

S.V.L.N.S GOVERNMENT DEGREE COLLEGE

BHEEMUNIPATNAM

DEPARTMENT OF PHYSICS

COURSE OUTCOMES

Course I: Mechanics, Waves and Oscillations:

Course outcomes: On successful completion of this course, the students will be able to

- Understand Newton's laws of motion and motion of variable mass system and its application to rocket motion and the concepts of impact parameter, scattering cross section.
- Apply the rotational kinematic relations, the principle and working of gyroscope and its applications and the precessional motion of a freely rotating symmetric top.
- Comprehend the general characteristics of central forces and the application of Kepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.
- Understand postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence.
- Examine phenomena of simple harmonic motion and the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic oscillator.
- Appreciate the formulation of the problem of coupled oscillations and solve them to obtain normal modes of oscillation and their frequencies in simple mechanical systems.
- Figure out the formation of harmonics and overtones in a stretched string and acquire the knowledge on Ultrasonic waves, their production and detection and their applications in different fields.

Practical Course 1: Mechanics, Waves and Oscillations:

- On successful completion of this practical course, the student will be able to
- Perform experiments on Properties of matter such as the determination of moduli of elasticity viz., young's modulus, Rigidity modulus of certain materials; Surface tension of water, Coefficient of viscosity of a liquid, Moment of inertia of some regular bodies by different methods and compare the experimental values with the standard values.
- Know how to determine the acceleration due to gravity at a place using Compound pendulum and Simple pendulum.
- Notice the difference between flat resonance and sharp resonance in case of volume resonator and sonometer experiments respectively.
- Verify the laws of transverse vibrations in a stretched string using sonometer and comment on the relation between frequency, length and tension of a stretched string under vibration.
- Demonstrate the formation of stationary waves on a string in Melde's string experiment.
- Observe the motion of coupled oscillators and normal modes.

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Course-II: WAVE OPTICS:

- On successful completion of this course, the student will be able to:
- Understand the phenomenon of interference of light and its formation in (i) Lloyd's single mirror due to division of wave front and (ii) Thin films, Newton's rings and Michelson interferometer due to division of amplitude.
- Distinguish between Fresnel's diffraction and Fraunhofer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating.
- Describe the construction and working of zone plate and make the comparison of zone plate with convex lens.
- Explain the various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity.
- Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields.
- Explain about the different aberrations in lenses and discuss the methods of minimizing them.
- Understand the basic principles of fibre optic communication and explore the field of Holography and Nonlinear optics and their applications.

Practical Course II: Wave Optics:

- On successful completion of this practical course the student will be able to,
- Gain hands-on experience of using various optical instruments like spectrometer, polarimeter and making finer measurements of wavelength of light using Newton Rings experiment, diffraction grating etc.
- Understand the principle of working of polarimeter and the measurement of specific rotatory power of sugar solution
- Know the techniques involved in measuring the resolving power of telescope and dispersive power of the material of the prism.
- Be familiar with the determination of refractive index of liquid by Boy's method and the determination of thickness of a thin wire by wedge method.

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Course-III: HEAT AND THERMODYNAMICS:

On successful completion of this course, the student will be able to:

- Understand the basic aspects of kinetic theory of gases, Maxwell-Boltzman distribution law, equipartition of energies, mean free path of molecular collisions and the transport phenomenon in ideal gases
- Gain knowledge on the basic concepts of thermodynamics, the first and the second law of thermodynamics, the basic principles of refrigeration, the concept of entropy, the thermodynamic potentials and their physical interpretations.
- Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency
- Develop critical understanding of concept of Thermodynamic potentials, the formulation of Maxwell's equations and its applications.
- Differentiate between principles and methods to produce low temperature and liquefy air and also understand the practical applications of substances at low temperatures.
- Examine the nature of black body radiations and the basic theories.

Practical Course-III: Heat and Thermodynamics:

On successful completion of this practical course, the student will be able to;

- Perform some basic experiments in thermal Physics, viz., determinations of Stefan's constant, coefficient of thermal conductivity, variation of thermo-emf of a thermocouple with temperature difference at its two junctions, calibration of a thermocouple and Specific heat of a liquid.

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Course-IV: ELECTRICITY, MAGNETISM AND ELECTRONICS:

On successful completion of this course, the students will be able to:

- Understand the Gauss law and its application to obtain electric field in different cases and formulate the relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity and Dielectric constant.
- Distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances.
- Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents.
- Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves.
- Phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q- factor, Power factor and the comparative study of series and parallel resonant circuits. ∞ Describe the operation of p-n junction diodes, zener diodes, light emitting diodes and transistors
- Understand the operation of basic logic gates and universal gates and their truth tables

Practical Course IV: Electricity, Magnetism and Electronics:

- On successful completion of this practical course the student will be able to;
- Measure the current sensitivity and figure of merit of a moving coil galvanometer
- Observe the resonance condition in LCR series and parallel circuit
- Learn how a sonometer can be used to determine the frequency of AC-supply.
- Observe the variation of magnetic field along the axis of a circular coil carrying current using Stewart and Gee's apparatus.
- Understand the operation of PN junction diode, Zener diode and a transistor and their V-I characteristics.
- Construct the basic logic gates, half adder and full adder and verify their truth tables. Further, the student will understand how NAND and NOR gates can be used as universal building blocks.

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Course V: MODERN PHYSICS:

On successful completion of this course, the students will be able to:

- Develop an understanding on the concepts of Atomic and Modern Physics, basic elementary quantum mechanics and nuclear physics.
- Develop critical understanding of concept of Matter waves and Uncertainty principle.
- Get familiarized with the principles of quantum mechanics and the formulation of Schrodinger wave equation and its applications.
- Examine the basic properties of nuclei, characteristics of nuclear forces, salient features of nuclear models and different nuclear radiation detectors.
- Classify Elementary particles based on their mass, charge, spin, half-life and interaction.
- Get familiarized with the nano materials, their unique properties and applications.
- Increase the awareness and appreciation of superconductors and their practical applications.

Practical Course V: Modern Physics:

On successful completion of this practical course, the student will be able to;

- Measure charge of an electron and e/m value of an electron by Thomson method.
- Understand how the Planck's constant can be determined using Photocell and LEDs.
- Study the absorption of α -rays and β -rays, Range of β -particles and the characteristics of GM counter
- Determine the Energy gap of a semiconductor using thermistor and junction diode.

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Course 6A: OPTICAL INSTRUMENTS AND OPTOMETRY

Course outcomes:

Students at the successful completion of the course will be able to:

1. Understand the construction and working principles of various optical instruments used in daily life.
2. Acquire a critical knowledge on the various defects of eye and their correcting methods with suitable lenses.
3. Demonstrate skills of using biological microscope through hands on experience.
4. Understand the various techniques used in optometry and computer-based eye testing.
5. Comprehend the various applications of microscopes and telescopes.

Course 6A: Optical Instruments and Optometry – PRACTICAL SYLLABUS

Learning Outcomes:

On successful completion of this practical course, student shall be able to:

1. List out, identify and handle various equipment like binoculars, telescopes and microscopes.
2. Learn the procedures of operation of various optical instruments.
3. Demonstrate skills on testing the power of lenses, improving the resolution of telescopes and microscopes.
4. Acquire skills in observing and measuring the power, focal length and different refractive errors of eye.
5. Perform some techniques related to testing the blood and other biological samples.
6. Understand the technique of operation of Computer eye testing and evaluation.

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Course 7A: OPTICAL IMAGING AND PHOTOGRAPHY:

Learning Outcomes:

Students after successful completion of the course will be able to:

1. Identify the different types of cameras and camera lenses according to different purposes.
2. Identify and understand the focal length of the different types of lenses
3. Acquire a critical knowledge on natural and artificial sources of light and their application in photography.
4. Demonstrate skills of camera usage especially Digital Cameras.
5. Understand the various Image development and editing techniques.
6. Comprehend the concept of different types of common shooting techniques.

Course 7A: Optical Imaging and Photography – Practical (lab) work:

Learning Outcomes:

On successful completion of this practical course, student shall be able to:

1. List out, identify and understand various image formation techniques including Eye.
2. Learn the procedures of using Analog and Digital cameras.
3. Demonstrate the focusing techniques of Analog and Digital cameras.
4. Acquire skills in the editing and development of photos and videos.
5. Perform some experimental skills related to images, videos using the equipment available in the lab or in a local studio.

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Course 6B: LOW TEMPERATURE PHYSICS & REFRIGERATION:

Learning Outcomes:

Students after successful completion of the course will be able to

1. Identify various methods and techniques used to produce low temperatures in the Laboratory.
2. Acquire a critical knowledge on refrigeration and air conditioning.
3. Demonstrate skills of Refrigerators through hands on experience and learns about refrigeration components and their accessories.
4. Understand the classification, properties of refrigerants and their effects on environment.
5. Comprehend the applications of Low Temperature Physics and refrigeration.

Course 6B: Low Temperature Physics & Refrigeration – Practical (lab) work:

Learning Outcomes:

On completion of practical course, student shall be able to

1. List out, identify and handle equipment used in refrigeration and low temperature lab.
2. Learn the procedures of preparation of Freezing Mixtures.
3. Demonstrate skills on developing various Freezing mixtures and materials and their applications in agriculture, medicine and day to day life.
4. Acquire skills in observing and measuring various methodologies of very low temperatures
5. Perform some techniques related to Refrigeration and Freezing in daily life.

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Course 7B: Solar Energy and Applications:

Learning Outcomes:

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

1. Understand Sun structure, forms of energy coming from the Sun and its measurement.
2. Acquire a critical knowledge on the working of thermal and photovoltaic collectors.
3. Demonstrate skills related to callus culture through hands on experience
4. Understand testing procedures and fault analysis of thermal collectors and PV modules.
5. Comprehend applications of thermal collectors and PV modules.

Course 7B: Solar Energy and Applications – Practical (lab) work:

Learning Outcomes:

On successful completion of this practical course, student shall be able to:

1. List out and identify various components of solar thermal collectors and systems, solar photovoltaic modules and systems.
2. Learn the procedures for measurement of direct, global and diffuse solar radiation, I - V characteristics and efficiency analysis of solar cells and modules.
3. Demonstrate skills acquired in evaluating the performance of solar cell / module in connecting them appropriately to get required power output.
4. Acquire skills in identification and elimination of the damaged panels without affecting the output power in a module / array.
5. Perform procedures and techniques related to general maintenance of solar thermal and photovoltaic modules.

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Course 6C: APPLICATIONS OF ELECTRICITY & ELECTRONICS:

Learning Outcomes:

Students after successful completion of the course will be able to:

1. Identify various components present in Electricity & Electronics Laboratory.
2. Acquire a critical knowledge of each component and its utility (like resistors, capacitors, inductors, power sources etc.).
3. Demonstrate skills of constructing simple electronic circuits consisting of basic circuit elements.
4. Understand the need & Functionality of various DC & AC Power sources.
5. Comprehend the design, applications and practices of various electrical & Electronic devices and also their trouble shooting.

Course 6C: Applications of Electricity & Electronics – PRACTICAL SYLLABUS:

Learning Outcomes:

On successful completion of this practical course, student shall be able to:

1. List out, identify and handle various equipment in Electrical & Electronics laboratory.
2. Learn the procedures of designing simple electrical circuits.
3. Demonstrate skills on the utility of different electrical components and devices.
4. Acquire the skills regarding the operation, maintenance and troubleshooting of various Devices in the lab.
5. Understand the different applications of Electromagnetic induction.

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Course 7C: ELECTRONIC INSTRUMENTATION:

Learning Outcomes:

Students after successful completion of the course will be able to:

1. Identify various facilities required to set up a basic Instrumentation Laboratory.
2. Acquire a critical knowledge of various Electrical Instruments used in the Laboratory.
3. Demonstrate skills of using instruments like CRO, Function Generator, Multimeter etc. through hands on experience.
4. Understand the Principle and operation of different display devices used in the display systems and different transducers
5. Comprehend the applications of various biomedical instruments in daily life like B.P. meter, ECG, Pulse oximeter etc. and know the handling procedures with safety and security.

Course 7C: Electronic Instrumentation– PRACTICAL SYLLABUS

Learning Outcomes:

On successful completion of this practical course, student shall be able to:

1. List out, identify and handle various equipment in Instrumentation Laboratory or Electronic Laboratory.
2. Learn the construction, operational principles of various instruments.
3. Demonstrate skills on handling, Maintenance & trouble shooting of different instruments used in the Labs.
4. Acquire skills in observing and measuring various electrical and electronic quantities.
5. Perform some techniques related to Biomedical Instrumentation and measurement of Certain physiological parameters like body temperature, B.P. and sugar levels etc.