# Government College for Women (A), Srikakulam

**Reaccredited by NAAC with A grade 3rd cycle CGPA 3.09**

**ESTD 1968 (AFFLIATED TO DR B R AMDEDKAR UNIVERSITY)**

# BRIDGE COURSE

## DEPARTMENT OF PHYSICS

# Bridge Course for First-Year Degree Students

***Objectives:***

1. **To Bridge the Knowledge Gap:** Help students transition smoothly from school-level learning to college-level academics.
2. **To Strengthen Fundamental Concepts:** Reinforce key concepts in subjects like Mathematics, Science, and English to ensure a solid foundation.
3. **To Develop Study Skills:** Teach effective study techniques, time management, and critical thinking skills.
4. **To Familiarize with College Culture:** Acquaint students with college-level expectations, academic regulations, and available resources.
5. **To Enhance Communication Skills:** Improve reading, writing, speaking, and comprehension skills for better academic performance.
6. **To Boost Confidence:** Encourage self-learning, problem-solving, and interactive participation in classroom activities.
7. **To Promote Digital Literacy:** Introduce essential technological tools and platforms required for modern learning.
8. **To Facilitate Peer Interaction:** Help students build connections, collaborate, and develop teamwork skills.

***Aim:***

The aim of the bridge course is to ease the transition of first-year degree students into higher education by equipping them with essential academic, technical, and soft skills. It ensures they adapt comfortably to the new learning environment, become independent learners, and perform effectively in their degree programs.

***Conclusion:***

The bridge course plays a crucial role in preparing first-year students for the challenges of college education. By strengthening foundational knowledge, enhancing study skills, and fostering confidence, it helps students adjust to their academic journey smoothly. A well-structured bridge course sets the stage for long-term academic success and personal growth.

# CONTENTS

## Bridge Course Material:

## 1.Waves, Oscillations, and Mechanics

***Module 1: Introduction to Waves and Oscillations***

**Basic Definitions**

1. Wave: Disturbance that transfers energy from one point to another.
2. Oscillation: Repeated motion about an equilibrium position.

2. **Types of Waves**

1. Mechanical Waves (require medium): Sound waves, water waves.
2. Electromagnetic Waves (do not require medium): Light, radio waves.
3. Transverse vs. Longitudinal Waves.

**Characteristics of Waves**

1. Wavelength (λ), Frequency (f), Period (T), Amplitude (A).
2. Wave Speed: v=fλv = f\lambdav=fλ.

**Simple Harmonic Motion (SHM)**

1. Equation of SHM: x=Acos(ωt+ϕ)x = A \cos(\omega t + \phi)x=Acos(ωt+ϕ).
2. Angular frequency: ω=2πf\omega = 2\pi fω=2πf.
3. Energy in SHM: Kinetic and Potential Energy variation.

**Damped and Forced Oscillations**

1. Damping: Loss of energy due to resistive forces.
2. Resonance: Large amplitude oscillations at natural frequency.

***Module 2: Basics of Mechanics***

**Fundamental Concepts**

1. Scalars and Vectors.
2. Distance vs. Displacement, Speed vs. Velocity, Acceleration.

**Newton's Laws of Motion**

1. First Law (Inertia).
2. Second Law: F=maF = maF=ma.
3. Third Law (Action and Reaction).

**Work, Energy, and Power**

1. Work Done: W=Fdcosθ W = Fd \cos \thetaW=Fdcosθ.
2. Kinetic Energy: KE=12mv2KE = \frac{1}{2} mv^2KE=21mv2.
3. Potential Energy: PE=mghPE = mghPE=mgh.
4. Law of Conservation of Energy.

**Momentum and Collisions**

1. Linear Momentum: p=mvp = mvp=mv.
2. Impulse: FΔt=mΔvF\Delta t = m\Delta vFΔt=mΔv.
3. Types of Collisions: Elastic and Inelastic.

**Rotational Motion**

1. Torque: τ=rFsinθ\tau = rF \sin \thetaτ=rFsinθ.
2. Moment of Inertia and Angular Momentum.

***Conclusion:***

This bridge course provides a foundational understanding of **waves, oscillations, and mechanics**, ensuring students are well-prepared for advanced topics in physics. It emphasizes basic principles, mathematical formulations, and real-world applications to help students develop problem-solving skills and confidence in handling physics-related coursework.

**Fundamentals of Waves and Oscillations**

***1. Oscillations***

Oscillations refer to the repetitive motion of an object about a fixed point or equilibrium position. Examples include a pendulum, a vibrating string, and a mass-spring system.

**Types of Oscillations:**

- **Free Oscillations:** Occur when a system oscillates with its natural frequency without any external force (e.g., a pendulum in vacuum).
- **Damped Oscillations:** Amplitude decreases over time due to resistive forces like friction or air resistance.
- **Forced Oscillations:** A periodic external force drives the system (e.g., swings pushed periodically).
- **Resonance:** A phenomenon where the amplitude of oscillations increases when an external force matches the system's natural frequency.

**Simple Harmonic Motion (SHM):**

A special type of oscillation where the restoring force is directly proportional to displacement and acts in the opposite direction.

- Equation: x=Acos(ωt+ϕ)x = A \cos(\omega t + \phi)x=Acos(ωt+ϕ)
- Velocity: v=−Aωsin(ωt+ϕ)v = -A\omega \sin(\omega t + \phi)v=−Aωsin(ωt+ϕ)
- Acceleration: a=−ω2xa = -\omega^2 xa=−ω2x
- Time Period: T=2πωT = \frac{2\pi}{\omega}T=ω2π
- Examples: Mass-spring system, simple pendulum for small angles.

***2. Waves***

A wave is a disturbance that transfers energy from one point to another without the physical transport of matter.

**Types of Waves:**

- **Mechanical Waves:** Require a medium (e.g., sound waves, water waves).
- **Electromagnetic Waves:** Do not require a medium (e.g., light, radio waves).
- **Transverse Waves:** Particles oscillate perpendicular to wave propagation (e.g., water waves, light waves).
- **Longitudinal Waves:** Particles oscillate parallel to wave propagation (e.g., sound waves).

**Wave Parameters:**

- **Wavelength (λ):** Distance between successive crests or troughs.
- **Frequency (f):** Number of wave cycles per second (Hz).
- **Period (T):** Time taken for one complete cycle (T=1fT = \frac{1}{f}T=f1).

- **Wave Speed (v):** v=fλv = f\lambdav=fλ.
- **Amplitude (A):** Maximum displacement from equilibrium position.

**Energy in Waves:**

- Higher amplitude means higher energy.
- Mechanical waves transfer kinetic and potential energy.

***3. Superposition of Waves***

When two or more waves overlap, their resultant displacement is the sum of their individual displacements.

- **Constructive Interference:** Waves combine to form a larger wave.
- **Destructive Interference:** Waves cancel each other out.

**Standing Waves:**

Formed by the interference of two identical waves moving in opposite directions.

- Nodes: Points of zero displacement.
- Antinodes: Points of maximum displacement.

***Conclusion:***

Understanding **waves and oscillations** is essential for applications in physics, engineering, and daily life. These concepts form the foundation for studying sound, optics, quantum mechanics, and many other scientific fields.

Solar geometry refers to the study of the position of the Sun relative to the Earth at any given time. It's essential for understanding how sunlight reaches different locations on Earth and how this varies throughout the day and year. Here's a breakdown of the basics:

**1. Solar Declination (δ)**

- The **solar declination** is the angle between the rays of the Sun and the plane of the Earth's equator.
- It varies throughout the year as the Earth orbits around the Sun.
- At the **vernal equinox** (around March 21), the declination is 0°, meaning the Sun is directly over the equator.

- At the **summer solstice** (around June 21), the declination is approximately +23.5°, meaning the Sun is directly over the Tropic of Cancer.
- At the **winter solstice** (around December 21), the declination is approximately -23.5°, meaning the Sun is directly over the Tropic of Capricorn.

**2. Hour Angle (H)**

- The **hour angle** represents the time of day, measured in degrees from the solar noon.
- It increases by 15° per hour (360° / 24 hours).
- At solar noon, the hour angle is 0°.
- In the morning, the hour angle is negative, and in the afternoon, it's positive.

**3. Solar Elevation Angle (α)**

- The **solar elevation angle** is the apparent angle of the Sun above the horizon.
- It depends on the time of day and the observer's latitude.
- At solar noon, the Sun is highest in the sky.
- The elevation angle can be calculated using the observer's latitude, the solar declination, and the hour angle.

The formula for the **solar elevation angle** (α) is:

$$\alpha = \sin^{-1} \left( \sin(\delta) \sin(\phi) + \cos(\delta) \cos(\phi) \cos(H) \right)$$

Where:

- **δ** is the solar declination
- **φ** is the latitude of the observer
- **H** is the hour angle

**4. Solar Azimuth Angle (Az)**

- The **solar azimuth angle** is the compass direction from which the sunlight is coming at any given time of day.
- It is measured in degrees clockwise from true north (0° is north, 90° is east, 180° is south, and 270° is west).

- The azimuth angle is important for understanding the direction of sunlight at a particular time, such as when designing solar panels or understanding shadows.

**5. Solar Time**

- **Solar time** is based on the position of the Sun relative to a specific location.
- **Solar noon** is when the Sun is at its highest point in the sky, and the local time can be adjusted to match solar time by correcting for the **equation of time** (a correction for the Earth's elliptical orbit and axial tilt) and the observer's **longitude** relative to the standard meridian.

**6. Day Length**

- The **length of the day** varies throughout the year and depends on the observer's latitude.
- At the equinoxes (around March 21 and September 21), the day length is approximately 12 hours everywhere on Earth.
- At the solstices, the day length is longest in the summer and shortest in the winter for each hemisphere.

**7. Solar Irradiance**

- This refers to the amount of solar energy received per unit area, typically measured in **watts per square meter ($W/m^2$)**.
- Solar irradiance varies based on the time of day, season, and geographic location.
- The Earth's atmosphere scatters and absorbs some of the solar energy, so the amount of energy that reaches the surface is less than the total emitted by the Sun.

**Key Concepts for Solar Geometry:**

- **Solar Declination** changes with Earth's tilt and orbit.
- **Hour Angle** changes with time.
- **Solar Elevation Angle** changes with time, latitude, and declination.
- **Solar Azimuth Angle** provides the direction of the Sun.
- **Day Length** varies based on latitude and season.

**Practical Applications:**

- **Solar Power:** Understanding solar geometry is crucial for designing solar energy systems, optimizing panel orientations, and predicting energy output.

- **Architecture & Building Design:** Solar geometry is used for passive heating, daylighting design, and optimizing building layouts.
- **Agriculture:** It helps determine the best times for planting and harvesting based on sunlight exposure.

# 2.SOLAR CELL BASICS

A **solar cell**, also known as a **photovoltaic (PV) cell**, is a device that converts light energy directly into electrical energy through the **photovoltaic effect**. It is the fundamental building block of solar panels, which are used to harness solar energy. Here's an overview of how solar cells work and their key components:

**1. Basic Principle of Solar Cells**

- When light (usually sunlight) strikes a solar cell, **photons** (particles of light) are absorbed by the semiconductor material of the cell.
- This energy excites electrons in the semiconductor, knocking them loose from their atoms.
- These free electrons create an electric current as they flow through the material, which can be harnessed to power electrical devices.

This phenomenon is called the **photovoltaic effect**.

**2. Key Components of a Solar Cell**

- **Semiconductor Material**: Most solar cells are made of silicon, which is a semiconductor. Silicon is used because it has the ideal properties to absorb sunlight and release electrons.
    - **Monocrystalline Silicon**: Made from a single continuous crystal structure. These cells are efficient but can be more expensive.
    - **Polycrystalline Silicon**: Made from silicon crystals that are melted together. They are less efficient than monocrystalline cells but are cheaper to produce.
    - **Amorphous Silicon**: A non-crystalline form of silicon used in thin-film solar cells. It's flexible and can be used in a variety of applications, though it has lower efficiency.
- **P-N Junction**: This is the heart of the solar cell. A solar cell is made up of two layers of semiconductor material: one with a surplus of electrons (n-type) and one with a shortage of electrons (p-type).
    - The **n-type** layer has extra electrons (negative charge).

    - The **p-type** layer has "holes" (positive charge).
    - When these two layers are joined, an **electric field** is created at the junction. This electric field helps guide the free electrons towards the external circuit.
- **Metal Contacts**: These are placed on the top and bottom of the solar cell to allow electrons to flow in and out of the cell. The **front contact** is a thin grid that allows sunlight to pass through and reach the semiconductor, while the **back contact** completes the circuit.

**3. How Solar Cells Work**

1. **Photon Absorption**: When sunlight hits the solar cell, photons from the sunlight are absorbed by the semiconductor material.
2. **Excitation of Electrons**: The absorbed energy excites electrons in the semiconductor, causing them to move and break free from their atoms.
3. **Electron-Hole Creation**: The freed electrons leave behind "holes" (positively charged spaces) in the semiconductor.
4. **Electric Field Effect**: The electric field at the **p-n junction** forces the electrons to move towards the **n-type** layer and the holes to move towards the **p-type** layer.
5. **Electric Current**: The movement of electrons from one layer to another creates an electric current that flows through an external circuit. This current can be used to power devices or charge batteries.

**4. Solar Cell Efficiency**

- Efficiency refers to the percentage of sunlight that can be converted into usable electricity by a solar cell.
- Typical commercial silicon-based solar cells have efficiencies between **15% and 22%**.
- Newer technologies, like **perovskite solar cells** or **multijunction solar cells**, are pushing efficiency higher, sometimes exceeding 30% under ideal conditions.
- Efficiency depends on several factors:
    - **Material quality**: Higher quality semiconductors lead to better efficiency.
    - **Light absorption**: More efficient absorption of sunlight increases the power output.
    - **Temperature**: Higher temperatures reduce the efficiency of solar cells, which is why cooling is sometimes used in large-scale installations.
    - **Angle of incidence**: The orientation of the solar panel relative to the Sun affects how much light the cell receives.

**5. Types of Solar Cells**

- **Monocrystalline Silicon Solar Cells**: Known for their high efficiency and longevity, these cells are made from a single crystal structure, resulting in higher purity and performance.
- **Polycrystalline Silicon Solar Cells**: Made from silicon crystals melted together, they are less efficient but more affordable.
- **Thin-Film Solar Cells**: Made from very thin layers of photovoltaic material (like cadmium telluride or amorphous silicon), these cells are lightweight and flexible but less efficient than silicon-based cells.
- **Perovskite Solar Cells**: A newer type of solar cell that uses a different material with a crystal structure similar to the mineral **perovskite**. They promise lower cost and potentially higher efficiency, though they are still in the development phase for commercial use.
- **Organic Solar Cells**: These use organic compounds (carbon-based materials) to capture sunlight and generate electricity. They are lightweight and flexible but currently have lower efficiency than silicon-based cells.

**6. Solar Panel Configuration**

- **Solar Cells in Series and Parallel**: To create a **solar panel**, individual solar cells are connected in series and parallel.
    - **Series Connection**: Increases the voltage of the solar panel (but current remains the same).
    - **Parallel Connection**: Increases the current of the solar panel (but voltage remains the same).
- A typical solar panel consists of **60 to 72 cells** connected in series and parallel to produce a voltage output of around 18 to 22 volts.

**7. Advantages of Solar Cells**

- **Renewable Energy Source**: Solar energy is abundant and sustainable. The Sun provides more energy in one hour than the world uses in a year.
- **Low Operating Costs**: Once installed, solar panels have very low maintenance costs and can last 25–30 years or more.
- **Environmentally Friendly**: Solar cells produce no direct emissions, making them a clean source of energy.

- **Energy Independence**: Solar power can reduce reliance on fossil fuels and improve energy security.

**8. Challenges and Limitations**

- **Intermittency**: Solar power depends on sunlight, so it is only available during the day and is affected by weather conditions.
- **Storage**: To use solar power at night or during cloudy days, energy must be stored in **batteries** or fed into the grid.
- **Initial Cost**: The upfront cost of solar panels and installation can be high, although prices have been steadily decreasing.
- **Space Requirements**: Solar panels require a large area for installation, especially if high power output is needed.

**9. Applications of Solar Cells**

- **Residential**: Solar panels on rooftops for energy generation in homes.
- **Commercial and Industrial**: Large solar farms or rooftop installations for businesses and factories.
- **Remote Areas**: Solar power is used for off-grid applications, especially in areas with limited access to electricity.
- **Portable Devices**: Solar cells are used in calculators, outdoor lighting, and solar-powered chargers for phones and small electronics.
- **Space**: Solar cells power satellites and spacecraft in orbit.

# 3.IMAGING TECHNIQUES: IMAGING TECHNIQUES-XRAY, CT SCAN PET, SPECT, EBRT, IBRT BASICS

Imaging techniques are critical in the medical field for diagnosis, treatment planning, and monitoring of various conditions, especially in fields like oncology and radiology. Here's an overview of several major imaging modalities, including X-ray, CT Scan, PET, SPECT, EBRT, and IBRT.

**1. X-Ray Imaging**

- **Principle**: X-ray imaging uses ionizing radiation to produce images of the inside of the body. X-rays are a form of electromagnetic radiation that can pass through the body, but they are absorbed in different amounts by different tissues.
- **How It Works**:
  - When X-rays pass through the body, dense tissues like bones absorb more radiation and appear white on the image.
  - Soft tissues, like muscles and organs, absorb less radiation, so they appear darker.
  - X-ray images are captured on a photographic film or a digital detector.
- **Common Uses**:
  - **Bone fractures**
  - **Chest imaging** (e.g., for pneumonia, lung diseases)
  - **Dental imaging**
- **Advantages**: Fast, relatively low-cost, widely available.
- **Limitations**: Limited resolution for soft tissue; exposure to ionizing radiation.

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**2. CT Scan (Computed Tomography)**

- **Principle**: A CT scan, also known as a **CAT scan**, combines X-ray imaging with computer processing to create cross-sectional images (slices) of the body. This allows for more detailed visualization compared to conventional X-rays.
- **How It Works**:
  - The patient lies on a table that moves through a circular opening in the CT scanner.
  - A rotating X-ray tube sends X-rays through the body from different angles, and detectors measure the radiation that passes through.
  - A computer reconstructs the data into detailed cross-sectional images.
- **Common Uses**:
  - **Detecting tumors, injuries, and infections**
  - **Planning surgery or radiation therapy**
  - **Diagnosing strokes, internal bleeding, and bone fractures**
- **Advantages**: Detailed, high-resolution images of both bones and soft tissues.
- **Limitations**: Higher radiation dose compared to regular X-rays, relatively expensive.

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**3. PET Scan (Positron Emission Tomography)**

- **Principle**: PET imaging involves detecting radiation emitted from a small amount of radioactive substance (tracer) that is injected into the body. The tracer emits positrons, which interact with electrons in the body and produce gamma rays that are detected by the scanner.
- **How It Works**:
  - A radiotracer (e.g., fluorodeoxyglucose, or **FDG**, a sugar molecule tagged with a radioactive isotope) is injected into the body.
  - The tracer is absorbed by tissues and organs, with areas of high metabolic activity (such as cancer cells) absorbing more of the tracer.
  - The scanner detects the gamma rays produced when positrons collide with electrons.
  - A computer creates a 3D image showing the metabolic activity of the tissues.
- **Common Uses**:
  - **Cancer detection**: Identifying tumors and metastasis.
  - **Neurological imaging**: Assessing brain function, detecting Alzheimer's, epilepsy, or other brain disorders.
  - **Cardiology**: Evaluating heart function.
- **Advantages**: Excellent for detecting areas of high metabolic activity (e.g., cancer, infections).
- **Limitations**: Expensive, exposure to small amounts of radiation, limited resolution.

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**4. SPECT (Single Photon Emission Computed Tomography)**

- **Principle**: SPECT is similar to PET but uses gamma rays from a radioactive tracer. The difference is that SPECT scanners detect only one photon at a time, while PET scanners detect pairs of photons. SPECT provides functional imaging by showing how tissues and organs are working.
- **How It Works**:
  - A radiotracer is injected into the body, and it accumulates in the area of interest (e.g., heart, brain).
  - The SPECT scanner rotates around the body and detects the gamma rays emitted from the tracer.
  - A computer constructs detailed images of the functional processes happening inside the body.
- **Common Uses**:
  - **Cardiology**: Evaluating blood flow in the heart and detecting coronary artery disease.

  - **Neurology**: Diagnosing conditions like epilepsy, Alzheimer's, and Parkinson's.
  - **Oncology**: Identifying tumor locations and assessing the spread of cancer.
- **Advantages**: Useful for functional imaging and less expensive than PET.
- **Limitations**: Lower resolution than PET, lower sensitivity.

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**5. EBRT (External Beam Radiation Therapy)**

- **Principle**: EBRT uses high-energy X-rays or other types of radiation to treat cancer. It targets tumors from outside the body, aiming to destroy cancer cells while minimizing damage to healthy tissues.
- **How It Works**:
  - A machine (linear accelerator) directs a beam of radiation precisely to the tumor site.
  - The patient is positioned in a specific way, and the radiation beams are adjusted to match the shape of the tumor.
  - The radiation kills cancer cells by damaging their DNA, preventing them from growing and dividing.
- **Common Uses**:
  - **Cancer treatment**: Used to shrink tumors or eliminate cancer cells.
  - **Palliative care**: Easing symptoms like pain or bleeding from tumors.
- **Advantages**: Non-invasive, can be used for many types of cancers, outpatient procedure.
- **Limitations**: Requires precise targeting, side effects can occur (e.g., fatigue, skin irritation).

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**6. IBRT (Image-Guided Radiation Therapy)**

- **Principle**: IBRT is a technique used to improve the precision and accuracy of radiation therapy. It uses imaging technologies to guide radiation delivery in real-time, allowing for better targeting of tumors.
- **How It Works**:
  - During treatment, imaging techniques like **CT scans**, **MRI**, or **X-rays** are used to visualize the tumor and surrounding tissues.
  - These images help ensure that the radiation beam is accurately directed at the tumor, taking into account any changes in the patient's position or tumor size.

    - Techniques such as **conformal radiation therapy** or **stereotactic radiation therapy** may be used in combination with image guidance.
- **Common Uses**:
    - **Precision cancer treatment**: Ensuring radiation targets only the tumor, reducing damage to healthy tissue.
    - **Adaptive therapy**: Adjusting treatment as the tumor changes during the course of therapy.
- **Advantages**: Increased accuracy, reduced side effects, better outcomes in some cases.
- **Limitations**: Requires advanced equipment and technology, often more time-consuming.

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**Summary of Imaging Techniques**

| Technique | Type | Uses | Advantages | Limitations |
|---|---|---|---|---|
| **X-Ray** | Imaging (Radiation) | Bone fractures, lung diseases | Fast, low-cost, widely available | Ionizing radiation, limited soft tissue resolution |
| **CT Scan** | Imaging (Radiation) | Tumors, stroke, bone injuries | Detailed images of bones and soft tissues | High radiation dose, expensive |
| **PET Scan** | Functional Imaging (Radiation) | Cancer, brain disorders, heart | High metabolic sensitivity (e.g., cancer) | Expensive, limited resolution, radiation exposure |
| **SPECT** | Functional Imaging (Radiation) | Heart disease, brain disorders, cancer | Functional imaging, less expensive than PET | Lower resolution, sensitivity |
| **EBRT** | Radiation Therapy (External) | Cancer treatment | Non-invasive, can treat many cancer types | Requires precision, side effects |
| **IBRT** | Radiation Therapy (Guided) | Precision cancer treatment | Improved accuracy, reduces side effects | Advanced technology, time-consuming |

# 4.FUNDAMENTALS OF OPTICAL PHENOMENA: INTERFERENCE, DIFFRACTION AND POLARIZATION

Optical phenomena such as **interference**, **diffraction**, and **polarization** are key concepts in the study of light and its behavior. These phenomena reveal the wave-like nature of light and are fundamental in various applications, including optics, photography, telecommunications, and even quantum mechanics. Here's an overview of these phenomena:

**1. Interference**

**Interference** occurs when two or more light waves overlap and combine. The result depends on the phase relationship between the waves, leading to regions of constructive or destructive interference.

**Types of Interference:**

- **Constructive Interference**: When two light waves are in phase (i.e., their peaks and troughs align), they combine to form a wave with a greater amplitude. This results in a brighter intensity at the point of overlap.
    - Example: **Bright fringes** in a double-slit experiment.
- **Destructive Interference**: When two light waves are out of phase (i.e., the peak of one wave aligns with the trough of the other), they cancel each other out. This results in reduced or zero intensity.
    - Example: **Dark fringes** in a double-slit experiment.

**Applications of Interference:**

- **Thin Film Interference**: This occurs when light reflects off the top and bottom surfaces of a thin film (e.g., soap bubbles, oil slicks). The two reflected waves interfere with each other, producing colorful patterns based on the thickness of the film and the wavelength of light.
- **Interferometers**: Instruments like the **Michelson interferometer** use interference to make precise measurements of distances or wavelengths.

**Mathematical Description:**

- If two waves have amplitudes A1A_1A1 and A2A_2A2, and they interfere at a point, the resultant amplitude AAA is the sum of the individual amplitudes, adjusted for phase difference:

A=A1+A2·eiδA = A_1 + A_2 \cdot e^{i \delta}A=A1+A2·eiδ where δ\deltaδ is the phase difference between the two waves.

- The intensity III is proportional to the square of the amplitude:

I∝|A|2I \propto |A|^2I∝|A|2

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**2. Diffraction**

**Diffraction** refers to the bending of light around obstacles or the spreading of light when it passes through small apertures. This phenomenon is particularly noticeable when the size of the obstacle or aperture is comparable to the wavelength of light.

**Types of Diffraction:**

- **Single-Slit Diffraction**: When light passes through a narrow slit, the light waves spread out. The resulting pattern consists of a central bright fringe with alternating dark and bright fringes (minima and maxima) on either side.
- **Double-Slit Diffraction**: When light passes through two slits, it creates an interference pattern of bright and dark fringes. This pattern results from the interference between the two wavefronts originating from the slits.
- **Fraunhofer Diffraction**: This type of diffraction occurs when the light source and the observation screen are at infinite distances from the diffracting object. It typically results in easily measurable patterns, like those from a diffraction grating.
- **Fresnel Diffraction**: This occurs when the source or the screen is at a finite distance from the diffracting object. The patterns are more complex and are influenced by the curvature of the wavefront.

**Applications of Diffraction:**

- **X-ray Crystallography**: Used to determine the atomic structure of materials. X-rays are diffracted by the crystalline structure, and the diffraction pattern provides information about the arrangement of atoms.
- **Optical Instruments**: Diffraction limits the resolution of optical instruments such as microscopes and telescopes.
- **Diffraction Gratings**: Used in spectrometers to separate light into its component wavelengths.

**Mathematical Description:**

- In the case of a single-slit diffraction pattern, the condition for dark fringes (minima) is given by:

$$a \sin \theta = m \lambda$$

where $a$ is the slit width, $\theta$ is the angle of diffraction, $m$ is the order of the minimum (1, 2, 3,...), and $\lambda$ is the wavelength of the light.

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**3. Polarization**

**Polarization** refers to the orientation of the oscillations of a light wave in relation to its direction of propagation. Light waves are transverse waves, meaning their oscillations occur perpendicular to the direction of travel. Polarization describes the direction in which these oscillations occur.

**Types of Polarization:**

- **Linear Polarization**: The oscillations of the electric field of light occur in a single plane. This can be achieved by passing light through a polarizer.
  - Example: **Polarized sunglasses** use linear polarization to reduce glare from reflected surfaces like water or roads.
- **Circular Polarization**: The electric field of the light wave rotates as the wave travels. It is a special case where the electric field vector traces a circle as the wave moves forward. Circular polarization can be left-handed or right-handed, depending on the direction of rotation.
  - Example: **3D glasses** for movies use circular polarization to separate the images for each eye.
- **Elliptical Polarization**: A combination of linear and circular polarization, where the electric field traces an ellipse as the wave propagates.

**Polarization by Reflection and Refraction:**

- Light can become polarized when reflected from a surface at a particular angle known as the **Brewster angle**. At this angle, light reflected from a surface becomes completely polarized perpendicular to the plane of incidence.
- Polarization can also occur through **scattering**, where the light waves are scattered in various directions, and the scattered light is partially polarized.

**Applications of Polarization:**

- **Sunglasses**: Polarized lenses block horizontally polarized light, which is typically the light that causes glare from reflective surfaces.
- **Photography**: Polarizing filters are used to reduce glare and enhance the contrast of skies and foliage.
- **Optical Communications**: Polarization can be used to carry additional information, enabling multiple channels to be transmitted through a single optical fiber.
- **Liquid Crystal Displays (LCDs)**: Polarization is key to the operation of LCDs, where the light passes through polarizing filters and is modulated by liquid crystals.

**Mathematical Description:**

- The electric field vector $\mathbf{E}$ of a plane wave can be written as a combination of two orthogonal components:

$$\mathbf{E}(t) = \hat{i} E_0 \cos(kz - \omega t) + \hat{j} E_0 \sin(kz - \omega t)$$

where $\hat{i}$ and $\hat{j}$ are unit vectors in the $x$- and $y$-directions, respectively, $k$ is the wave number, $\omega$ is the angular frequency, and $t$ is time.

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**Summary of the Optical Phenomena:**

| Phenomenon | Description | Key Applications | Key Concept |
|---|---|---|---|
| **Interference** | The superposition of two or more waves leading to constructive or destructive patterns. | Thin-film interference, interferometers | Wave superposition, phase difference |
| **Diffraction** | The bending or spreading of waves around obstacles or through small apertures. | X-ray crystallography, optical instruments | Wave bending, aperture size, wavelength |
| **Polarization** | The orientation of the oscillations of light waves. | Polarizing filters, sunglasses, LCDs | Electric field orientation |

These optical phenomena provide a deep insight into the wave nature of light and are fundamental to various optical devices and technologies used in science, engineering, and medicine. Let me know if you'd like further details on any of these concepts!

# 5.Fundamentals of Lasers, Optical Fibers, and Holography

These three technologies are central to many modern applications in science, medicine, communication, and entertainment. Here's an overview of their principles and applications:

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### 1. Lasers (Light Amplification by Stimulated Emission of Radiation)

A **laser** is a device that emits light through a process called **stimulated emission**. The key characteristic of laser light is its **coherence** (both spatial and temporal), **monochromaticity** (single wavelength), and **directionality** (highly collimated beam).

**Basic Principles of Lasers:**

- **Stimulated Emission**: When atoms or molecules in a material (called the **gain medium**) are excited by an external energy source (such as electrical current or light), they can release energy in the form of photons. When a photon interacts with an excited atom, it stimulates the emission of another photon with the same energy, phase, and direction, amplifying the light.
- **Population Inversion**: For lasing to occur, more atoms must be in an excited state than in a ground state. This is called **population inversion**.
- **Optical Cavity**: The laser consists of a **gain medium** placed between two mirrors, creating an optical cavity. One of the mirrors is partially transparent, allowing some of the light to escape as a coherent laser beam.

**Laser Components:**

1. **Gain Medium**: This is the material (solid, liquid, or gas) that amplifies light. Examples include:
   - **Solid-state lasers** (e.g., Nd:YAG, Ruby lasers)
   - **Gas lasers** (e.g., $CO_2$, helium-neon lasers)
   - **Semiconductor lasers** (e.g., diode lasers)
2. **Pump Source**: Provides energy to excite the atoms or molecules in the gain medium.
3. **Optical Cavity**: A set of mirrors that bounce light back and forth through the gain medium to amplify it. One mirror is partially transparent to allow light to exit.
4. **Output Coupler**: The partially transparent mirror through which the laser beam exits.

**Laser Characteristics:**

- **Monochromaticity**: A laser typically emits light of a single wavelength or a very narrow range of wavelengths.
- **Coherence**: Both spatial coherence (beam remains narrow and focused) and temporal coherence (light wave remains in phase over time) are present.
- **Directionality**: A laser produces a beam that is highly collimated (focused in a narrow beam) and can travel long distances without spreading out significantly.

**Applications of Lasers:**

- **Communication**: Laser light is used in fiber-optic communication to transmit data over long distances.
- **Medical**: Laser surgery, laser eye treatment (e.g., LASIK), and diagnostic techniques (e.g., endoscopy).
- **Industry**: Laser cutting, welding, and engraving.
- **Research**: In spectroscopy, quantum computing, and materials processing.
- **Entertainment**: Laser pointers, laser light shows, and holography.

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**2. Optical Fibers**

**Optical fibers** are flexible, transparent fibers made of glass or plastic that transmit light over long distances by **total internal reflection**. They are essential for modern telecommunications, medical instruments, and more.

**Basic Principles of Optical Fibers:**

- **Total Internal Reflection**: When light travels through the core of an optical fiber, it strikes the boundary between the core and the cladding at an angle greater than the critical angle. This causes the light to reflect back into the core, effectively "trapping" the light inside the fiber.
- **Core and Cladding**: An optical fiber consists of two main parts:
    - **Core**: The central region that carries the light signal. It has a higher refractive index than the cladding.

- **Cladding**: Surrounds the core and has a lower refractive index. It ensures that light is confined within the core by total internal reflection.

- **Buffer Coating**: The outermost layer that protects the fiber from physical damage and moisture.

**Types of Optical Fibers:**

1. **Single-mode fibers**: Have a very small core (about 8 to 10 microns in diameter). They carry light in a single path and are used for long-distance communication, where low loss and high bandwidth are required.
2. **Multi-mode fibers**: Have a larger core (50 to 100 microns in diameter) and allow multiple light paths. They are used for shorter distances, like within buildings or campuses, but have higher attenuation and dispersion compared to single-mode fibers.

**Key Properties of Optical Fibers:**

- **Low Loss**: Optical fibers offer very low signal loss over long distances compared to electrical transmission lines.
- **High Bandwidth**: They can transmit large amounts of data at high speeds.
- **Immunity to Electromagnetic Interference**: Unlike electrical cables, optical fibers are not affected by electromagnetic noise.
- **Lightweight and Flexible**: They are much lighter and more flexible than metal wires, making them easier to install and manage.

**Applications of Optical Fibers:**

- **Telecommunications**: Internet, telephone, and cable TV services rely heavily on optical fibers for high-speed data transmission.
- **Medical**: Endoscopes, which are used to view inside the body, often rely on optical fibers to transmit light and images.
- **Networking**: Optical fibers are the backbone of modern computer networks and data centers.
- **Sensing**: Optical fibers can be used in sensors for monitoring pressure, temperature, and other variables.

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**3. Holography**

**Holography** is a technique that records and reconstructs light fields to create three-dimensional images. Unlike traditional photography, which captures only two-dimensional images, holography can reproduce the full depth and parallax of a scene, providing a true 3D representation.

**Basic Principles of Holography:**

- **Interference**: Holography relies on the principle of interference, where light from an object is split into two beams. One beam illuminates the object, and the other is a reference beam. These beams interfere on a photographic plate or a digital sensor.
- **Recording a Hologram**: When the object beam and the reference beam meet on the recording medium (like a photographic plate), they create an interference pattern. This pattern encodes both the amplitude and phase of the light waves coming from the object.
- **Reconstruction of the Image**: To view the 3D image, the recorded hologram is illuminated with the reference beam (or a replica of it), and the light scattered from the interference pattern reconstructs the object's light waves. This creates the illusion of a 3D image.

**Key Types of Holography:**

- **Transmission Holography**: The hologram is illuminated from the front, and the 3D image is seen through the hologram from the other side.
- **Reflection Holography**: The hologram is viewed from the same side as the illumination, often used for security holograms on credit cards and IDs.
- **Digital Holography**: Uses digital sensors (such as CCD or CMOS) to capture interference patterns and reconstruct the 3D image digitally, which is useful in scientific and medical imaging.

**Applications of Holography:**

- **Data Storage**: Holographic data storage offers the potential for incredibly high storage capacities by recording data in three dimensions.
- **Medical Imaging**: Holography is used to create 3D images of biological tissues for analysis and diagnostics, including in microscopy.
- **Art and Entertainment**: Holograms are used in art, advertising, and concerts (e.g., 3D projections of performers).
- **Security**: Holograms are widely used in security applications, such as on credit cards, banknotes, and identification cards, to prevent counterfeiting.

- **Non-Destructive Testing**: Holography can be used to inspect the surface of materials for stress and defects by analyzing the patterns of interference caused by surface deformations.

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**Summary Table**

| Technology | Basic Principle | Key Applications | Characteristics |
|---|---|---|---|
| **Laser** | Stimulated emission of radiation, coherent light generation. | Communication, medical surgery, manufacturing. | Monochromatic, coherent, highly directional. |
| **Optical Fibers** | Transmission of light through total internal reflection. | Telecommunications, internet, medical endoscopy. | Low loss, high bandwidth, immune to EMI. |
| **Holography** | Recording and reconstructing light fields to create 3D images. | 3D imaging, data storage, medical imaging, security. | 3D representation, uses interference and diffraction. |

These technologies are incredibly important in many modern fields, from communications and medical applications to entertainment and data storage. Let me know if you'd like more details or examples on any of these topics!

# 6.Basics of Atoms and Nucleus

The **atom** and **nucleus** are fundamental concepts in physics and chemistry, forming the basis of matter and the interactions that govern the physical universe. Here's an overview of the essential concepts regarding atoms and nuclei:

---

### 1. Atoms: The Building Blocks of Matter

An **atom** is the smallest unit of an element that retains the chemical properties of that element. Atoms consist of a **nucleus** at the center, surrounded by **electrons** that orbit the nucleus. The structure and behavior of atoms explain chemical reactions, bonding, and the properties of matter.

**Components of an Atom:**

1. **Nucleus**:

- Located at the center of the atom.
- Contains **protons** and **neutrons**.

2. **Electrons**:
   - Negatively charged particles that orbit the nucleus in regions called **orbitals**.
   - Electrons are found in **shells** or **energy levels**, with each shell able to hold a specific number of electrons.
   - The **atomic number** (number of protons) determines the element and its properties.

**Subatomic Particles:**

- **Protons**: Positively charged particles located in the nucleus.
  - Mass: approximately 1 atomic mass unit (amu).
  - Charge: +1.
- **Neutrons**: Neutral particles (no charge) found in the nucleus.
  - Mass: approximately 1 amu.
  - Charge: 0.
- **Electrons**: Negatively charged particles that orbit the nucleus in discrete energy levels.
  - Mass: approximately 1/1836 of a proton (very small compared to protons and neutrons).
  - Charge: -1.

**Structure of the Atom:**

- The nucleus is extremely dense and small compared to the entire atom, containing almost all the atom's mass.
- The **electron cloud** (formed by electrons) surrounds the nucleus and occupies most of the atom's volume.
- The electrons are arranged in energy levels (shells) around the nucleus. The arrangement of electrons in these shells is described by the **electron configuration**.
  - The **first shell** can hold 2 electrons, the **second shell** can hold 8 electrons, the **third shell** can hold 18, and so on.

**Atomic Number and Mass Number:**

- **Atomic Number (Z)**: The number of protons in the nucleus. It defines the element (e.g., hydrogen has an atomic number of 1, oxygen has 8).
- **Mass Number (A)**: The total number of protons and neutrons in the nucleus.

A=Z+Number of NeutronsA = Z + \text{Number of Neutrons}A=Z+Number of Neutrons

**Isotopes:**

- Atoms of the same element (same number of protons) that have different numbers of neutrons are called **isotopes**.
- Isotopes of an element have the same chemical properties but different physical properties, such as mass and stability.

**Electron Orbitals and Energy Levels:**

- Electrons are arranged in **orbitals** (regions of space where the probability of finding an electron is highest). These orbitals are further organized into energy levels or shells.
- The orbitals are labeled as sss, ppp, ddd, and fff, each with different shapes and energy.

**Bohr's Model:**

- Niels Bohr proposed that electrons orbit the nucleus in fixed paths or **energy levels** without radiating energy.
- Electrons can jump between these levels by absorbing or emitting a specific amount of energy, leading to the phenomenon of atomic spectra.

**Quantum Mechanical Model:**

- The modern model of the atom is based on **quantum mechanics**, which uses **probability clouds** (orbitals) instead of fixed paths to describe where electrons are most likely to be found.

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**2. Nucleus: The Core of the Atom**

The **nucleus** is the central, dense part of the atom, and it contains most of the atom's mass. It is made up of protons and neutrons and is held together by the **strong nuclear force**.

**Structure of the Nucleus:**

- **Protons**: Positively charged particles in the nucleus.

- **Neutrons**: Neutral particles in the nucleus.
- The number of protons in the nucleus determines the **element**.
- The **neutron-to-proton ratio** affects the **stability** of the nucleus.

**Nuclear Forces:**

- **Strong Nuclear Force**: This is the force that binds protons and neutrons together in the nucleus. It is very powerful but acts over very short distances.
- **Electrostatic Force**: The positive charges of the protons in the nucleus cause a repulsive force (Coulomb repulsion). The strong nuclear force must overcome this repulsion to keep the nucleus stable.

**Nuclear Stability:**

- A nucleus is stable when the number of protons and neutrons is balanced.
- If the neutron-to-proton ratio is too high or too low, the nucleus becomes unstable and can undergo **radioactive decay**.

**Types of Radioactive Decay:**

- **Alpha Decay**: The nucleus emits an alpha particle (two protons and two neutrons). This decreases the atomic number by 2 and the mass number by 4.
- **Beta Decay**: A neutron decays into a proton, emitting an electron (beta particle) and an antineutrino. This increases the atomic number by 1, but the mass number remains unchanged.
- **Gamma Decay**: The nucleus emits gamma radiation (high-energy photons) without changing the number of protons or neutrons, often following other types of decay.

**Binding Energy:**

- The **binding energy** of the nucleus is the energy required to break the nucleus into its individual protons and neutrons. This energy is related to the mass defect (the difference between the mass of the nucleus and the sum of the individual masses of the protons and neutrons).

**Nuclear Reactions:**

- **Nuclear Fission**: Involves the splitting of a heavy nucleus (e.g., uranium) into two lighter nuclei, releasing a large amount of energy. This process is used in nuclear power plants and atomic bombs.

- **Nuclear Fusion**: Involves the joining of two light nuclei (e.g., hydrogen isotopes) to form a heavier nucleus, releasing a tremendous amount of energy. This process powers stars, including the Sun.

**Applications of Nuclear Science:**

- **Nuclear Medicine**: Uses radioactive isotopes for diagnostics (e.g., PET scans) and treatments (e.g., cancer radiotherapy).
- **Nuclear Energy**: Uses fission to generate electricity in nuclear reactors.
- **Radiocarbon Dating**: Uses the decay of carbon-14 to estimate the age of organic materials.
- **Particle Accelerators**: Used to explore the properties of atomic nuclei and subatomic particles.

---

**Summary Table: Atoms vs. Nucleus**

| **Property** | **Atom** | **Nucleus** |
|---|---|---|
| **Constituents** | Electrons, protons, and neutrons. | Protons and neutrons. |
| **Charge** | Neutral, except in ions (positively or negatively charged). | Positive (due to protons). |
| **Mass** | Mostly concentrated in the nucleus. | Almost all the mass of the atom. |
| **Size** | Larger, with most of the volume occupied by electrons. | Extremely small, dense core of the atom. |
| **Forces Involved** | Electrostatic forces (between protons and electrons). | Strong nuclear force (holding protons and neutrons together). |
| **Properties Governed by** | Electron configuration and energy levels. | Proton and neutron numbers, nuclear forces. |
| **Role** | Determines chemical behavior and interactions. | Determines stability and nuclear reactions. |

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In summary, atoms are the basic units of matter, with a nucleus at their center composed of protons and neutrons, surrounded by electrons. The nucleus plays a critical role in determining the properties and stability of the atom, while the electrons govern the atom's chemical behavior.

# 7.Fundamentals of Electrostatics and Magnetostatics

Electrostatics and magnetostatics are fundamental branches of electromagnetism that deal with stationary electric charges and steady-state magnetic fields, respectively.

**1. Electrostatics**

Electrostatics is the study of electric charges at rest and the forces, fields, and potentials they generate.

**1.1 Electric Charge and Coulomb's Law**

- **Electric Charge (Q):** A fundamental property of matter, measured in **coulombs (C)**.
    - **Like charges repel, opposite charges attract.**
- **Coulomb's Law:** The force FFF between two charges Q1Q_1Q1 and Q2Q_2Q2 separated by distance rrr in vacuum: F=kQ1Q2r2F = k \frac{Q_1 Q_2}{r^2}F=kr2Q1Q2 where k=9×109k = 9 \times 10^9k=9×109 $Nm^2/C^2$ (Coulomb's constant).

**1.2 Electric Field (E)**

- The **electric field** at a point is the force experienced per unit positive charge: E=FQE = \frac{F}{Q}E=QF
- For a point charge QQQ, the electric field at distance rrr: E=kQr2E = k \frac{Q}{r^2}E=kr2Q
- **Direction:** Away from positive charge, toward negative charge.

**1.3 Electric Potential (V) and Potential Energy**

- **Electric Potential (V):** Work done per unit charge to move a charge from infinity to a point: V=kQrV = k \frac{Q}{r}V=krQ
- **Potential Difference (Voltage):** V12=V2−V1V_{12} = V_2 - V_1V12=V2−V1, measured in **volts (V)**.
- **Electric Potential Energy:** U=kQ1Q2rU = k \frac{Q_1 Q_2}{r}U=krQ1Q2

**1.4 Gauss's Law for Electrostatics**

The total electric flux ΦE\Phi_EΦE through a closed surface enclosing charge QencQ_{\text{enc}}Qenc:∮E·dA=Qencε0\oint E \cdot dA = \frac{Q_{\text{enc}}}{\varepsilon_0}∮E·dA=ε0Qenc

where ε0\varepsilon_0ε0 is the permittivity of free space (8.85×10−128.85 \times 10^{-12}8.85×10−12 $C^2/N\cdot m^2$).

**Applications of Gauss's Law:**Electric field due to a **point charge**.

- Field due to a **spherical conductor**.
- Field due to an **infinite charged plane**.

**2. Magnetostatics**

Magnetostatics deals with steady (constant) currents and the resulting magnetic fields.

**2.1 Magnetic Fields and Magnetic Force**

- A **magnetic field (B)** is a region where a moving charge or current-carrying conductor experiences a force.
- **Lorentz Force:** The force on a charge qqq moving with velocity vvv in a magnetic field BBB: F=q(v×B)F = q (\mathbf{v} \times \mathbf{B})F=q(v×B)
  - **Direction:** Given by the **right-hand rule**.

**2.2 Biot-Savart Law**

Gives the magnetic field dBdBdB due to a small current element IdlIdlIdl:

- dB=μ04πIdlsinθr2dB = \frac{\mu_0}{4\pi} \frac{I dl \sin\theta}{r^2}dB=4πμ0 r2Idlsinθ

where μ0\mu_0μ0 is the permeability of free space (4π×10−74\pi \times 10^{-7}4π×10−7 T·m/A).

**Applications:**Magnetic field due to a **straight current-carrying wire**.

    - Magnetic field at the center of a **circular loop**.

**2.3 Ampère's Circuital Law**

- The line integral of the magnetic field around a closed path is proportional to the total enclosed current: ∮B·dl=μ0Ienc\oint B \cdot dl = \mu_0 I_{\text{enc}}∮B·dl=μ0Ienc
- **Applications:** Magnetic field inside a **long solenoid**.

    - Field due to an **infinitely long straight wire**.

**2.4 Magnetic Force on a Current-Carrying Wire**

- A wire of length LLL carrying current III in a magnetic field BBB experiences a force: F=I(L×B)F = I (L \times B)F=I(L×B)

**2.5 Magnetic Dipole and Torque on a Current Loop**

- A current loop behaves like a **magnetic dipole** with a dipole moment: μ=IA\mu = I Aμ=IA where AAA is the area of the loop.
- **Torque on a current loop in a magnetic field:** τ=μ×B\tau = \mu \times Bτ=μ×B

**Conclusion**

Electrostatics and magnetostatics are crucial in understanding electric and magnetic fields, forces, and potential energy. These concepts are fundamental for applications in electromagnetism, electrical circuits, and modern technologies such as motors, generators, and electronic devices.

## .Fundamentals of Electronics

Electronics is the branch of physics and engineering that deals with the behavior and control of electrons to process and transmit information. It forms the foundation of modern devices like computers, mobile phones, and communication systems.

**1. Basic Electrical ConceptsCharge and Current**

- **Electric Charge (Q):** Measured in coulombs (C), electrons carry a negative charge.
- **Electric Current (I):** Flow of electric charge, measured in **amperes (A)**.
    - I=QtI = \frac{Q}{t}I=tQ (Current = Charge/Time).

**Voltage (V) and Resistance (R)**

- **Voltage (V):** Also called potential difference, it is the energy per unit charge, measured in volts (V).
- **Resistance (R):** Opposition to current flow, measured in ohms (Ω).
- **Ohm's Law:** V=IRV = IRV=IR (Voltage = Current × Resistance).

**Power in Electrical Circuits**

- **Power (P):** The rate at which electrical energy is consumed or produced.
  - P=VIP = VIP=VI
  - P=I2RP = I^2 RP=I2R (Using Ohm's law).

**2. Electronic Components**

**1. Passive Components** (Do not amplify signals)

- **Resistors:** Limit current flow, divide voltage.
- **Capacitors:** Store and release energy in the form of an electric field.
- **Inductors:** Store energy in a magnetic field and resist changes in current.

**2. Active Components** (Can amplify signals)

- **Diodes:** Allow current to flow in only one direction (used in rectifiers).
- **Transistors:** Act as switches or amplifiers in circuits.
  - **Types:** Bipolar Junction Transistor (BJT), Field-Effect Transistor (FET).
- **Integrated Circuits (ICs):** Miniaturized circuits with multiple electronic components.

**3. Circuit Basics**

**Types of Circuits**

- **Series Circuit:** Components connected end-to-end, same current flows through all.
- **Parallel Circuit:** Components connected across the same voltage source, different branches carry different currents.

**Kirchhoff's Laws**

- **Kirchhoff's Current Law (KCL):** The total current entering a junction equals the total current leaving.
- 
- **Kirchhoff's Voltage Law (KVL):** The sum of voltages around a closed loop is zero.

**4. Semiconductor Basics**

**1. Conductors, Insulators, and Semiconductors**

- **Conductors:** Allow easy flow of current (e.g., Copper, Silver).
- **Insulators:** Do not allow current flow (e.g., Rubber, Glass).
- **Semiconductors:** Have properties between conductors and insulators (e.g., Silicon, Germanium).

**2. P-N Junction and Diodes**

- **P-type:** Positive charge carriers (holes).
- **N-type:** Negative charge carriers (electrons).
- **P-N Junction Diode:** Allows current flow in one direction (used in rectification).

**5. Digital Electronics**

**Binary System**

- Electronics use **binary numbers (0 and 1)** to represent data.

**Logic Gates**

Basic building blocks of digital circuits:

- **AND Gate:** Output is 1 only if both inputs are 1.
- **OR Gate:** Output is 1 if at least one input is 1.
- **NOT Gate:** Inverts the input ($0 \rightarrow 1$, $1 \rightarrow 0$).
- **NAND, NOR, XOR, XNOR:** Variations used in complex digital circuits.

**6. Applications of Electronics**

- **Communication Systems:** Radios, telephones, and satellite networks.
- **Computing Devices:** Processors, memory chips, and embedded systems.
- **Power Electronics:** Transformers, rectifiers, and inverters.

- **Automation & Control:** Robotics, IoT, and industrial automation.

**Conclusion:**Electronics is a vast field that enables the functioning of modern technology. Understanding basic components, circuit principles, and semiconductor behavior is crucial for further study and practical applications.

# DEPARTMENT OF PHYSICS

19/25

**Comprehensive Evaluation - Bridge Course:2023-24**

**NAME OF THE STUDENT:** J. Subbalakshmi

**TOTAL MARKS :25 MARKS** **TIME: 30min** **DATE:** 30/08/2023

**************************************************************************************

**Q1:** What is the principle of fibre optical communication?

a) Frequency modulation b) Population inversion c) Total internal reflection d) Doppler Effect

**Q2:** According to Coulomb's law, the electrostatic force between two charges is:

A) Inversely proportional to the product of charges B) Directly proportional to the square of the distance between them C) Directly proportional to the product of charges D) Independent of the charges

**Q3:** The electric field due to a point charge is:

A) Constant everywhere B) Proportional to distance C) Inversely proportional to distance squared D) Independent of the charge

**Q4:** Which process gives the laser its special properties as an optical source?

a) Dispersion b) Stimulated absorption c) Spontaneous emission d) Stimulated emission

**Q5:** The SI unit of the magnetic field is:

A) Ampere B) Weber C) Tesla D) Henry

**Q6:** The force experienced by a charged particle moving in a uniform magnetic field is:

A) Maximum when moving parallel to the field B) Zero when moving perpendicular to the field C) Maximum when moving perpendicular to the field D) Always zero

**Q7:** A long straight wire carrying current produces a magnetic field around it, whose direction is given by:

A) Fleming's left-hand rule B) Right-hand thumb rule C) Ampere's law D) Faraday's law

**Q8:** According to Ampère's circuital law, the line integral of the magnetic field around a closed loop is equal to:

A) μ0Ienc\mu_0 I_{\text{enc}}μ0Ienc B) Iencμ0\frac{I_{\text{enc}}}{\mu_0}μ0Ienc

C) B·AB \cdot AB·A D) B·dAB \cdot dAB·dA

# DEPARTMENT OF PHYSICS

20/25

**Comprehensive Evaluation - Bridge Course:2023-24**

**NAME OF THE STUDENT:** Killampudi. Harika

**TOTAL MARKS :25 MARKS** **TIME: 30min** **DATE:** 30/08/2023

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C) B·AB \cdot AB·A D) B·dAB \cdot dAB·dA ✓

**Q9:** Newton's first law of motion states that:

A) Force is equal to mass times acceleration B) Every action has an equal and opposite reaction

C) A body remains in its state of rest or uniform motion unless acted upon by an external force

D) Energy is conserved in all physical processes

**Q10: Polarisation phenomenon explains which nature of light?**

a. Transverse b.longitudinal c.Both transverse and longitudinal d.geometrical

**Q11:** A body is said to be in equilibrium if:

A) The net force acting on it is zero B) The net torque acting on it is zero

C) Both A and B D) Neither A nor B

**Q12:** The information in the hologram exists in ________

a) Colored Image form b) Black and white image form c) 3-D image form d) Coded form

**Q13:** The speed of a wave is given by:

A) v=fλv = f\lambdav=fλ B) v=λ/fv = \lambda/fv=λ/f C) v=f2λv = f^2\lambdav=f2λ

D) v=λ2/fv = \lambda^2/fv=λ2/f

**Q14:** In simple harmonic motion, the acceleration is:

A) Constant B) Zero at the mean position C) Maximum at the mean position

D) Independent of displacement

**Q15:** Standing waves are formed due to:

A) Diffraction of waves B) Reflection of waves at a boundary C) Interference of two waves traveling in the same direction D) Interference of two waves traveling in opposite directions

16.Which of the following is not a type of primary resource?

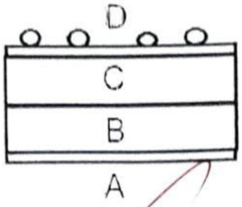
a) Crude Oil b) Coal c) Sunlight d) Hydrogen Energy

17.What is the major problem with wind energy?

a) Requires large area of land b) It is a renewable source of energy

c) Generates energy from wind d) Compact and does not require large area of land

18.Which of the following region is coated with a metal?




a) A b) B c) C d) D

19.A solar cell is a ___________

a) P-type semiconductor b) N-type semiconductor c) Intrinsic semiconductor d) P-N Junction

20.What do crowded lines of force indicate?

a) Strong electric field b) Weak electric field c) Strong electric potential d) Weak electric potential

21.Adiabatic demagnetisation is a technique used for [BHU 1984]

A) Adiabatic expansion of a gas B) Production of low temperature

C) Production of high temperature D) None

22. **When PN junction is in forward bias, by increasing the battery voltage**

a. Circuit resistance increases b.Current through P_N junction increases

c.Current through P_N junction decreases d.None of the above

23. In a p-type semiconductor, the current conduction is due to

a. Holes b.Atoms c.Electrons d.Protons

24.Which among the following is the most commonly used semiconductor?

a. Silicon b.Carbon c.Germanium d. Sulphur

25. The maximum force of attraction between two charges separated by a distance-

(a) grows K times (b) stays steady (c) drops K times

(d) increases K-1 times when air is replaced by a dielectric medium of constant K.

# DEPARTMENT OF PHYSICS

15/25

## Comprehensive Evaluation - Bridge Course:2023-24

**NAME OF THE STUDENT:** MUDDADA. Renuka

**TOTAL MARKS :25 MARKS** **TIME: 30min** **DATE:** 30/8/2023

*************************************************************************************

**Q1:** What is the principle of fibre optical communication?

a) Frequency modulation b) Population inversion c) Total internal reflection d) Doppler Effect

**Q2:** According to Coulomb's law, the electrostatic force between two charges is:

A) Inversely proportional to the product of charges B) Directly proportional to the square of the distance between them C) Directly proportional to the product of charges D) Independent of the charges

**Q3:** The electric field due to a point charge is:

A) Constant everywhere B) Proportional to distance C) Inversely proportional to distance squared D) Independent of the charge

**Q4:** Which process gives the laser its special properties as an optical source?

a) Dispersion b) Stimulated absorption c) Spontaneous emission d) Stimulated emission

**Q5:** The SI unit of the magnetic field is:

A) Ampere B) Weber C) Tesla D) Henry

**Q6:** The force experienced by a charged particle moving in a uniform magnetic field is:

A) Maximum when moving parallel to the field B) Zero when moving perpendicular to the field

C) Maximum when moving perpendicular to the field D) Always zero

**Q7:** A long straight wire carrying current produces a magnetic field around it, whose direction is given by:

A) Fleming's left-hand rule B) Right-hand thumb rule C) Ampere's law D) Faraday's law

**Q8:** According to Ampère's circuital law, the line integral of the magnetic field around a closed loop is equal to:

A) μ0Ienc\mu_0 I_{\text{enc}}μ0Ienc B) Iencμ0\frac{I_{\text{enc}}}{\mu_0}μ0Ienc

C) B·AB \cdot AB·A D) B·dAB \cdot dAB·dA

# DEPARTMENT OF PHYSICS

15/25

**Comprehensive Evaluation - Bridge Course:2023-24**

**NAME OF THE STUDENT:** Chintala. Geetha

**TOTAL MARKS :25 MARKS** **TIME: 30min** **DATE:** 30/8/23

******************************************************************************************

**Q1:** What is the principle of fibre optical communication?

a) Frequency modulation b) Population inversion c) Total internal reflection d) Doppler Effect

**Q2:** According to Coulomb's law, the electrostatic force between two charges is:

A) Inversely proportional to the product of charges B) Directly proportional to the square of the distance between them C) Directly proportional to the product of charges D) Independent of the charges

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A) Ampere B) Weber C) Tesla D) Henry

**Q6:** The force experienced by a charged particle moving in a uniform magnetic field is:

A) Maximum when moving parallel to the field B) Zero when moving perpendicular to the field

C) Maximum when moving perpendicular to the field D) Always zero

**Q7:** A long straight wire carrying current produces a magnetic field around it, whose direction is given by:

A) Fleming's left-hand rule B) Right-hand thumb rule C) Ampere's law D) Faraday's law

**Q8:** According to Ampère's circuital law, the line integral of the magnetic field around a closed loop is equal to:

A) μ0Ienc\mu_0 I_{\text{enc}}μ0Ienc B) Iencμ0\frac{I_{\text{enc}}}{\mu_0}μ0Ienc

C) B·AB \cdot AB·A D) B·dAB \cdot dAB·dA

# DEPARTMENT OF PHYSICS

## BRIDGE COURSEATTENDANCE 2023-24

| Name of the Student | 11/8/23 2hrs | 14/8 2hrs | 17/8/23 1hr | 21/8 2hrs | 22/8 1hr | 23/8 1hr | 24/8 1hr | | | | | Marks Obtained (25) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MURIBANDALA SYAMALA | P | P | A | P | P | P | P | | | | | 18 |
| NEELAPU NEELAVENI | P | A | P | P | P | P | P | | | | | 16 |
| PALAVALASA KEERTHI | P | P | P | P | P | P | P | | | | | 21 |
| KILUGU RAKSHITHA | P | A | A | A | P | A | A | | | | | — |
| CHIDAPANA HARIKA | P | A | A | A | P | A | A | | | | | — |
| PINNIMDORA PREETIJA | P | P | P | P | P | P | P | | | | | 24 |
| BADIREDDI TRIVENI | P | P | P | P | P | P | P | | | | | 20 |
| CHINTALA GEETHA | P | P | P | P | P | P | P | | | | | 19 |
| KARNAPU KRISHNAVENI | P | P | P | A | P | P | P | | | | | 21 |
| JIGILI SUBBALAKSHMI | P | P | P | P | P | P | P | | | | | 22 |
| SUDESHNA PANIGRAHI | P | P | P | P | P | P | P | | | | | 24 |
| BIDDIKA SANTHI | A | P | P | P | A | P | P | | | | | 19 |
| KOTTALANKA KEERTHANA | A | A | A | A | A | A | A | | | | | — |
| VATHADA HEMALATHA | A | A | A | A | A | A | A | | | | | — |
| PILLATI RAMALAKSHMI | A | A | A | A | A | A | A | | | | | — |
| PILLATI SAILAJA | P | P | P | P | P | P | P | | | | | 17 |
| BAGADI BHAGYALAKSHMI | A | A | A | A | A | A | A | | | | | — |
| KOYYANA MEENAKSHI | A | A | A | A | A | A | A | | | | | — |
| NAKKA RADHIKA | A | A | A | A | A | A | P | | | | | — |
| PONDARA DIVYA | A | A | A | A | A | P | A | | | | | — |
| LOTTI NILAVATI | A | A | A | A. | A | A | A | | | | | — |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UNKILI RENUKA | P | P | P | P | P | P | P | | | | | 19 |
| KANCHARANA MADHAVI | P | P | P | P | P | P | P | | | | | 22 |
| MELLAKA TRIVENI | P | P | A | P | P | P | P | | | | | 19 |
| NIMMAKA SAMEERA | A | A | A | A | A | A | A | | | | | — |
| GANGU RENUKA | A | A | A | A | A | A | A | | | | | — |
| SEEDI PUJA | P | P | A | P | P | P | P | | | | | 19 |
| YALLA BHAVANI | P | A | P | P | P | P | P | | | | | 21 |
| SAVARA RICHA | P | A | P | A | P | P | P | | | | | 19 |
| SAVARA VASPEENA | P | P | P | P | P | P | P | | | | | 18 |
| PEDDINTI TEJESWARI | P | P | P | P | P | P | P | | | | | 18 |
| VAMBARAVELLI PALLAVI | P | P | P | P | P | P | P | | | | | 21 |
| KONETI THANUSHA | P | P | P | P | P | P | P | | | | | 19 |
| KORRAYI KUMARI | P | A | P | P | P | P | P | | | | | 19 |
| KARANAM KUMARI | P | P | P | A | P | P | P | | | | | 22 |
| BASWA DEEPIKA | P | P | P | P | P | P | P | | | | | 21 |
| SIMMA HEMALATHA | P | A | P | P | P | P | P | | | | | 22 |
| DUMPA SRAVANTHI | A | A | A | A | A | A | A | | | | | — |
| KILLAMPUDI HARIKA | P | P | P | P | P | P | P | | | | | 20 |
| VANAPALLI KEERTHI | P | P | P | P | P | A | A | | | | | — |
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## Student Feedback - Bridge Course:2023-24

**Name of the Student:** B.Triveni **Date:**

---

1. How would you rate your overall experience with the bridge course?

- [ ] Excellent
- [x] Good
- [ ] Average
- [ ] Needs Improvement

2. Was the course content relevant and helpful in bridging the gap between school and college-level subjects?

- [ ] Yes, very helpful
- [x] Somewhat helpful
- [ ] Not helpful

3. Did the course duration feel adequate for covering the topics?

- [ ] Yes, it was well-paced
- [x] It was too short
- [ ] It was too long

4.How would you rate the teaching methods used in the course?

- [x] Very Effective
- [ ] Moderately Effective
- [ ] Not Effective

5.Were the instructors approachable and helpful?

- [ ] Always
- [x] Sometimes
- [ ] Rarely
- [x] Never

6.How engaging were the sessions?

- [x] Very engaging
- [ ] Somewhat engaging
- [ ] Not engaging

7.Were the learning materials (notes, presentations, videos, etc.) useful?

- [ ] Very useful
- [x] Somewhat useful
- [ ] Not useful

8. After completing the bridge course, how confident do you feel about your first-year subjects?

- [ ] Very confident
- [x] Somewhat confident
- [ ] Not confident

9.Did the course help in improving your understanding of fundamental concepts?

- [x] Yes, significantly
- [ ] Yes, but I need more practice
- [ ] No, it didn't help much

10.Do you feel better prepared for your degree-level studies after this course?

- [x] Yes
- [ ] No

11. Would you recommend this bridge course to future students?

- [ ] Yes
- [x] No

12.What improvements would you suggest for future bridge courses?

- [ ] More interactive sessions
- [ ] More practical applications
- [x] More real-life examples
- [ ] Better study materials
- [ ] No improvements needed

**Thank you for your feedback!**

**DEPARTMENT OF PHYSICS**

**Student Feedback - Bridge Course:2023-24**

**Name of the Student:** k.krishnaveni **Date:**

---

1. How would you rate your overall experience with the bridge course?

- [ ] Excellent
- [x] Good
- [ ] Average
- [ ] Needs Improvement

2. Was the course content relevant and helpful in bridging the gap between school and college-level subjects?

- [ ] Yes, very helpful
- [x] Somewhat helpful
- [ ] Not helpful

3. Did the course duration feel adequate for covering the topics?

- [x] Yes, it was well-paced
- [ ] It was too short
- [ ] It was too long

4.How would you rate the teaching methods used in the course?

- [ ] Very Effective
- [ ] Moderately Effective
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5.Were the instructors approachable and helpful?

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- [x] Sometimes
- [ ] Rarely
- [ ] Never

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- [ ] Somewhat confident
- [ ] Not confident

9.Did the course help in improving your understanding of fundamental concepts?

- [ ] Yes, significantly
- [x] Yes, but I need more practice
- [ ] No, it didn't help much

10.Do you feel better prepared for your degree-level studies after this course?

- [x] Yes
- [ ] No

11. Would you recommend this bridge course to future students?

- [x] Yes
- [ ] No

12.What improvements would you suggest for future bridge courses?

- [ ] More interactive sessions
- [x] More practical applications
- [ ] More real-life examples
- [ ] Better study materials
- [ ] No improvements needed

**Thank you for your feedback!**

## DEPARTMENT OF PHYSICS

### Student Feedback - Bridge Course:2023-24

**Name of the Student:** Mylapalli. Pavani **Date:**

1. How would you rate your overall experience with the bridge course?
☑ Excellent ☐ Good ☐ Average ☐ Needs Improvement

2. Was the course content relevant and helpful in bridging the gap between school and college-level subjects?
☐ Yes, very helpful ☑ Somewhat helpful ☐ Not helpful

3. Did the course duration feel adequate for covering the topics?
☑ Yes, it was well-paced ☐ It was too short ☐ It was too long

4.How would you rate the teaching methods used in the course?
☐ Very Effective ☑ Moderately Effective ☐ Not Effective

5.Were the instructors approachable and helpful?
☐ Always ☑ Sometimes ☐ Rarely ☐ Never

6.How engaging were the sessions?
☑ Very engaging ☐ Somewhat engaging ☐ Not engaging

7.Were the learning materials (notes, presentations, videos, etc.) useful?
☑ Very useful ☐ Somewhat useful ☐ Not useful

8. After completing the bridge course, how confident do you feel about your first-year subjects?
☑ Very confident ☐ Somewhat confident ☐ Not confident

9.Did the course help in improving your understanding of fundamental concepts?
☐ Yes, significantly ☑ Yes, but I need more practice ☐ No, it didn't help much

10.Do you feel better prepared for your degree-level studies after this course?
☑ Yes ☐ No

11. Would you recommend this bridge course to future students?
☑ Yes ☐ No

12.What improvements would you suggest for future bridge courses?
☐ More interactive sessions ☑ More practical applications ☐ More real-life examples
☐ Better study materials ☐ No improvements needed

**Thank you for your feedback!**

**DEPARTMENT OF PHYSICS**

**Student Feedback - Bridge Course:2023-24**

**Name of the Student:** B. Deepika **Date:**

1. How would you rate your overall experience with the bridge course?
- [ ] Excellent
- [x] Good
- [ ] Average
- [ ] Needs Improvement

2. Was the course content relevant and helpful in bridging the gap between school and college-level subjects?
- [x] Yes, very helpful
- [ ] Somewhat helpful
- [ ] Not helpful

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- [x] It was too short
- [ ] It was too long

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- [x] Sometimes
- [ ] Rarely
- [ ] Never

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- [ ] Somewhat confident
- [ ] Not confident

9. Did the course help in improving your understanding of fundamental concepts?
- [ ] Yes, significantly
- [x] Yes, but I need more practice
- [ ] No, it didn't help much

10. Do you feel better prepared for your degree-level studies after this course?
- [x] Yes
- [ ] No

11. Would you recommend this bridge course to future students?
- [x] Yes
- [ ] No

12. What improvements would you suggest for future bridge courses?
- [ ] More interactive sessions
- [x] More practical applications
- [ ] More real-life examples
- [ ] Better study materials
- [ ] No improvements needed

**Thank you for your feedback!**

# DEPARTMENT OF PHYSICS

**Comprehensive Evaluation - Bridge Course -2024-25**

22/25

**NAME OF THE STUDENT:** K. RISHITHA

**TOTAL MARKS :15 MARKS** **TIME:** **DATE:**

*******************************************************************************************

**Q1:** Which of the following is the SI unit of electric charge?

A) Coulomb B) Farad C) Volt D) Newton

**Q2:** According to Coulomb's law, the electrostatic force between two charges is:

A) Inversely proportional to the product of charges B) Directly proportional to the square of the distance between them C) Directly proportional to the product of charges D) Independent of the charges

**Q3:** What does the 'P' in PET stand for?

a) Positron b) Photon c) Proton d) P – orbital

**Q4:** The total electric flux through a closed surface enclosing a charge QQQ is given by:

A) Q/4πQ / 4\piQ/4π B) Q/ε0Q / \varepsilon_0Q/ε0C) Q/r2Q / r^2Q/r2 D) Q/2πQ / 2\piQ/2π

**Q5:** The SI unit of the magnetic field is:

A) Ampere B) Weber C) Tesla D) Henry

**Q6:** The term photo voltaic is in use since _________

a) 1840 b) 1844 c) 1849 d) 1850

**Q7:** A long straight wire carrying current produces a magnetic field around it, whose direction is given by:

A) Fleming's left-hand rule B) Right-hand thumb rule C) Ampere's law D) Faraday's law

**Q8:** The colours on the soap bubble is due to

a. Interference b.Polarisation c.Diffraction d.Reflection

**Q9:** Newton's first law of motion states that:

A) Force is equal to mass times acceleration B) Every action has an equal and opposite reaction

C) A body remains in its state of rest or uniform motion unless acted upon by an external force

D) Energy is conserved in all physical processes

# DEPARTMENT OF PHYSICS

18/25

**Comprehensive Evaluation - Bridge Course -2024-25**

**NAME OF THE STUDENT** P. Meghana

**TOTAL MARKS :15 MARKS** **TIME:** **DATE:**

*********************************************************************************************

**Q1:** Which of the following is the SI unit of electric charge?

A) Coulomb B) Farad C) Volt D) Newton

**Q2:** According to Coulomb's law, the electrostatic force between two charges is:

A) Inversely proportional to the product of charges B) Directly proportional to the square of the distance between them C) Directly proportional to the product of charges D) Independent of the charges

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D) Energy is conserved in all physical processes

# DEPARTMENT OF PHYSICS

## Comprehensive Evaluation - Bridge Course -2024-25

24/25

**NAME OF THE STUDENT:** Gayatri. U.

**TOTAL MARKS :15 MARKS** **TIME:** **DATE:**

**************************************************************************************

**Q1:** Which of the following is the SI unit of electric charge?

A) Coulomb B) Farad C) Volt D) Newton

**Q2:** According to Coulomb's law, the electrostatic force between two charges is:

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A) Q/4πQ / 4\piQ/4π B) Q/ε0Q / \varepsilon_0Q/ε0C) Q/r2Q / r^2Q/r2 D) Q/2πQ / 2\piQ/2π

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A) Ampere B) Weber C) Tesla D) Henry

**Q6:** The term photo voltaic is in use since _________

a) 1840 b) 1844 c) 1849 d) 1850

**Q7:** A long straight wire carrying current produces a magnetic field around it, whose direction is given by:

A) Fleming's left-hand rule B) Right-hand thumb rule C) Ampere's law D) Faraday's law

**Q8:** The colours on the soap bubble is due to

a. Interference b.Polarisation c.Diffraction d.Reflection

**Q9:** Newton's first law of motion states that:

A) Force is equal to mass times acceleration B) Every action has an equal and opposite reaction

C) A body remains in its state of rest or uniform motion unless acted upon by an external force

D) Energy is conserved in all physical processes

# DEPARTMENT OF PHYSICS

## Comprehensive Evaluation - Bridge Course -2024-25

15/25

**NAME OF THE STUDENT:** G. Nandini.

**TOTAL MARKS :15 MARKS**

**TIME:**

**DATE:**

*******************************************************************************

**Q1:** Which of the following is the SI unit of electric charge?
A) Coulomb B) Farad C) Volt D) Newton

**Q2:** According to Coulomb's law, the electrostatic force between two charges is:
A) Inversely proportional to the product of charges B) Directly proportional to the square of the distance between them C) Directly proportional to the product of charges D) Independent of the charges

**Q3:** What does the 'P' in PET stand for?
a) Positron b) Photon c) Proton d) P – orbital

**Q4:** The total electric flux through a closed surface enclosing a charge QQQ is given by:
A) Q/4πQ / 4\piQ/4π B) Q/ε0Q / \varepsilon_0Q/ε0C) Q/r2Q / r^2Q/r2 D) Q/2πQ / 2\piQ/2π

**Q5:** The SI unit of the magnetic field is:
A) Ampere B) Weber C) Tesla D) Henry

**Q6:** The term photo voltaic is in use since ________
a) 1840 b) 1844 c) 1849 d) 1850

**Q7:** A long straight wire carrying current produces a magnetic field around it, whose direction is given by:
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a. Interference b. Polarisation c. Diffraction d. Reflection

**Q9:** Newton's first law of motion states that:
A) Force is equal to mass times acceleration B) Every action has an equal and opposite reaction
C) A body remains in its state of rest or uniform motion unless acted upon by an external force
D) Energy is conserved in all physical processes

# DEPARTMENT OF PHYSICS

# BRIDGE COURSEATTENDANCE 2024-25

| Name of the Student | 5/8/24 | 9/8 | 12/8 | 17/8/24 | 19/8 | 22/8 | 23/8 | | | | | Marks Obtained |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2hr | 1hr | 2hr | 1hr | 2hr | 1hr | 1hr | | | | | 19 |
| MADAPALA RAJESWARI | P | P | A | P | P | P | P | | | | | 21 |
| KANAPAKALA MADHURI | P | A | P | P | A | P | P | | | | | 18 |
| PANDAVA MEGHANA | P | P | P | P | P | P | P | | | | | 21 |
| GOBBAKA LAVANYA | P | P | P | A | P | P | P | | | | | 20 |
| VATTAM SASI LIKHITHA | P | P | P | P | A | P | P | | | | | 18 |
| KINJARAPU BHAVANI | P | P | P | P | A | P | P | | | | | — |
| SIMMA BHARGAVI | P | P | P | P | P | P | A | | | | | — |
| GURUBELLI BHUVANESWARI | A | A | A | A | A | A | A | | | | | — |
| DAVALA SRAVANTHI | A | A | A | A | A | A | A | | | | | — |
| PARAPATI DURGA | A | A | A | A | A | A | A | | | | | 16 |
| GURU GAYATHRI | P | P | P | P | P | P | P | | | | | 18 |
| REVALLA MANEESHA | P | P | P | A | P | P | P | | | | | 21 |
| KORLAPU DILLESWARI | P | P | P | A | P | P | P | | | | | 20 |
| CHALLA ARCHANA | A | A | A | A | A | A | A | | | | | 19 |
| PALAVALASA AKSHAYA | P | P | P | P | A | P | P | | | | | — |
| KINJARAPU ARUNAKUMARI | A | A | A | A | A | A | A | | | | | 15 |
| GUMMADI NANDINI | P | P | P | P | P | P | P | | | | | |
| PASUPUREDDY SHALINI | P | P | P | P | P | P | P | | | | | — |
| ORULOTHU POOJA | A | A | A | A | A | A | A | | | | | |
| KAKARLA JYOTHI | P | P | P | P | P | P | A | | | | | — |
| MAJJI AKHILA | A | A | A | A | A | A | A | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VARANASI MEGHANA | P | P | P | A | P | P | P | | | | | 19 |
| SRAVANI NEYYELA | P | A | P | A | P | P | P | | | | | 21 |
| BAGADI HARISHMA | P | P | P | P | P | P | P | | | | | 22 |
| PAILA RUPA | P | A | P | P | A | P | P | | | | | 23 |
| KALLEPALLI RISHITHA | P | P | P | P | P | P | P | | | | | 22 |
| CHALLA CHANDINI | P | P | P | A | P | P | P | | | | | — |
| URJANA GAYATRI | P | P | P | P | P | P | P | | | | | 24 |
| SAKALABAKTULA TEJASWARI | A | A | A | A | A | A | A | | | | | — |
| DONKANA SOWJANYA | P | P | P | P | P | P | P | | | | | — |
| TOYAKA SAILAJA | P | A | P | P | A | P | P | | | | | — |
| KILLI MEGHANA | P | P | P | P | P | A | P | | | | | 21 |
| GOOTLA PAVANI | P | A | P | P | P | P | P | | | | | 14 |
| MAHANKALI MANORAMA | P | P | P | P | P | P | P | | | | | — |
| PITTA YAMUNA | P | P | P | P | P | P | P | | | | | 19 |
| PANCHIREDDY MAHALAKSHMI | A | A | A | A | A | A | A | | | | | 20 |
| GOLLAPALLI RAMALAKSHMI | P | P | A | P | P | P | P | | | | | — |
| LABBA PALLAVI | P | A | P | P | P | P | P | | | | | — |
| MALLARPU PRAGATHI | A | A | A | A | A | A | A | | | | | — |
| KALLA SAILAJA | P | P | P | A | P | P | P | | | | | 21 |
| MOGILI GEETHA | A | A | A | A | A | A | A | | | | | — |
| IDHUMALLA SASIKUMARI | P | P | P | P | P | A | P | | | | | 23 |
| MURAPAKA LIKHITA | A | A | A | A | A | A | A | | | | | — |
| ADAPAKA PUJITHA | P | P | A | P | A | P | A | | | | | 17 |
| KAKARLA SAILAJA | P | P | P | P | A | P | P | | | | | 18 |
| MANGI DIVYA | A | A | A | A | A | A | A | | | | | — |
| TULUGU PARVATHI | P | P | P | P | A | P | P | | | | | 22 |
| KARNAM MOUNIKA | P | P | P | A | P | P | P | | | | | 19 |

**DEPARTMENT OF PHYSICS**

**Student Feedback - Bridge Course:2024-25**

**Date:** 30-08-2024

**Name of the Student:** U. Gayatri

1. How would you rate your overall experience with the bridge course?
- [x] Excellent
- [ ] Good
- [ ] Average
- [ ] Needs Improvement

2. Was the course content relevant and helpful in bridging the gap between school and college-level subjects?
- [x] Yes, very helpful
- [ ] Somewhat helpful
- [ ] Not helpful

3. Did the course duration feel adequate for covering the topics?
- [x] Yes, it was well-paced
- [ ] It was too short
- [ ] It was too long

4.How would you rate the teaching methods used in the course?
- [ ] Very Effective
- [x] Moderately Effective
- [ ] Not Effective

5.Were the instructors approachable and helpful?
- [x] Always
- [ ] Sometimes
- [ ] Rarely
- [ ] Never

6.How engaging were the sessions?
- [x] Very engaging
- [ ] Somewhat engaging
- [ ] Not engaging

7.Were the learning materials (notes, presentations, videos, etc.) useful?
- [x] Very useful
- [ ] Somewhat useful
- [ ] Not useful

8. After completing the bridge course, how confident do you feel about your first-year subjects?
- [x] Very confident
- [ ] Somewhat confident
- [ ] Not confident

9.Did the course help in improving your understanding of fundamental concepts?
- [ ] Yes, significantly
- [x] Yes, but I need more practice
- [ ] No, it didn't help much

10.Do you feel better prepared for your degree-level studies after this course?
- [x] Yes
- [ ] No

11. Would you recommend this bridge course to future students?
- [x] Yes
- [ ] No

12.What improvements would you suggest for future bridge courses?
- [x] More interactive sessions
- [ ] More practical applications
- [ ] More real-life examples
- [ ] Better study materials
- [ ] No improvements needed

**Thank you for your feedback!**

**DEPARTMENT OF PHYSICS**

**Student Feedback - Bridge Course:2024-25**

**Name of the Student:** R. Mahalakshmi **Date:** 30/8/2024

1. How would you rate your overall experience with the bridge course?
☐ Excellent ☐ Good ☐ Average ☐ Needs Improvement

2. Was the course content relevant and helpful in bridging the gap between school and college-level subjects?
☐ Yes, very helpful ☐ Somewhat helpful ☐ Not helpful

3. Did the course duration feel adequate for covering the topics?
☐ Yes, it was well-paced ☐ It was too short ☐ It was too long

4.How would you rate the teaching methods used in the course?
☐ Very Effective ☐ Moderately Effective ☐ Not Effective

5.Were the instructors approachable and helpful?
☐ Always ☐ Sometimes ☐ Rarely ☐ Never

6.How engaging were the sessions?
☐ Very engaging ☐ Somewhat engaging ☐ Not engaging

7.Were the learning materials (notes, presentations, videos, etc.) useful?
☐ Very useful ☐ Somewhat useful ☐ Not useful

8. After completing the bridge course, how confident do you feel about your first-year subjects?
☐ Very confident ☐ Somewhat confident ☐ Not confident

9.Did the course help in improving your understanding of fundamental concepts?
☐ Yes, significantly ☐ Yes, but I need more practice ☐ No, it didn't help much

10.Do you feel better prepared for your degree-level studies after this course?
☐ Yes ☐ No

11. Would you recommend this bridge course to future students?
☐ Yes ☐ No

12.What improvements would you suggest for future bridge courses?
☐ More interactive sessions ☐ More practical applications ☐ More real-life examples
☐ Better study materials ☐ No improvements needed

**Thank you for your feedback!**