**B.L.D.E.ASSOCIATION'S**
**SB ARTS AND K.C.P. SCIENCE COLLEGE, VIJAYAPUR**
**RE-ACCREDITED AT THE 'B++' LEVEL**
**Bachelor of Science**
**Department of Physics**
**Academic year: 2023-24**

# Program Outcomes

| | Descriptions |
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| **PO1** | **Discipline Knowledge:** Knowledge of basics of science and ability to apply the understanding of fundamentals of major discipline in solving complex problems. |
| **PO2** | **Conduct investigations:** Conduct investigations of issues in their respective disciplines and arrive at valid conclusions. |
| **PO3** | **Problem solving:** Implement a solution process using first principles of science to solve problems related to respective discipline. |
| **PO4** | **Modern tool usage:** Select and use a modern scientific, engineering and IT tool or technique for solving problems in the areas of their discipline. |
| **PO5** | **Environment and Society:** Evaluate the impact of scientific solutions on society and environment and the need for sustainable solutions. |
| **PO6** | **Ethics:** Demonstrate professional ethics, responsibilities and norms in respective profession. |
| **PO7** | **Individual and teamwork:** Work effectively as an individual as a team member and as a leader in a multidisciplinary team. |
| **PO8** | **Communication:** Communicate effectively with the stake holders, write and comprehend project reports and documentation, deliver effective presentations, and give and receive clear instructions. |
| **PO9** | **Project Management and Finance:** Apply the knowledge of scientific and technological principles to one's own work to manage projects in multidisciplinary settings. |
| **PO10** | **Lifelong Learning:** Engage in lifelong learning in the context of changing trends in respective discipline. |

# Course outcomes

| CLASS | PAPER | COURSE OUTCOMES | DESCREPTIONS |
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| B. SC. I SEM | Mechanics and properties of matter | CO1 | Estimate the possible error in measurement of a physical quantity, using its dimensional equations, the least counts if instruments used and by actual measurements in the appropriate system of units. |
| | | CO2 | Students will be able to explain gradient, divergence and curl in a physical phenomenon and write mathematical formula for the same. |
| | | CO3 | Students must identify and explain three examples for Divergence and three examples for Curls in real-world applications. |
| | | CO4 | Apply laws of conservation of momentum and associated energy along with laws to motion to the systems of linear/rotational motion determines different parameters associated with physically rigid bodies. |
| | | CO5 | Students will describe how fictitious forces arise in a non-inertial frame, using this explain why a person sitting in a merry-go-round experiences an outward pull. |
| | | CO6 | Determine theoretically and experimentally the relation between three elastic constants. |
| | | CO7 | **Apply** the concept of surface tension and viscosity of liquid. Classify fluids based on the law of viscosity. |
| | | CO8 | Students will be able draw Stress and Strain Curve for Steel, Rubber and Wood. |

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| | | **CO9** | Measure surface tension of water and other common liquids. |
| | Theory based Practical's on Mechanics and properties of matter | **CO1** | Students will learn, how to use Vernier caliper & screw gauge to calculate dimensional values of different solid materials. |
| | | **CO2** | Practically learn & get the knowledge about S.H.M. |
| | | **CO3** | Experimentally students will calculate the value of 'g' at different places in the laboratory & discover that the value of 'g' changes at each place by performing Bar pendulum & Flat spiral spring experiment. |
| | | **CO4** | Performing the experiment on Stoke's law. |
| | | **CO5** | Learn to solve system of linear equations. |
| | Energy sources | **CO1** | Understand the need of energy conversion and the various methods of energy storage. |
| | | **CO2** | Explain the field applications of solar energy. |
| | | **CO3** | Identify wind energy as alternate form of energy and to know how it can be tapped. |
| | | **CO4** | Explain bio gas generation and its impact on environment. |
| | | **CO5** | Understand the Geothermal and Tidal energy, its mechanism of production and its applications. |
| | | **CO6** | Illustrate the concepts of Direct Energy Conversion Systems and their applications. |
| **B. SC. II SEM** | Electricity & Magnetism | **CO1** | Give the applications of charge distribution and energy associated with a charge for various shapes of electrical conductors, using the principles of the different laws of Electrostatic field and potential. |
| | | **CO2** | Explain the impact of polarization due to |

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| | | | an electrical field on a dielectric material, and the different terms related to dielectrics and the relation between them. |
| | | **CO3** | To obtain the impact of the electrical field in producing a magnetic field with resulting laws and applications. |
| | | **CO4** | Define various terms associated with a magnetic material and the relation between them, and demonstrate the types of the magnetic material in terms of their respective BH curves. |
| | | **CO5** | Obtain Maxwell's equations in differential and integral forms of transverse electromagnetic waves based on Faraday's and Lenz's laws, along with their production. |
| | | **CO6** | Obtain different quantities of resonance, power dissipation, quality factor and bandwidth for RL, RC, LCR series and parallel circuits, using basic laws of electrical circuits. |
| | | **CO7** | Use Ballistic Galvanometer to obtain charge sensitivity and electromagnetic damping. |
| | Theory based Practical's on Electricity & Magnetism | **CO1** | To understand the importance of Thevenin's theorem and Draw the Complex Network into a Thevenin's equivalent circuit. |
| | | **CO2** | To understand the importance of Norton's theorem and Draw the Complex Network into a Norton's equivalent circuit. |
| | | **CO3** | To study the charging and discharging of the capacitor through the given resistance. |
| | | **CO4** | To calibrate the Ammeters for the study of Helmoltz Galvanometer and study the deflections of the Galvanometer under the magnetic field. |
| | | **CO5** | To study the noise reduction produced |

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| | | | into De Sauty's AC Bridge and compare the capacitance of the given capacitors. |
| | | **CO6** | Using Cathode Ray Oscilloscope, students will study the measurement of voltage, frequency and phase shift of different waves. |
| | Optical Instruments | **CO1** | To learn about different telescopes used to see galaxies and their ranges. |
| | | **CO2** | To observe the dispersion of light through prism. |
| | | **CO3** | To observe rainbows and understand optics. |
| | | **CO4** | To study the reflection and refraction of light, students can use various lenses and different medium. |
| | | **CO5** | To study the age of the materials or heavenly bodies, carbon dating is very helpful for the students to know the age any of the heavenly bodies. |
| **B. SC. III SEM** | Wave motion and Optics | **CO1** | Identify different types of waves by looking into their characteristics. |
| | | **CO2** | Formulate a wave equation and obtain the expression for different parameters associated with waves. |
| | | **CO3** | Give an analytical treatment of resonance in case of open and closed pipes in general and Helmoltz resonators in particular. |
| | | **CO4** | Describe the different parameters affect the acoustics in a building, measure it and control it. |
| | | **CO5** | Explain the polarization of light and obtain how the polarization occurs due to quarter wave plate, half wave plate and through the optical activity of a medium. |
| | Theory based Practical's on Wave | **CO1** | Explain how Newton's rings are obtained and discuss how the wavelength of light is determined using this experiment. |
| | | **CO2** | Discuss the formation of different |

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| | motion and Optics | | lissajous figures under different conditions of amplitude and frequency when they superimposed perpendicularly. |
| | | **CO3** | Obtain experimentally frequency of AC using Sonometer. |
| | | **CO4** | How diffraction due to grating. |
| | | **CO5** | Determination of frequency of tuning fork by transverse vibration using Melde's experiment. |
| | Climate Science | **CO1** | Understand the physical basics of the natural greenhouse effect, including the meaning of the term radiative forcing. |
| | | **CO2** | Know the impacts that climate change is having on the natural environment. |
| | | **CO3** | Learn to determine atmospheric humidity using wet bulb and dry bulb thermometers. |
| | | **CO4** | To understand the process of cloud seeding. |
| | | **CO5** | Know some of the global impacts of sea level rise. |
| **B. SC. IV SEM** | Thermal physics and Electronics | **CO1** | Apply the laws of thermodynamics and analyze the thermal system. |
| | | **CO2** | Apply the laws of kinetic theory and Radiation laws to the ideal and practical thermodynamic systems through derived thermodynamic relations. |
| | | **CO3** | Use the concepts of semiconductors to describe different semiconductor devices such as diode, transistors, bjt, fet etc. and explain their functioning. |
| | | **CO4** | Explain the functioning of Op-amps and use them as the building blocks of logic gates. |
| | | **CO5** | Give the use of logic gates using different theorems of Boolean algebra followed by logic circuits. |
| | | **CO6** | Explain the polarization of light and how the polarization occurs due to quarter |

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| | | | wave plates, half wave plates and the optical activity of a medium. |
| | Theory based Practical's on Thermal physics and Electronics | **CO1** | To draw the characteristics of Zener diode and study and its use as a voltage regulator. |
| | | **CO2** | Realization of basic gates using NAND gate and using IC7400. |
| | | **CO3** | Verification of Boolean algebra using NAND gate and IC7400. |
| | | **CO4** | Study the frequency response of CE amplifier. |
| **B. SC. V SEM** | Paper-I Classical Mechanics and Quantum Mechanics - I | **CO1** | Identify the failure of Classical Physics at the microscopic level. |
| | | **CO2** | Find the relationship between the normalization of a wave function and the ability to correctly calculate expectation values or probability densities. |
| | | **CO3** | Explain the minimum uncertainty of measuring both observables on any quantum state. |
| | | **CO4** | Describe the time-dependent and time-independent Schrödinger equation for simple potentials like for instance one-dimensional potential well and Harmonic oscillator. |
| | | **CO5** | Understand the concept of tunneling. |
| | Theory based Practical's on Classical Mechanics and Quantum Mechanics - I | **CO1** | To determine 'g', the acceleration due to gravity, at a given place. |
| | | **CO2** | Studying the effect of amplitude of oscillation on the time period of the simple pendulum. |
| | | **CO3** | To study the spectral characteristics of a photo-voltaic cell. |
| | | **CO4** | Determination of quantum efficiency of Photodiode. |
| | | **CO5** | To find the value of e/m for an electron by Thomson's method using bar magnets. |
| | | **CO6** | Verify the Principle of Conservation of Linear Momentum. |

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| | Paper-II Elements of Atomic, Molecular & Laser Physics | **CO1** | Describe atomic properties using basic atomic models. |
| | | **CO2** | Interpret atomic spectra of elements using vector atom model. |
| | | **CO3** | Interpret molecular spectra of compounds using basics of molecular physics. |
| | | **CO4** | Explain laser systems and their applications in various fields. |
| | | **CO5** | Learn the importance of Statistical mechanics and different distribution functions. |
| | Practical's on Elements of Atomic, Molecular & Laser Physics | **CO1** | To determine the ionization potential of mercury. |
| | | **CO2** | To determine Planck's constant using Photocell. |
| | | **CO3** | Characteristics of Laser Diode. |
| | | **CO4** | Study of Raman scattering by CCl4 using laser and spectrometer/CDS. |
| | | **CO5** | Study Photoconductive cell characteristics. |
| **B. SC. VI SEM** | Paper-I Elements of Condensed Matter & Nuclear Physics | **CO1** | To learn the seven crystal systems in condensed matter Physics. |
| | | **CO2** | To study the magnetic and dielectric behaviors of materials. |
| | | **CO3** | Describe the processes of alpha, beta and gamma decays based on well-established theories. |
| | | **CO4** | Explain the basic aspects of interaction of gamma radiation with matter by photoelectric effect, Compton scattering and pair production. |
| | | **CO5** | Explain the different nuclear radiation detectors such as ionization chamber, Geiger-Mueller counter etc. |
| | | **CO6** | Explain the basic concept of scintillation detectors, photo-multiplier tube and semiconductor detectors. |
| | Theory based | **CO1** | Determination of Plank's constant by Photo Cell. |

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| | Practical's on Elements of Condensed Matter & Nuclear Physics | **CO2** | B-H Curve Using CRO. |
| | | **CO3** | Specific Heat of Solid by Electrical Method. |
| | | **CO4** | Analysis of X-ray diffraction spectra and calculation of lattice parameter. |
| | | **CO5** | Spectral Response of Photo Diode and its I-V Characteristics. |
| | Paper-II Electronic Instrumentation & Sensors | **CO1** | Identify different types of tests and measuring instruments used in practice and understand their basic working principles. |
| | | **CO2** | Get hands on training in wiring a circuit, soldering, making a measurement using an electronic circuit used in instrumentation. |
| | | **CO3** | Have an understanding of the basic electronic components viz., resistors, capacitors, inductors, discrete and integrated circuits, colour codes, values and pin diagram, their practical use. |
| | | **CO4** | Understanding of the measurement of voltage, current, resistance value, identification of the terminals of a transistor and ICs. |
| | | **CO5** | Identify and understand the different types of transducers and sensors used in robust and hand-held instruments. |
| | | **CO6** | Understand and give a mathematical treatment of the working of rectifiers, filter, data converters and different types of transducers. |
| | | **CO7** | Connect the concepts learnt in the course to their practical use in daily life. |
| | | **CO8** | Develop basic hands-on skills in the usage of oscilloscopes, multimeters, rectifiers, amplifiers, oscillators and high voltage probes, generators and digital meters. |
| | | **CO9** | Servicing of simple faults of domestic |

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| | | | appliances: Iron box, immersion heater, fan, hotplate, battery charger, emergency lamp and the like. |
| | | **CO10** | Learn about Fourier series and its applications. |
| | Theory based Practical's onElectronic Instrumentation & Sensors | **CO1** | Design and construct a Wien bridge oscillator. |
| | | **CO2** | Study the frequency response of a first order op-amp low pass filter. |
| | | **CO3** | Study the characteristics of *pn*-junction of a solar cell and determine its efficiency. |
| | | **CO4** | Study the characteristics of a photo-diode. |
| | | **CO5** | Study the amplitude modulation using a transistor. |
| | Project | **CO1** | Understanding research methodology and it helps in research career. |
| | | **CO2** | Gain experience in research. |

HOD

Head
Department of Physics
S.B.Arts & K.C.P.Science College
Vijayapur-586103.

IQAC Co-ordinator

IQAC, Co-ordinator
S.B.Arts & K.C.P.Science College,
Vijayapur.

Principal

Principal,
S.B.Arts & KCP. Sc. College
Vijayapur.