian Press
- 5) *Heat and Thermodynamics* - M.W. Zemansky and R.Dittman, McGraw Hill (8th Ed)
- 6) *Heat Thermodynamics and Statistical physics* - J.P. Agrawal and Satya Prakash, Pragati Prakashan

Minor Course B.Sc. Part-I NEP-2020

Level 4.5 (Semester- II)

Paper- IV: PHYSICS PRACTICAL

Code: PHY-MNRP-IV

Theory: 60 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will be able to

- develop students to learn measuring skills in practical.
- prepare students to determine M. I. and acceleration due to gravity.
- introduce students to understand the measurement of electrical quantities by using Multimeter.
- familiarize students to determine high resistance, capacitances and impedance.

Experiments:

1. Use of Multimeter
2. Use of Spectrometer to determine Angle of prism
3. Dispersive power of prism
4. Diffraction grating to determine its grating element
5. LASER (to determine its wavelength of LASER beam by using diffraction grating)
6. Newton's ring (to determine Wavelength and Radius of curvature of Plano-convex lens)
7. Diode characteristics (Forward and reverse bias)
8. Charging and discharging of capacitor
9. Single Stage CE Amplifier
10. Bridge rectifier with π filter
11. Out Put Characteristics Transistor amplifier in CE mode: determination of β
12. Zener diode as a voltage regulator
13. Impedance of series LCR Circuit
14. Sharpness of Series/Parallel LCR Circuit.
15. Liquid lens to determine the refractive index of any liquid

***Note: Minimum Ten experiments from above group must be completed.**

Learning Outcomes:

Student will be able to

- explain measuring skills in practical.
- understand theoretical concepts by performing experiments.
- develop awareness of minimizing errors.
- handle various instruments.

Reference books:

1. *Advanced level Practical Physics* – Nelkon, Pearson Education Limited; Revised edition
2. *B.Sc. Practical physics* - C. L. Arora, S.Chand Publications.
3. *Practical Physics* – P. R. Sasi Kumar, PHI Learning Private Limited.

Open Elective (OE) B.Sc. Part-I NEP-2020

Level 4.5 (Semester- II)

Paper- II: Amazing World of Light

Code: PHY-OET-II

Theory: 30 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will be able to

- explain light is a form of energy and that it can be characterized as a wave.
- learn how secondary colors (purple, orange and green) are made by mixing primary colors (red, yellow and blue).
- define angle of incidence, angle of reflection, incident ray and reflected ray.
- verify law of reflection and to experimentally determine the index of refraction for glass and water.
- classify different types of lasers

Unit- I: Nature of Light (06)

What makes things visible, nature of light, the sources of light, properties of light: rectilinear propagation, wavelength, Frequency, photon of light, Sunlight-white or colored, visible range.

Unit- II: Color (05)

Color- complementary colors, mixed colored pigments, why- the sky is blue, red color of sunset, clouds are white, greenish blue color of water.

Unit- III: Reflection and Refraction (07)

Reflection, law of reflection, refraction, law of refraction, cause of refraction, total internal reflection, regular and diffused reflection, reflected light can be reflected again, multiple images, Formation of mirage.

Unit- IV: Interference and Diffraction (06)

Interference, diffraction, scattering of light, single- color thin film interference, example from daily life- apparent depth, twinkling of stars.

Unit- V: Geometrical Optics

(06)

Focal length, power of lenses, refractive index, dispersion, concave and convex lenses, magnification.

LASER- properties of lasers, types of lasers, applications of lasers.

Learning Outcomes:

After completion of unit, Students will able to

- understand concept and properties of light.
- distinguish plain color contrast from color contrast.
- compare regular and irregular reflections.
- discuss interference in thin films.
- describe basic properties of lasers.

Reference books:

1. *Fundamental of Physics with Applications* - Arthur Beiser, 5th Edition, 1 July 2017.
2. *Conceptual Physics* - Paul G Hewitt, 12th Edition, 15 September 2017.
3. *A Textbook of Optics* - Subramanyam S Chand publication, 23rd Revised Edition 2006.
4. *Optics*- A. Ghatak, The McGraw-Hill companies, 4th edition
5. *College Physics*- Paul Peter Urone and Roger Hinrichs, OpenStax 1st edition.

Open Elective (OE) B.Sc. Part-I NEP-2020

Level 4.5 (Semester- II)

Paper- II: प्रकाश विश्व

Code: PHY-OET-II

Theory: 30 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will be able to

- explain light is a form of energy and that it can be characterized as a wave.
- learn how secondary colors (purple, orange and green) are made by mixing primary colors (red, yellow and blue).
- define the angle of incidence, the angle of reflection, incident ray and reflected ray.
- verify the law of reflection and to experimentally determine the index of refraction for glass and water.
- classify different types of lasers

प्रकरण-१: प्रकाशाचे स्वरूप

(०६)

कशामुळे गोष्टी दृश्यमान होतात, प्रकाशाचे स्वरूप, प्रकाशाचे स्रोत, प्रकाशाचे गुणधर्म: रेक्टलाइनियर प्रसार, तरंगलांबी, वारंवारता, प्रकाशाचे फोटॉन, सूर्यप्रकाश-पांढरा किंवा रंगीत, दृश्यमान श्रेणी

प्रकरण-२: रंग

(०५)

रंग-पूरक रंग, मिश्र रंगीत रंगद्रव्ये, का- आकाश निळे, लाल रंगाचा सूर्यास्त, ढग पांढरे असतात, पाण्याचा हिरवा निळा रंग.

प्रकरण-३: परावर्तन आणि अपवर्तन

(०७)

परावर्तन, परावर्तनाचे नियम, अपवर्तन, अपवर्तनाचे नियम, अपवर्तनाचे कारण, एकूण अंतर्गत परावर्तन, नियमित आणि विखुरलेले प्रतिबिंब, परावर्तित प्रकाश पुन्हा परावर्तित होऊ शकतो, अनेक प्रतिमा, मृगजळ निर्मिती.

प्रकरण-४: हस्तक्षेप आणि विवर्तन

(०६)

हस्तक्षेप, विवर्तन, प्रकाशाचे विखुरणे, एकल-रंगीत पातळ फिल्म हस्तक्षेप, दैनंदिन जीवनातील उदाहरण- उघड खोली, तारे चमकणे.

प्रकरण-५: भौमितिक ऑप्टिक्स

(०६)

फोकल लांबी, लेन्सची शक्ती, अपवर्तक निर्देशांक, फैलाव, अवतल आणि बहिर्वक्र भिंग,

विस्तृतीकरण.

लेसर - लेसरचे गुणधर्म, लेसरचे प्रकार, लेसरचे अनुप्रयोग.

Learning Outcomes:

After completion of unit, Students will able to

- understand concept and properties of light.
- distinguish plain color contrast from color contrast.
- compare regular and irregular reflections.
- discuss interference in thin films.
- describe basic properties of lasers.

Open Elective (OE) B.Sc. Part-I NEP-2020

Level 4.5 (Semester- II)

Paper- II: Amazing World of Light

Code: PHY-OEP-II

Theory: 60 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will be able to

1. develop skills in taking readings/observations obtained from these instruments.
2. learn how to analyses and interpret experimental data, including error analysis,
3. perform calculations to obtain the experimental results.
4. test whether the experimental results hold good with theoretical results.

List of Experiments:

1. To study law of reflection
2. To study law of refraction
3. To study total internal reflection
4. To study diffraction pattern using diffraction grating
5. To identify different types of lenses and mirrors
6. To study properties of laser
7. To study the dispersion of light (Color Spectrum)
8. Identification of different types of light sources
9. Measurement of intensity of light using LUX meter
10. Demonstration of Newton's ring.
11. Image formation from lenses and mirror.
12. Study of photo cell

Additional Activities

1. Educational tour and its report equivalent to two experiments
2. Hobby project

Course Outcomes:

Students should be able to

1. exhibit practical skills in comparing intensities using LUX meter.
2. demonstrate problem solving skills by encountering and resolving technical challenges that may arise during experiments.
3. analysing experimental observations/readings
4. discuss and correlate their physics theory concepts and theoretical values with practical and experimental values.

Skill Enhancement Course (SEC) B.Sc. Part-I NEP-2020

Level 4.5 (Semester- II)

Paper- I: Maintenance and Repairing of Household Electrical Appliances

Code: PHY-SEC- I.

Theory: 30 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will be able to

- create awareness among students in understanding the working principle, maintenance & repairing of electric home appliances.
- ability to do maintenance of general electric home appliances.
- encourage student for self employment.
- ensure steady flow of skilled worker in different trades for the industries.

Unit - I Basic Electronic Components (5)

Symbol, specifications, types and applications: resistor, capacitor, inductor, diode, transistor, Fuse, switches, power supply.

Unit - II Circuit Connections and measurements (5)

Introduction, Types of electrical connections, wires and cables, Earthing, Practical diagram of house wiring, meters (use of Ammeter, Voltmeter, multimeter).

Unit - III Home Appliances (5)

Testing and repairing: switch board, Fuse, Fan, Mixer, iron, Table Lamp, Induction Coil, Inverter & UPS, Electric Bell, Torch.

Practicals:

1. Identification of electrical component
2. Use of Multimeter (Testing of Electronic Components).
3. Fuse checking and Fault finding in electric circuits.
4. Earthing preparation.
5. Build and test switch board.

6. Testing/Fault finding in Fans, Mixer, iron, Table Lamps, Induction Coil.
7. Testing/Fault finding in UPS

Learning Outcomes: after completion of the course, Student should be able to:

- understand the working principle, maintenance and repairing of electric home appliances.
- able to do maintenance of general electric home appliances.
- ensure student for Self employment.
- enhance student's skill to do self job.

Reference Books:

1. *Basic Electronics(Solid State)*- B. L. Theraja, S. Chand Publication (Edition 2007)
2. *Electrician*- K. Mehta, G. V. Ramana Murthy, Asian Publisher (Edition 2021)
3. *Electrical Measurements and Measuring Instruments*- R. K. Rajput, S. Chand Publication, ISBN: 978-81-219-2963-9
4. *A Textbook of Electrical Technology*- B. L. Theraja, Volume III, S. Chand Publication (Edition 2013).
5. *Electronic Measurements and Instrumentation*- Dr. R. S. Sedha, S. Chand Publication, ISBN: 978-81-219-9775-1

VALUE EDUCATION COURSE (VEC) B.Sc. Part-I NEP-2020

Level 4.5 (Semester- II)

Paper- II: Environmental Science

Code: PHY-VEC- II

Theory: 30 Lectures

Marks: 50 (Credits: 2)

Learning Objectives:

Students will be able to-

- learn the concept of Environment and Ecosystem.
- explain different types of environmental pollutions.
- aware about various energy resources.
- understand the impact of human population on environment.
- explain social issues related to environment.

Unit- I. Understanding the Environment (6)

Environment: concept, importance and components, Ecosystem: concept, structure and function (food chain, food web, ecological pyramids and energy flow), natural resources: renewable and non- renewable.

Unit- II. Environmental pollution (6)

Air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear pollution, solid waste management, industrial wastes, disaster management (floods, earthquake, cyclone and landslides).

Unit- III. Energy and Environment (6)

Solar energy, fossil fuels, petroleum and natural gas, shale oil, coal bed methane, principle and generation of hydro-power, tidal energy, ocean thermal energy conservation, wind power, geothermal energy.

Unit- IV. Human Population and Environment (6)

Population growth and explosion, environment and human health, human rights, value education, women and child welfare, role of information technology in environment and human health.

Unit- V. Social Issues and Environment (6)

From unsustainable to sustainable development, urban problems related to energy, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, public awareness.

Learning Outcomes:

After completion of the unit, Students will able to

- understand the concept of Environment and eco system.
- describe different types of environmental pollutions.
- understand the various energy resources.
- interpret impact of human population on environment.
- bring awareness about social issues related to environment.

Reference books:

1. *Environmental Studies*- D. K. Asthana & Dr. Meera Asthana, S. Chand Publication (Revised Edition).
2. *Environmental Biology*- K. C. Agarwal, 2001, Nidi Publ. Ltd., Bikaner.
3. *Environmental Education*- Dr. S. Juneja, Dr. A. Kumar & S. Kumar (S. Dinesh & Co.)