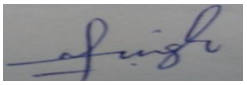
# Department of Civil Engineering
## Details of Lesson Plan

| S.No. | Particulars | Details |
|---|---|---|
| 1. | Course Name | Building Services & Maintenance |
| 2. | Course Code | CE-201 |
| 3. | Academic Year | 2025-2026 |
| 4. | Semester | 2nd |
| 5. | Number of Lesson plans | 36 |
| 6. | Faculty Assigned | Dr. Niranjan Singh |

Faculty Signature 

| Lesson Plan No. 1.1 | Course Name: Building Services & Maintenance<br>Topic: Introduction to Building Services | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>*a. Define building services and explain their importance in a building.*<br>*b. Identify different types of building services and their uses.*<br>*c. Understand the role of building services in maintaining a comfortable and functional building environment.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | 1. **Introduction** *(5 minutes)*<br>- *Begin by asking students what comes to mind when they think of "building services."*<br>- *Discuss the importance of building services in a structure: "Building services are systems installed in a building to ensure its functionality, safety, and comfort."*<br>- *Provide examples such as heating, ventilation, air conditioning (HVAC), plumbing, electrical, fire protection, and security systems.*<br>- *Explain that without these services, a building would not be habitable or functional.*<br>- *Show images or diagrams of buildings with various building services installed.*<br><br>2. **Development** *(30 minutes)*<br>*a. Introduce and explain different types of building services:*<br>*-Heating, Ventilation, and Air Conditioning (HVAC): Regulates temperature and air quality.*<br>*-Plumbing: Provides water supply, drainage, and sewage disposal.*<br>*-Electrical: Provides power for lighting, appliances, and equipment.*<br>*-Fire Protection: Includes fire alarms, sprinkler systems, and fire extinguishers.*<br>*-Security Systems: Cameras, access control, and alarms for safety.*<br>*b. Discuss the specific uses and importance of each service:*<br>*-HVAC: Maintains a comfortable temperature and air quality for occupants.*<br>*-Plumbing: Provides clean water for drinking, sanitation, and wastewater removal.*<br>*-Electrical: Powers lighting, appliances, and equipment for daily activities.*<br>*-Fire Protection: Ensures early detection and suppression of fires for safety.* |

| | |
|---|---|
| | *-Security Systems: Monitors and protects the building and its occupants from intruders or emergencies.*<br>**3. Exercise**<br>*- Divide the class into small groups.*<br>*- Assign each group a specific building service.* |
| **Closure** | 1. *Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>2. *Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>3. *Homework*<br>- *Explain the primary functions of HVAC systems in buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | 1. *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| | | |
|---|---|---|
| **Lesson Plan No. 1.2** | **Course Name: Building Services & Maintenance**<br>**Topic:** *Applications of services for different types of buildings* | **Course No.: CE-201** |

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>a. *Define building services and explain their importance.*<br>b. *Identify different types of building services and their uses.*<br>c. *Understand the role of building services in maintaining a comfortable and functional building environment.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | 1. **Introduction** *(5 minutes)*<br>- *Start by asking students what they think "building services" encompass.*<br>- *Discuss the importance of building services: "Building services are essential systems installed in a building to ensure its functionality, safety, and comfort."*<br>- *Provide examples such as HVAC, plumbing, electrical, fire protection, and security systems.*<br>- *Explain that these services are vital for habitability and functionality.* |

| | |
|---|---|
| | - *Show images or diagrams of buildings with various building services installed.*<br>**2. Development** *(30 minutes)*<br>**a. Types of Building Services**<br>- *Heating, Ventilation, and Air Conditioning (HVAC):*<br>• *Explanation: Regulates temperature and air quality.*<br>• *Importance: Maintains a comfortable environment for occupants.*<br>- *Plumbing:*<br>• *Explanation: Provides water supply, drainage, and sewage disposal.*<br>• *Importance: Enables clean water for drinking and sanitation.*<br>- *Electrical:*<br>• *Explanation: Provides power for lighting, appliances, and equipment.*<br>• *Importance: Powers daily activities and operations.*<br>- *Fire Protection:*<br>• *Explanation: Includes fire alarms, sprinkler systems, and fire extinguishers.*<br>• *Importance: Ensures early detection and suppression of fires for safety.*<br>- *Security Systems:*<br>• *Explanation: Cameras, access control, alarms for safety.*<br>• *Importance: Monitors and protects the building and its occupants.*<br>**b. Uses and Importance:**<br>**HVAC:** *Maintains a comfortable temperature and air quality.*<br>**Plumbing:** *Provides clean water for drinking, sanitation, and wastewater removal.*<br>**Electrical:** *Powers lighting, appliances, and equipment for daily activities.*<br>**Fire Protection:** *Ensures early detection and suppression of fires for safety.*<br>**Security Systems:** *Monitors and protects the building and its occupants from intruders or emergencies.*<br>**3. Exercise (10 minutes)**<br>• *Divide the class into small groups.*<br>• *Assign each group a specific building service (HVAC, Plumbing, - Electrical, Fire Protection, Security).*<br>• *Each group discusses:*<br>- *The primary purpose of their assigned service.*<br>- *Why it is essential for a building.*<br>- *Examples of how it is applied in different building types.* |
| **Closure** | *1. Summarize the Lesson Learning Outcomes and get affirmation from* |

| | |
|---|---|
| | *students on these.*<br>2. *Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*https://www.designingbuildings.co.uk/wiki/Building_services_for_residential_and_commercial_development*<br>3. *Homework*<br>- *Explain the primary functions of HVAC systems in buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| **Lesson Plan No. 1.3** | **Course Name: Building Services & Maintenance**<br>**Topic: Classification of Building Services, Types, and Selection** | **Course No.: CE-201** |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>a. *Understand the classification of building services.*<br>b. *Identify different types of building services.*<br>c. *Discuss factors involved in the selection of appropriate services for a building* |
| **Teaching Aids (if any)** | *PPT Slides* |
| **Teaching Development** | 1. **Introduction** *(5 minutes)*<br>- *Begin by defining "building services classification": "Building services are categorized into different types based on their functions and roles within a building."*<br>- *Discuss the importance of classifying services for efficient building design and operation.*<br>- *Explain that understanding these classifications helps in selecting the right services for specific building needs.*<br>2. **Development** *(30 minutes)*<br>- *Classification of Building Services (15 minutes)*<br>o *Mechanical Services:*<br>✓ *Heating, Ventilation, and Air Conditioning (HVAC):*<br>*Explanation: Controls temperature, humidity, and air quality.*<br>✓ *Plumbing:* |

*Explanation: Provides water supply, drainage, and sewage disposal.*

- ✓ *Fire Protection:*
  *Explanation: Fire alarms, sprinklers, extinguishers for safety.*
- *Electrical Services:*
- ✓ *Lighting:*
  *Explanation: Provides illumination for indoor and outdoor spaces.*
- ✓ *Power:*
  *Explanation: Supplies electricity for equipment and appliances.*
- ✓ *Security Systems:*
  *Explanation: Cameras, access control, alarms for safety..*

- *Types of Building Services (15 minutes)*
  - ✓ **Essential Services:**
    *Explanation: Services necessary for the basic functioning of a building (e.g., HVAC, plumbing).*
  - ✓ **Occupancy Services:**
    *Explanation: Services that directly affect occupants' comfort (e.g., lighting, security).*
  - ✓ **Maintenance Services:**
    *Explanation: Services required for ongoing maintenance and repair (e.g., elevators, fire protection systems).*
- *Selection of Building Services (15 minutes)*
- *Discuss factors influencing service selection:*

- **Building Type:**
  *Different types of buildings have unique service requirements (e.g., residential, commercial, industrial).*
- **Budget and Cost:**
  *Affordability and maintenance costs.*
- **Energy Efficiency:**
  *Choosing services that are energy-efficient and sustainable.*
- **Safety and Regulations:**
  *Compliance with safety codes and regulations.*
- **Environmental Impact:**
  *Considering eco-friendly options.*
- **User Needs:**
  *Tailoring services to the needs of occupants.*
- **Future Expansion:**
  *Planning for scalability and future building modifications.*

**3. Exercise**

*- Divide the class into small groups.*

| | |
|---|---|
| | *- Assign each group a specific building service.* |
| **Closure** | *1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>*- "Introduction to Building Services" by Christopher Hall, Paul Greening*<br>https://www.designingbuildings.co.uk/wiki/Building_services<br>**3.** *Homework*<br>*- Explain the primary functions of HVAC systems in buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| | | |
|---|---|---|
| **Lesson Plan No. 1.4** | **Course Name: Building Services & Maintenance**<br>**Topic: Natural and Artificial Lighting Principles and Factors** | **Course No.: CE-201** |

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>*a. Understand the principles of natural and artificial lighting.*<br>*b. Identify factors that affect lighting design.*<br>*c. Discuss the arrangement of luminaries, distribution of illumination, and utilization factors.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | **1. Introduction** *(5 minutes)*<br>*- Begin by discussing the significance of lighting in architectural design.*<br>*- Define natural lighting: "Lighting that comes from the sun and sky, including daylight."*<br>*- Define artificial lighting: "Lighting that comes from man-made sources, such as electric lamps."*<br>*- Explain that a successful lighting design blends natural and artificial light to create functional, aesthetic, and energy-efficient spaces.*<br>**2. Development** *(30 minutes)*<br>*a. Natural Lighting:*<br>- **Direct Sunlight:** *Brightest and most intense, can create glare.*<br>- **Diffused Sunlight:** *Scattered light on cloudy days, more uniform and softer.* |

| | |
|---|---|
| | - **Reflected Sunlight:** *Light bouncing off surfaces, providing indirect illumination.*<br>- **Daylighting:** *Designing to maximize natural light penetration into a building.*<br>*b. Artificial Lighting:*<br>- **Intensity:** *Brightness of the light source, measured in lumens.*<br>- **Color Temperature:** *Warm (yellowish) to cool (bluish) light, measured in Kelvin.*<br>- **Color Rendering Index (CRI):** *Ability of a light source to accurately render colors.*<br>- **Directionality:** *How light is directed, such as downlights, uplights, or spotlights.*<br>**3. Exercise**<br>*- Divide the class into small groups.*<br>*- Assign each group a specific a room layout.* |
| **Closure** | 1. *Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>2. *Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>https://www.wbdg.org/resources/daylighting<br>3. *Homework*<br>- *Research and write about a building with innovative lighting design and its impact on occupants.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| | | |
|---|---|---|
| **Lesson Plan No. 1.5** | **Course Name: Building Services & Maintenance**<br>**Topic: Necessity of Ventilation** | **Course No.: CE-201** |

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>a. *Define ventilation and explain its importance in a building.*<br>b. *Identify the benefits of proper ventilation.*<br>c. *Understand the role of ventilation in maintaining a healthy and comfortable indoor environment.* |
| **Teaching Aids** | *PPT* |

| | |
|---|---|
| **(if any)** | |
| **Teaching Development** | **1. Introduction** *(5 minutes)*<br>- *Begin by asking students what they think of when they hear "ventilation."*<br>- *Discuss the importance of ventilation in a building: "Ventilation is the process of supplying fresh air to indoor spaces and removing stale air. It plays a crucial role in maintaining indoor air quality, controlling moisture, and providing comfort."*<br>- *Provide examples of ventilation systems such as natural ventilation, mechanical ventilation, and air conditioning.*<br>- *Explain that without proper ventilation, indoor air quality can deteriorate, leading to health issues and discomfort.*<br>- *Show images or diagrams of buildings with various ventilation systems installed.*<br>**2. Development** *(30 minutes)*<br>*a. Importance of Ventilation:*<br>- **Indoor Air Quality:** *Proper ventilation ensures the removal of indoor pollutants, such as volatile organic compounds (VOCs), odors, and allergens, resulting in healthier indoor air.*<br>- **Moisture Control:** *Ventilation helps control humidity levels, preventing mold and mildew growth, and preserving building materials.*<br>- **Comfort:** *Adequate ventilation maintains a comfortable indoor environment by regulating temperature and reducing stuffiness.*<br>- **Health Benefits:** *Good ventilation reduces the risk of respiratory problems and sick building syndrome.*<br>*b. Benefits of Proper Ventilation:*<br>- **Improved Indoor Air Quality:** *Fresh air circulation leads to healthier indoor environments.*<br>- **Moisture Control:** *Prevents mold growth and preserves building materials.*<br>- **Comfort:** *Maintains a comfortable and pleasant indoor environment.*<br>- **Health:** *Reduces the risk of respiratory problems and allergies.*<br>**3. Exercise**<br>- *Divide the class into small groups.*<br>- *Each group discusses a scenario where ventilation is inadequate or lacking (e.g., a poorly ventilated classroom, a building with mold issues).* |
| **Closure** | 1. *Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>2. *Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul* |

| | |
|---|---|
| | *Greening*<br>https://www.epa.gov/indoor-air-quality-iaq/introduction-indoor-air-quality<br><br>3. *Homework*<br>- *Homework: Ask students to research and write about a case study where inadequate ventilation led to health issues or building problems.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| **Lesson Plan No. 1.6** | **Course Name: Building Services & Maintenance**<br>**Topic: Requirement of good acoustics in buildings** | **Course No.: CE-201** |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>a. *Define acoustics and its importance in building design.*<br>b. *Identify the requirements for achieving good acoustics in different building types.*<br>c. *Understand the impact of poor acoustics on occupants and building functionality.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | **1. Introduction** *(5 minutes)*<br>- *Begin by asking students what they understand by the term "acoustics in buildings."*<br>- *Define acoustics in building design: "Acoustics refers to the science of sound control within a building, ensuring that spaces have appropriate levels of sound quality."*<br>- *Discuss the importance of good acoustics in various building types such as concert halls, offices, classrooms, and residential spaces.*<br>- *Explain that good acoustics enhance communication, reduce noise, and create comfortable environments.*<br>**2. Development** *(30 minutes)*<br>**a. Sound Absorption:**<br>- **Definition:** *Sound absorption materials absorb sound energy, reducing echo and reverberation.* |

| | |
|---|---|
| | - **Materials:** *Discuss materials such as acoustic panels, ceiling tiles, carpets, curtains, and furniture that absorb sound.*<br>- **Placement:** *Proper placement of sound-absorbing materials in spaces where echo or noise is an issue.*<br>**b. Sound Insulation:**<br>- **Definition:** *Sound insulation prevents sound transmission between spaces, ensuring privacy and reducing noise transfer.*<br>- **Materials:** *Discuss materials like double-glazed windows, soundproof doors, and insulation.*<br>- **Construction:** *The importance of proper construction techniques to prevent sound transmission through walls, floors, and ceilings.*<br>**c. Room Shape and Design:**<br>- **Shape:** *Discuss how room shape affects sound reflections and reverberation. Rectangular rooms with parallel walls can create echoes.*<br>- **Ceiling Height:** *Taller ceilings can reduce sound reflections and improve sound quality.*<br>- **Surfaces:** *Smooth, hard surfaces like concrete or glass can cause sound to bounce, while textured surfaces absorb sound.*<br>**3. Exercise**<br>*- Divide the class into small groups.*<br>*- Each group presents their ideas to the class, explaining the reasons behind their choices.* |
| **Closure** | 1. *Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>2. *Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>https://www.wbdg.org/design-objectives/sustainable/indoor-environmental-quality-acoustics<br>3. *Homework*<br>- *Ask students to research and write about a building with excellent acoustics and its impact on occupants.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 1.7 | Course Name: Building Services & Maintenance<br>Topic: Various Sound Absorbents | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>a. *Define sound absorbents and their role in acoustics.*<br>b. *Identify different types of sound absorbents and their characteristics.*<br>c. *Understand the applications and effectiveness of various sound absorbents in building design.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | **1. Introduction** *(5 minutes)*<br>- *Begin by asking students what they understand by the term "sound absorbents."*<br>- *Define sound absorbents: "Sound absorbents are materials that reduce the reflection of sound waves, preventing echoes and reverberations."*<br>- *Discuss the importance of sound absorbents in creating comfortable and acoustically balanced spaces.*<br>**2. Development** *(30 minutes)*<br>*a. Types of Sound Absorbents:*<br>✓ **Acoustic Panels:**<br>- **Description:** *Panels made of materials like foam, fabric, or fiberglass designed to absorb sound.*<br>- **Applications:** *Used on walls and ceilings in offices, studios, and auditoriums.*<br>- **Characteristics:** *Various sizes, shapes, and colors available for aesthetic and acoustic requirements.*<br>✓ **Ceiling Tiles:**<br>- **Description:** *Tiles made of porous materials like mineral fiber or foam.*<br>- **Applications:** *Installed in suspended ceilings to reduce sound reflections.*<br>- **Characteristics:** *Designed to be lightweight and easy to install.*<br>✓ **Carpet and Rugs:**<br>- **Description:** *Soft floor coverings made of fabric fibers.*<br>- **Applications:** *Used on floors to absorb footfall noise and reduce sound reflections.*<br>- **Characteristics:** *Different pile heights and densities affect their sound absorption properties.*<br>✓ **Fabric Wall Coverings:**<br>- **Description:** *Textile-based coverings for walls.*<br>- **Applications:** *Improve aesthetics while providing sound absorption.*<br>- **Characteristics:** *Various textures and patterns available with different* |

| | |
|---|---|
| | *acoustic properties.*<br>*b. Characteristics and Effectiveness:*<br>- **Absorption Coefficient:** *Explain the concept of absorption coefficients and how they measure the effectiveness of absorbents.*<br>- **Thickness and Density:** *Discuss how the thickness and density of materials affect their absorption capabilities.*<br>- **Placement:** *Importance of proper placement to maximize sound absorption in different spaces.*<br>**3. Exercise**<br>*- Divide the class into small groups.*<br>*- Each group is given a scenario (e.g., designing a music studio, a classroom, an office).* |
| **Closure** | 1. *Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>2. *Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>https://www.acousticalsurfaces.com/acoustic_panels/acoustic_wall_panels.htm<br>3. *Homework*<br>- *Ask students to research and write about a building or space with effective sound absorbents and its impact on occupants.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| | | |
|---|---|---|
| **Lesson Plan No. 1.8** | **Course Name: Building Services & Maintenance**<br>**Topic: Factors to be followed for noise controlling residential building** | **Course No.: CE-201** |

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>a. *Understand the importance of noise control in residential buildings.*<br>b. *Identify factors that contribute to noise issues in residential settings.*<br>c. *Learn strategies and factors for effective noise control in residential buildings.* |
| **Teaching Aids (if any)** | *PPT* |

| | |
|---|---|
| **Teaching Development** | **1. Introduction** *(5 minutes)*<br>- *Begin by discussing the importance of noise control in residential buildings.*<br>- *Define noise pollution and its impact on quality of life and health.*<br>- *Explain that residential buildings can face noise from various sources such as traffic, neighbors, mechanical systems, and outdoor activities*<br>**2. Development** *(30 minutes)*<br>***a.* External Factors:**<br>- **Traffic Noise:** *Discuss the impact of road traffic on noise levels in residential areas.*<br>- **Neighbor Noise:** *Noise from adjacent units or neighboring properties.*<br>- **Outdoor Activities:** *Noise from parks, playgrounds, or public spaces.*<br>**b. Internal Factors:**<br>- **Mechanical Systems:** *Noise from HVAC systems, plumbing, and appliances.*<br>- **Flooring:** *Impact of hard surfaces like tiles or hardwood floors on noise transmission.*<br>- **Wall Construction:** *Discuss how thin walls or lack of insulation can allow noise to travel.*<br>- **Windows:** *Single-pane windows can transmit more noise than double-pane windows.*<br>**3. Exercise**<br>*- Divide the class into small groups.*<br>*- Each group is given a scenario of a noise issue in a residential building (e.g., noisy neighbours, traffic noise, mechanical noise).* |
| **Closure** | 1. *Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>2. *Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>https://www.soundproofcow.com/soundproofing-101/what-factors-contribute-to-noise-pollution-in-your-home/<br>3. *Homework*<br>- *Write about a case study of a residential building with effective noise control measures and its impact on residents.*<br>- *Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 2.1 | Course Name: Building Services & Maintenance<br>Topic: Types of mechanical lifts | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Identify and describe various types of mechanical lifts.*<br>*b. Understand the principles of operation for each type of lift.*<br>*c. Analyze the advantages and disadvantages of different mechanical lift systems.*<br>*d. Apply knowledge of mechanical lifts to practical scenarios in engineering and design* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Define Mechanical Lifts**<br>• *Introduce mechanical lifts as devices used to elevate or lower loads vertically or horizontally using mechanical systems.*<br>• *Discuss their importance in various applications such as construction, transportation, and industrial processes.*<br>*2.* **Development (30 minutes)**<br>*a.* **Hydraulic Lifts**<br>• **Principle of Operation***:*<br>○ *Explain that hydraulic lifts use fluid pressure to lift loads. When a force is applied to a small piston, it creates pressure that is transferred to a larger piston, lifting the load.*<br>• **Applications***:*<br>○ *Used in automotive repair shops, elevators, and in construction for heavy lifting.*<br>*b.* **Screw Lifts**<br>• **Principle of Operation***:*<br>○ *Describe how screw lifts use a screw mechanism to convert rotational motion into linear motion. A screw thread rotates and moves a load up or down.*<br>• **Applications***:*<br>○ *Used in machinery, platforms, and adjustable tables.*<br>*c.* **Chain Hoists**<br>• **Principle of Operation***:*<br>○ *Explain that chain hoists use a chain to lift loads. A manual or electric chain hoist uses a chain wrapped around a drum or sprocket to raise and lower a load.*<br>• **Applications***:*<br>○ *Commonly used in warehouses, construction sites, and for lifting heavy machinery.*<br>*d.* **Pneumatic Lifts** |

| | |
|---|---|
| | • **Principle of Operation***:*<br>  ○ *Describe how pneumatic lifts use compressed air to move a load. Air pressure in a cylinder creates a force that lifts the load.*<br>• **Applications***:*<br>  ○ *Used in manufacturing and assembly lines for lifting components and tools.*<br>*e.* **Rack and Pinion Lifts**<br>• **Principle of Operation***:*<br>  ○ *Explain that rack and pinion lifts use a gear mechanism where a pinion gear rotates to move a rack gear, lifting the load.*<br>• **Applications***:*<br>  ○ *Used in elevators, vertical transportation systems, and for heavy-duty lifting applications.*<br>*3.* **Exercise (5 minutes)**<br>• **In-Class Problem***:*<br>  ○ *Provide a problem where students choose an appropriate type of mechanical lift for a specific application (e.g., lifting heavy construction materials, adjusting a workbench height) and justify their choice based on the advantages and disadvantages of each lift type.*<br>*Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2. Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>- **https://nptel.ac.in/courses/112/106/112106286/**<br>- **https://nptel.ac.in/courses/112/106/112106180/**<br>**3.** *Homework*<br>- *Write about different mechanical lifts commonly used in the residential and commercial buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 2.2 | Course Name: Building Services & Maintenance<br>Topic: Design Considerations, Location, Sizes of a lift | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Understand the key design considerations for different types of lifts.*<br>*b. Determine the appropriate location for installing a lift based on its intended use.*<br>*c. Calculate and select the appropriate sizes for a lift system to ensure optimal performance and safety.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1* • **Introduction (5 minutes)**<br>*a.* **Define Key Concepts**<br>• *Introduce the importance of design considerations, location, and sizing in the installation and operation of lifts.*<br>• *Discuss how these factors impact the performance, safety, and efficiency of lift systems.*<br>*2.* **Development (30 minutes)**<br>*a.* **Design Considerations**<br>• **Load Capacity***:*<br>○ *Discuss the importance of determining the maximum load the lift must handle. Consider factors like the weight of the load, the frequency of use, and safety margins.*<br>○ *Example: Calculate the load capacity required for a lift used in a warehouse versus a residential building.*<br>• **Type of Lift***:*<br>○ *Compare the suitability of different lift types (hydraulic, screw, chain hoist, pneumatic, rack and pinion) based on the application, load capacity, and space constraints.*<br>○ *Example: Choose the appropriate type of lift for a high-rise building versus an industrial facility.*<br>• **Safety Features***:*<br>○ *Highlight essential safety features such as emergency stop buttons, overload sensors, and safety interlocks.*<br>○ *Discuss how safety features contribute to reliable and secure operation.*<br>• **Efficiency and Energy Consumption***:*<br>○ *Consider the energy requirements and operational efficiency of different lift systems.*<br>○ *Example: Compare the energy consumption of a hydraulic lift with that of a pneumatic lift.*<br>• **Maintenance Requirements***:*<br>○ *Discuss the maintenance needs for different lift types and how these affect operational costs and downtime.* |

- *Example: Assess the maintenance frequency for a chain hoist versus a hydraulic lift.*

*b.* **Location Factors**

- **Accessibility***:*
  - *Ensure that the lift location allows for easy access for users and maintenance personnel. Consider compliance with accessibility standards such as the Americans with Disabilities Act (ADA).*
  - *Example: Plan the location of a lift in a public building to meet accessibility requirements.*
- **Space Constraints***:*
  - *Analyze the available space for installing the lift, including space for the lift shaft, machinery, and any additional components.*
  - *Example: Determine the spatial requirements for a compact lift system in a building with limited floor area.*
- **Building Structure***:*
  - *Consider the structural integrity of the building where the lift will be installed. Ensure that the lift installation does not compromise the building's load-bearing capacity.*
  - *Example: Evaluate the impact of installing a heavy-duty lift in an older building.*
- **Environmental Conditions***:*
  - *Assess environmental factors such as temperature, humidity, and exposure to chemicals that might affect lift operation and durability.*
  - *Example: Select a lift type that can withstand harsh conditions in a factory setting.*

*c.* **Sizing of Lifts**

- **Car Size and Capacity***:*
  - *Determine the appropriate size of the lift car based on the expected load and the dimensions of the items or people it will transport.*
  - *Example: Calculate the required car size for a lift in a hospital versus a shopping mall.*
- **Lift Shaft Dimensions***:*
  - *Calculate the dimensions of the lift shaft to accommodate the lift car, counterweights, and any safety clearances.*
  - *Example: Determine the shaft dimensions needed for a high-rise elevator system.*
- **Travel Height and Speed***:*
  - *Assess the required travel height and speed of the lift based on its intended use and building height.*
  - *Example: Calculate the travel height and speed for an elevator in a multi-story office building.*
- **Clearances and Headroom***:*
  - *Ensure that there is adequate clearance above and below*

| | |
|---|---|
| | *the lift car, including space for mechanical components and safety mechanisms.*<br>○ *Example: Determine the headroom and pit depth required for a hydraulic lift in a commercial building.*<br>*3.* **Exercise (5 minutes)**<br>• **In-Class Problem***:*<br>○ *Provide a scenario where students must design a lift system for a specific application, considering load capacity, type of lift, location, and size requirements.*<br>*Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>- *https://nptel.ac.in/courses/112/106/112106286/*<br>- *https://ascelibrary.org/*<br>*3.Homework*<br>- *Write about different mechanical lifts commonly used in the residential and commercial buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 2.3 | Course Name: Building Services & Maintenance<br>Topic: Component parts of a lift | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Identify and describe the key components of a mechanical lift.*<br>*b. Understand the function and operation of each component.*<br>*c. Analyze how each component contributes to the overall performance and safety of the lift system.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Define the Lift System**<br>• *Introduce the concept of a lift system as a mechanical device designed to move loads vertically or horizontally within a building or structure.*<br>*2.* **Development (30 minutes)**<br>*a.* **Lift Car**<br>• **Function***:*<br>○ *The lift car is the enclosed space that carries passengers or cargo. It moves up and down within the lift shaft.*<br>• **Components***:*<br>○ *Car Frame: The structural framework supporting the car.*<br>○ *Car Doors: Provide access to the lift car and are usually equipped with automatic door operators.*<br>○ *Car Floor: The base of the lift car where passengers or cargo are placed.*<br>*b.* **Lift Shaft**<br>• **Function***:*<br>○ *The vertical space or enclosure through which the lift car moves. It contains the guide rails and other supporting structures.*<br>• **Components***:*<br>○ *Guide Rails: Provide a track for the lift car to move smoothly and prevent lateral movement.*<br>○ *Shaft Walls: The walls of the shaft that enclose and protect the lift car.*<br>*c.* **Hoist Mechanism**<br>• **Function***:*<br>○ *The system responsible for lifting and lowering the lift car.*<br>• **Components***:*<br>○ **Motor***: Provides the driving force for the hoist mechanism.*<br>○ **Sheave or Pulley***: Guides the lift cables or ropes and transmits motion.*<br>○ **Cables or Ropes***: Connect the motor to the lift car and counterweight, transmitting the lifting force.* |

| | |
|---|---|
| | *d.* **Counterweight**<br>• **Function***:*<br>○ *Balances the lift car's weight to reduce the load on the motor and improve efficiency.*<br>• **Components***:*<br>○ **Counterweight Block***: Heavy block or set of weights attached to the lift system.*<br>○ **Counterweight Guides***: Ensure smooth movement of the counterweight.*<br>*e.* **Control System**<br>• **Function***:*<br>○ *Manages the operation of the lift, including movement, speed, and stopping.*<br>• **Components***:*<br>○ **Control Panel***: User interface for selecting floors and controlling the lift.*<br>○ **Relay and Control Circuits***: Electrical circuits that control the operation of the motor and other components.*<br>○ **Sensors and Switches***: Detect the position of the lift and ensure safe operation.*<br><br>*3.* **Exercise (5 minutes)**<br><br>• **In-Class Problem***:*<br>○ *Provide a scenario where students must identify and describe the components of a lift system based on a given Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>- *https://nptel.ac.in/courses/112/106/112106286/*<br>- *https://ascelibrary.org/*<br>*3.Homework*<br>- *Write about different mechanical lifts commonly used in the residential and commercial buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 2.4 | Course Name: Building Services & Maintenance<br>**Topic:** *Elevators & Different types of elevators* | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Identify and describe various types of elevators.*<br>*b. Understand the operating principles and applications of each type.*<br>*c. Analyze the advantages and disadvantages of different elevator systems.*<br>*d. Apply knowledge of elevator types to practical scenarios in building design.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Define Elevators**<br>• *Introduce elevators as vertical transportation systems used to move people and goods between different floors of a building or structure.*<br>*2.* **Development (30 minutes)**<br>*a.* **Hydraulic Elevators**<br>• **Principle of Operation***:*<br>○ *Explain that hydraulic elevators use a hydraulic system to lift and lower the elevator car. A hydraulic fluid is pumped into a cylinder to move the car.*<br>• **Applications***:*<br>○ *Commonly used in low-rise buildings and where space constraints or budget limitations exist.*<br>*b.* **Traction Elevators**<br>• **Principle of Operation***:*<br>○ *Describe how traction elevators use a system of ropes and pulleys or a belt to move the elevator car. The ropes or belt are connected to a motor-driven sheave that lifts and lowers the car.*<br>• **Applications***:*<br>○ *Suitable for mid- to high-rise buildings and those requiring higher speeds.*<br>*c.* **Machine-Room-Less (MRL) Elevators**<br>• **Principle of Operation***:*<br>○ *Explain that MRL elevators are a type of traction elevator where the motor is located in the elevator shaft rather than in a separate machine room.*<br>• **Applications***:*<br>○ *Used in mid-rise buildings and buildings where space is a premium.*<br>*d.* **Pneumatic Elevators**<br>• **Principle of Operation***:*<br>○ *Describe how pneumatic elevators use air pressure to move* |

| | |
|---|---|
| | *the elevator car. A vacuum system or air pressure is used to lift and lower the car.*<br>• **Applications***:*<br>○ *Often used in residential settings and small commercial buildings.*<br>*e.* **Geared vs. Gearless Elevators**<br>• **Geared Elevators***:*<br>○ **Principle of Operation***:*<br>▪ *Use a gearbox to drive the sheave that moves the ropes or belt. Suitable for mid-rise buildings.*<br>• **Gearless Elevators***:*<br>○ **Principle of Operation***:*<br>▪ *Use a direct-drive motor connected to the sheave without a gearbox. Suitable for high-rise buildings.*<br>*3.* **Exercise (5 minutes)**<br>• **In-Class Problem***:*<br>○ *Provide a scenario where students must select the appropriate type of elevator for a specific building (e.g., a residential high-rise, a small commercial building) and justify their choice based on the advantages and disadvantages of each type.*<br>*Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>- *https://nptel.ac.in/courses/112/106/112106286/*<br>- *https://ascelibrary.org/*<br>*3.Homework*<br>- *Write about different elevators commonly used in the residential and commercial buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 2.5 | Course Name: Building Services & Maintenance<br>Topic: Uses of different types of elevators | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Understand the specific applications and uses of various types of elevators.*<br>*b. Analyze the suitability of different elevator types for specific building types and purposes.*<br>*c. Apply knowledge of elevator uses to real-world scenarios in architectural and engineering design.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | **1. Introduction (5 minutes)**<br>*a.* **Importance of Elevator Selection**<br>• *Introduce the concept of selecting the right elevator type based on the building's requirements, height, and purpose. Highlight the importance of understanding where and why each type of elevator is used.*<br>*2.* **Development (30 minutes)**<br>*a.* **Hydraulic Elevators**<br>• **Typical Uses***:*<br>○ *Low-rise buildings (up to 5-6 stories), such as residential apartments, small office buildings, and retail stores.*<br>○ *Ideal for freight elevators in warehouses and industrial settings due to their high lifting capacity.*<br>*b.* **Traction Elevators**<br>• **Typical Uses***:*<br>○ *Mid- to high-rise buildings, including commercial office buildings, residential towers, and hotels.*<br>○ *High-speed elevators in skyscrapers and other tall structures.*<br>*c.* **Machine-Room-Less (MRL) Elevators**<br>• **Typical Uses***:*<br>○ *Mid-rise buildings, such as commercial buildings, residential complexes, and hospitals.*<br>○ *Retrofit projects where space for a machine room is limited.*<br>*d.* **Pneumatic Elevators**<br>• **Typical Uses***:*<br>○ *Residential buildings, particularly single-family homes and small multi-story houses.*<br>○ *Light-duty commercial settings, such as small shops or boutique hotels.*<br>*e.* **Geared Elevators**<br>• **Typical Uses***:* |

| | |
|---|---|
| | ○ *Mid-rise buildings, such as residential buildings, moderate-sized office complexes, and commercial buildings.*<br>○ *Applications requiring moderate speed and load capacity, such as shopping centers and hospitals.*<br>*f.* **Gearless Elevators**<br>• **Typical Uses***:*<br>○ *High-rise buildings, including skyscrapers, luxury residential towers, and major office buildings.*<br>○ *Applications where speed, comfort, and efficiency are paramount.*<br>*3.* **Exercise (5 minutes)**<br>• **In-Class Problem***:*<br>○ *Provide scenarios where students must recommend an elevator type based on the building's design and intended use (e.g., selecting an elevator for a shopping mall, residential building, or hospital).*<br>*Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>- *https://nptel.ac.in/courses/112/106/112106286/*<br>- *https://ascelibrary.org/*<br>*3.Homework*<br>- *Write about different elevators commonly used in the residential and commercial buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 2.6 | Course Name: Building Services & Maintenance<br>Topic: Escalators and their applications | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Understand the design and operation of escalators.*<br>*b. Identify the various types of escalators and their specific applications.*<br>*c. Analyze the advantages of using escalators in different building environments.*<br>*d. Apply knowledge of escalator systems to practical scenarios in building design.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Define Escalators**<br>• *Introduce escalators as moving staircases used for transporting people between floors in a continuous manner, typically in high-traffic areas.*<br>*2.* **Development (30 minutes)**<br>*a.* **Basic Operation of Escalators**<br>• **Principle of Operation***:*<br>○ *Describe how escalators consist of a continuous loop of steps driven by a motorized chain system, allowing for seamless vertical or inclined transport.*<br>• **Components***:*<br>○ *Steps, handrails, balustrades, motors, chains, and drive systems.*<br>• **Safety Features***:*<br>○ *Skirt brushes, emergency stop buttons, step demarcations, and anti-slide coatings.*<br>*b.* **Types of Escalators**<br>• **Parallel Escalators***:*<br>○ *Two or more escalators running side by side in the same direction or opposite directions. Common in shopping malls and airports.*<br>• **Crisscross Escalators***:*<br>○ *Alternating escalators in opposite directions stacked vertically, often seen in department stores to save space.*<br>• **Spiral Escalators***:*<br>○ *Escalators that follow a curved path, often used for architectural aesthetics in high-end commercial buildings.*<br>• **Outdoor Escalators***:*<br>○ *Designed for exterior use with weather-resistant features, commonly found in public transport stations or connecting different levels of urban areas.*<br>*c.* **Applications of Escalators** |

| | |
|---|---|
| | • **Shopping Malls and Retail Spaces***:*<br>• **Airports and Train Stations***:*<br>• **Commercial Buildings***:*<br>• **Public Transport Hubs***:*<br>• **Exhibition Centers and Convention Halls***:*<br><br>*e.* **Design Considerations**<br>• **Incline Angle***:*<br>• **Step Width***:*<br>• **Speed***:*<br>• **Capacity***:*<br><br>• **Exercise (5 minutes)**<br>• **In-Class Problem***:*<br>○ *Provide scenarios where students must recommend escalator types and configurations for specific buildings (e.g., a large shopping mall, a metro station, or a convention center).*<br>*Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>- *https://nptel.ac.in/courses/112/106/112106286/*<br>- *https://ascelibrary.org/*<br>*3.Homework*<br>- *Write about different escalators commonly used in the residential and commercial buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 2.7 | Course Name: Building Services & Maintenance<br>Topic: Air conditioning | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Define air conditioning and understand its fundamental components.*<br>*b. Explain the purpose of air conditioning in various environments.*<br>*c. Understand the basic principles governing air conditioning systems.*<br>*d. Apply knowledge of air conditioning principles to practical scenarios in building design and HVAC systems.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Define Air Conditioning**<br>• *Introduce air conditioning as the process of controlling the temperature, humidity, purity, and movement of air in an enclosed space to create a comfortable indoor environment.*<br>*2.* **Development (30 minutes)**<br>*a.* **Purpose of Air Conditioning**<br>• **Comfort Cooling***:*<br>○ *Discuss the primary purpose of air conditioning in providing thermal comfort for occupants in residential, commercial, and industrial spaces.*<br>• **Preservation of Goods***:*<br>○ *Explain how air conditioning is used in cold storage, food processing, and pharmaceutical industries to maintain specific temperature and humidity levels, ensuring product quality.*<br>• **Industrial Applications***:*<br>○ *Highlight the role of air conditioning in controlling environmental conditions in manufacturing processes where temperature and humidity are critical, such as in semiconductor fabrication and textile production.*<br>• **Improving Indoor Air Quality***:*<br>○ *Discuss how air conditioning systems filter and circulate air, reducing pollutants, allergens, and odors to maintain a healthy indoor environment.*<br>*b.* **Principles of Air Conditioning**<br>• **Thermodynamic Principles***:*<br>○ *Explain the basic thermodynamic cycle that governs air conditioning, focusing on the processes of compression, condensation, expansion, and evaporation.*<br>• **Heat Transfer***:*<br>○ *Discuss the principle of heat transfer, where heat is absorbed from the indoor air (cooling) and released outside the building, typically through refrigerants.* |

| | |
|---|---|
| | • **Humidity Control***:*<br>  ○ *Explain how air conditioning systems manage humidity by condensing moisture from the air as it cools, maintaining a balanced and comfortable indoor environment.*<br>• **Air Distribution and Filtration***:*<br>  ○ *Discuss the importance of proper air distribution and filtration in maintaining consistent air quality and temperature throughout the conditioned space.*<br>*c.* **Applications of Air Conditioning**<br>• **Residential Air Conditioning***:*<br>• **Commercial Air Conditioning***:*<br>• **Industrial Air Conditioning***:*<br>• **Specialized Environments***:*<br>*3.***Exercise (5 minutes)**<br>• **In-Class Problem***:*<br>  ○ *Provide scenarios where students must recommend the type of air conditioning system for specific environments (e.g., a residential home, an office building, a data center).*<br>*Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1.Review the definition, purpose, and principles of air conditioning, emphasizing the importance of each in various applications.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>- *https://nptel.ac.in/courses/112/106/112106286/*<br>- *https://nptel.ac.in/courses/112/106/112106286/*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 2.8 | Course Name: Building Services & Maintenance<br>Topic: Types of Air Conditioners | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Identify and describe the different types of air conditioners available in the market.*<br>*b. Understand the specific applications and advantages of each type of air conditioner.*<br>*c. Analyze the suitability of different air conditioner types for various environments and requirements.*<br>*d. Apply knowledge of air conditioner types to real-world HVAC system design.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Importance of Choosing the Right Air Conditioner**<br>• *Discuss the importance of selecting the right type of air conditioner based on the specific needs of the space, including factors like size, layout, and usage.*<br>*2* **Development (30 minutes)**<br>*a.* **Window Air Conditioners**<br>• **Description***:*<br>○ *A single unit installed in a window or through a wall, combining all components into one box.*<br>• **Applications***:*<br>○ *Ideal for cooling single rooms or small spaces, commonly used in apartments and small homes.*<br>*b.* **Split Air Conditioners**<br>• **Description***:*<br>○ *Consists of two units: an indoor unit that handles the cooling and an outdoor unit that expels the heat.*<br>• **Applications***:*<br>○ *Suitable for cooling individual rooms or multiple rooms when connected with multiple indoor units.*<br>*c.* **Portable Air Conditioners**<br>• **Description***:*<br>○ *A mobile, self-contained unit that can be moved from room to room with an exhaust vent to a window.*<br>• **Applications***:*<br>○ *Ideal for spaces where installing a window or split unit is not possible or where temporary cooling is needed.*<br>*d.* **Central Air Conditioners**<br>• **Description***:*<br>○ *A system that cools air in a central location and distributes it throughout the building via a network of ducts.* |

| | |
|---|---|
| | • **Applications**:<br>  ○ *Best suited for large homes, office buildings, and commercial spaces requiring consistent cooling across multiple rooms.*<br>*3* **Exercise (5 minutes)**<br>• **In-Class Problem**:<br>  ○ *Provide scenarios where students must choose the appropriate type of air conditioner for specific settings (e.g., a small apartment, a large office building, a historical home).*<br>*Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1.Review the different types of air conditioners, their applications, and advantages.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>- *https://nptel.ac.in/courses/112/106/112106286/*<br>- *https://nptel.ac.in/courses/112/106/112106286/*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| | | |
|---|---|---|
| **Lesson Plan No. 3.1** | **Course Name: Building Services & Maintenance**<br>**Topic: Introduction to plumbing and water distribution system for a building** | **Course No.: CE-201** |

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Understand the basic concepts and components of plumbing systems in buildings.*<br>*b. Describe the water distribution system and its importance in ensuring efficient water supply.*<br>*c. Identify the different types of pipes and fittings used in plumbing.*<br>*d. Apply knowledge of plumbing and water distribution systems to design and troubleshoot basic building water systems.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Define Plumbing**<br>• *Introduce plumbing as the system of pipes, fittings, valves, and fixtures installed in buildings for the distribution of potable water and the removal of waste.*<br>*b.* **Importance of Plumbing and Water Distribution Systems** |

| | |
|---|---|
| | • *Discuss the critical role of plumbing in maintaining public health by providing clean water for drinking, cooking, and sanitation.*<br>• *Emphasize the importance of efficient water distribution systems in ensuring reliable water supply throughout a building.*<br><br>*2.* **Development (30 minutes)**<br>*a.* **Components of Plumbing Systems**<br>• **Water Supply System***:*<br>o *Discuss the elements that make up the water supply system, including the source (municipal supply, well), water treatment, pumps, and storage tanks.*<br>• **Drainage System***:*<br>o *Explain the drainage system, including soil pipes, waste pipes, vent pipes, and traps that ensure proper disposal of wastewater.*<br>• **Fixtures and Faucets***:*<br>o *Describe common plumbing fixtures (sinks, toilets, showers) and their connections to the water supply and drainage systems.*<br>*b.* **Water Distribution System**<br>• **Definition and Function***:*<br>o *Define the water distribution system as the network of pipes that deliver water from the main supply to various fixtures and appliances within a building.*<br>• **Types of Water Distribution Systems***:*<br>o *Discuss the two main types: Direct and Indirect water distribution systems.*<br>▪ *Direct System: Water is supplied directly from the main supply to fixtures.*<br>▪ *Indirect System: Water is supplied to a storage tank, then distributed to fixtures.*<br><br>*3.* **Exercise (5 minutes)**<br>• **In-Class Problem***:*<br>o *Provide a simple scenario where students must design a basic water distribution layout for a small residential building.*<br>*Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1.Review the components of plumbing systems, the types of water distribution systems, and the materials used in pipes and fitting*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*https://onlinecourses.nptel.ac.in/noc20_ce23/preview*<br><br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and* |

| | |
|---|---|
| | *discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| | | |
|---|---|---|
| **Lesson Plan No. 3.2** | **Course Name: Building Services & Maintenance**<br>**Topic: Use and care of the plumber's tools and equipments** | **Course No.: CE-201** |

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Identify and describe the various tools and equipment used by plumbers.*<br>*b. Understand the correct use of each tool to perform plumbing tasks safely and efficiently.*<br>*c. Learn proper maintenance and care techniques for plumbing tools and equipment to extend their lifespan.*<br>*d. Apply knowledge of tool use and care in practical plumbing scenarios.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Importance of Proper Tool Use in Plumbing**<br>• *Discuss how using the right tools in the correct manner is essential for efficient plumbing work and ensuring safety on the job.*<br>*2.* **Development (30 minutes)**<br>*a.* **Types of Plumbing Tools and Their Uses**<br>• **Wrenches***:*<br>○ *Pipe Wrench:*<br>▪ *Used for gripping and turning pipes. Discuss the importance of adjusting the wrench properly to avoid damage.*<br>○ *Basin Wrench:*<br>▪ *Used to tighten or remove faucet mounting nuts in tight spaces. Demonstrate how to use it effectively.*<br>○ *Adjustable Wrench:*<br>▪ *Versatile tool for various nuts and bolts. Emphasize the need to adjust it correctly to prevent slippage.*<br>• **Pipe Cutters***:*<br>○ *Tube Cutter:*<br>▪ *Used for cutting copper, PVC, and other types of tubing. Demonstrate the correct cutting technique for a clean cut.*<br>○ *Hacksaw:*<br>▪ *Used for cutting metal pipes, plastic pipes, and bolts. Discuss the importance of using the correct blade and cutting at the right angle.*<br>• **Plunger***:* |

| | |
|---|---|
| | ○ *Explain its use in clearing blockages in sinks, toilets, and drains. Demonstrate the proper plunging technique.*<br>• **Pipe Threading Tools***:*<br>○ *Pipe Die and Die Stock:*<br>▪ *Used to cut threads on the ends of pipes. Discuss the importance of using the correct size and lubricating the pipe before threading.*<br>• **Teflon Tape (Plumber's Tape)***:*<br>○ *Used to seal pipe threads to prevent leaks. Demonstrate the correct way to apply Teflon tape to threaded joints.*<br>*b.* **Safety Precautions**<br>• **Personal Protective Equipment (PPE)**<br>• **Tool Handling and Safety**<br>• **Worksite Safety***:*<br><br>*c.* **Maintenance and Care of Plumbing Tools**<br>• **Cleaning Tools After Use***:*<br>○ *Discuss the importance of cleaning tools after each use to prevent rust, corrosion, and buildup of debris.*<br>○ *Demonstrate cleaning techniques for different tools, such as wiping down wrenches, oiling moving parts, and cleaning cutting edges.*<br>*3.* **Exercise (5 minutes)**<br><br>• **In-Class Activity***:*<br>○ *Provide a set of tools for students to practice identifying and describing their use.*<br><br>*Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1.Review different types of plumbing tools, their uses, safety precautions, and maintenance practices.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*https://onlinecourses.nptel.ac.in/noc20_ce23/preview*<br><br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 3.3 | Course Name: Building Services & Maintenance<br>Topic: Description of plumber tools and equipments | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Identify and describe the various tools and equipment used in plumbing.*<br>*b. Understand the specific functions and applications of each tool in plumbing tasks.*<br>*c. Recognize the importance of proper tool selection and use for effective and safe plumbing work.*<br>*d. Apply knowledge of plumbing tools in practical scenarios to perform tasks efficiently.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Importance of Tools in Plumbing**<br>• *Discuss how the right tools are essential for performing plumbing tasks efficiently and safely.*<br>• *Emphasize the role of understanding each tool's function in achieving high-quality work.*<br><br>*2.* **Development (30 minutes)**<br>*a.* **Wrenches**<br>• **Pipe Wrench***:*<br>○ *Description: A heavy-duty tool with adjustable jaws, designed for gripping and turning pipes.*<br>○ *Use: Used primarily for tightening and loosening threaded pipes and fittings.*<br>• **Basin Wrench***:*<br>○ *Description: A T-shaped wrench with a pivoting head for reaching nuts under sinks.*<br>○ *Use: Ideal for installing or removing faucet mounting nuts in tight spaces.*<br>• **Adjustable Wrench***:*<br>○ *Description: A versatile wrench with an adjustable jaw for various sizes of nuts and bolts.*<br>○ *Use: Used for general plumbing tasks requiring adjustable grip.*<br><br>*b.* **Cutting Tools**<br>• **Tube Cutter***:*<br>○ *Description: A tool with a rotary cutting wheel for making clean cuts on pipes.*<br>○ *Use: Used for cutting copper, PVC, and other types of tubing.* |

| | |
|---|---|
| | • **Hacksaw***:*<br>  ○ *Description: A saw with a fine-toothed blade for cutting through pipes and metal.*<br>  ○ *Use: Used to cut metal and plastic pipes as well as other materials in plumbing.*<br><br>*c.* **Threading and Sealing Tools**<br>• **Pipe Die and Die Stock***:*<br>  ○ *Description: Tools used to cut threads onto the ends of pipes for joining.*<br>  ○ *Use: Used for threading pipes to connect them with fittings.*<br>• **Teflon Tape (Plumber's Tape)***:*<br>  ○ *Description: Thin tape used to seal pipe threads and prevent leaks.*<br>  ○ *Use: Wrapped around pipe threads to ensure a watertight seal.*<br><br>*3.* **Exercise (5 minutes)**<br><br>• **In-Class Activity***:*<br>  ○ *Present students with a selection of tools. Ask them to identify each tool and describe its use.*<br>  ○ *Provide scenarios where students must select the appropriate tool for a specific plumbing task.*<br><br>*Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1.Review the different plumbing tools discussed, emphasizing their uses and importance in plumbing work.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*https://onlinecourses.nptel.ac.in/noc20_ce23/preview*<br><br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 3.4 | Course Name: Building Services & Maintenance<br>Topic: Plumbing Symbols, Care & use of tools | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Understand and interpret common plumbing symbols used in technical drawings and blueprints.*<br>*b. Identify and describe the correct use of various plumbing tools.*<br>*c. Learn the proper care and maintenance of plumbing tools to ensure their longevity and efficiency.*<br>*d. Apply knowledge of plumbing symbols and tools in practical scenarios for effective plumbing work.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Importance of Plumbing Symbols and Tools**<br>• *Discuss how understanding plumbing symbols is crucial for reading blueprints and technical drawings, which are essential for accurate installation and repairs.*<br>• *Highlight the importance of using the right tools correctly for efficient and safe plumbing work.*<br><br>*2.* **Development (30 minutes)**<br>*a.* **Plumbing Symbols**<br>• **Pipes and Fittings***:*<br>○ *Symbol: Illustrate the symbols for various pipe types (e.g., hot and cold water lines) and fittings (e.g., elbows, tees, and couplings).*<br>○ *Use: Explain how these symbols represent the connections and flow direction in plumbing systems.*<br>• **Valves***:*<br>○ *Symbol: Show the symbols for different types of valves (e.g., gate, globe, check valves).*<br>○ *Use: Discuss the function of each valve and where it is typically used in a plumbing system.*<br>• **Fixtures and Appliances***:*<br>○ *Symbol: Illustrate symbols for common fixtures (e.g., sinks, toilets, bathtubs) and appliances (e.g., water heaters, washing machines).*<br>○ *Use: Explain how these symbols help in the layout and installation of plumbing systems.*<br>• **Pumps and Water Systems***:*<br>○ *Symbol: Show symbols for pumps, tanks, and water supply systems.*<br>○ *Use: Discuss the significance of these symbols in planning* |

| | |
|---|---|
| | *and maintaining water distribution systems.*<br><br>*b.* **Care and Maintenance of Plumbing Tools**<br>• **Cleaning Tools***:*<br>○ *Discuss the importance of cleaning tools after each use to prevent rust and buildup of debris.*<br>• **Proper Storage***:*<br>○ *Explain the importance of storing tools in a dry, organized space to prevent damage and ensure easy access.*<br>• **Regular Inspection***:*<br>○ *Emphasize the need for regular inspection of tools for signs of wear, damage, or dullness.*<br><br>*3.* **Exercise (5 minutes)**<br><br>• **In-Class Activity***:*<br>○ *Provide a worksheet with plumbing symbols for students to identify and interpret.*<br>○ *Have students practice identifying tools and describing their use and care.*<br>○ *Encourage students to demonstrate proper cleaning or maintenance of a selected tool.*<br><br>*Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1.Review the different plumbing symbols discussed, emphasizing their uses and importance in plumbing work.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*https://onlinecourses.nptel.ac.in/noc20_ce23/preview*<br>*https://ncert.nic.in/vocational/pdf/iepg104.pdf*<br><br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 3.5 | Course Name: Building Services & Maintenance<br>**Topic:** *Different kinds Pipes used in plumbing system* | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Identify and describe the different types of pipes used in plumbing systems.*<br>*b. Understand the specific applications and advantages of each type of pipe.*<br>*c. Select the appropriate type of pipe for various plumbing scenarios based on material properties and usage requirements.*<br>*d. Recognize the importance of proper pipe selection in ensuring the efficiency, durability, and safety of plumbing systems.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Importance of Pipe Selection in Plumbing**<br>• *Discuss how selecting the right type of pipe is crucial for the integrity and efficiency of a plumbing system.*<br>• *Emphasize the role of different pipes in catering to specific needs such as water supply, drainage, and gas distribution.*<br><br>*2.* **Development (30 minutes)**<br>*a.* **Types of Pipes**<br>• **PVC (Polyvinyl Chloride) Pipes**<br>○ *Description: Lightweight, plastic pipes known for their durability and corrosion resistance.*<br>○ *Applications: Used for cold water supply, drainage, and waste systems.*<br>• **CPVC (Chlorinated Polyvinyl Chloride) Pipes**<br>○ *Description: Similar to PVC but with additional chlorine, making them suitable for hot water systems.*<br>○ *Applications: Hot and cold water supply lines.*<br>• **Copper Pipes**<br>○ *Description: Metal pipes known for their durability and reliability in plumbing systems.*<br>○ *Applications: Used in water supply systems, both hot and cold, and in HVAC systems.*<br>• **PEX (Cross-linked Polyethylene) Pipes**<br>○ *Description: Flexible plastic pipes that are increasingly popular in residential plumbing.*<br>○ *Applications: Hot and cold water supply, radiant heating systems.*<br>• **Galvanized Steel Pipes**<br>○ *Description: Steel pipes coated with a layer of zinc to* |

| | |
|---|---|
| | *prevent corrosion.*<br>○ *Applications: Used historically in water supply lines but less common now due to corrosion issues.*<br>• **Cast Iron Pipes**<br>○ *Description: Heavy, durable pipes made from cast iron, typically used for drainage.*<br>○ *Applications: Wastewater and drainage systems in older buildings.*<br>• **Stainless Steel Pipes**<br>○ *Description: High-strength metal pipes resistant to corrosion and chemicals.*<br>○ *Applications: Used in areas with high exposure to corrosive materials, such as industrial plumbing and marine environments.*<br>○ *Advantages: Durable, resistant to corrosion and chemical*<br>*3.* **Exercise (5 minutes)**<br><br>• **In-Class Activity***:*<br>○ *Provide students with a selection of pipe samples and ask them to identify the type of pipe and its typical application.*<br>○ *Present different plumbing scenarios and have students select the appropriate type of pipe for each scenario, explaining their reasoning.*<br><br>*Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1.Review the different types of pipes used in plumbing system discussed, emphasizing their uses and importance in plumbing work.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*https://onlinecourses.nptel.ac.in/noc20_ce23/preview*<br>*https://ncert.nic.in/vocational/pdf/iepg104.pdf*<br><br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 3.6 | Course Name: Building Services & Maintenance<br>Topic: Pipe fittings | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Identify and describe the various types of pipe fittings used in plumbing systems.*<br>*b. Understand the specific functions and applications of different pipe fittings.*<br>*c. Select the appropriate fitting for various plumbing scenarios based on system requirements.*<br>*d. Recognize the importance of proper fitting selection and installation in ensuring a leak-free and efficient plumbing system.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Importance of Pipe Fittings in Plumbing**<br>• *Discuss how pipe fittings are crucial for connecting different sections of pipe, changing the direction of flow, and controlling the distribution of water, gas, or other fluids.*<br>• *Highlight the role of proper fitting selection and installation in preventing leaks and ensuring system efficiency.*<br><br>*2.* **Development (30 minutes)**<br>*a.* **Types of Pipe Fittings**<br><br>• **Bends and Elbows**<br>○ *Description: Fittings used to change the direction of flow in a piping system.*<br>○ *Applications:*<br>▪ *Bends: Generally used for gradual direction changes (e.g., 45-degree, 90-degree bends).*<br>▪ *Elbows: Used for sharp turns or direction changes in the system (e.g., 90-degree, 45-degree elbows).*<br>○ *Advantages: Helps in efficient space utilization, reduces stress on the pipes.*<br>• **Sockets (Couplings)**<br>○ *Description: Fittings used to connect two pipes of the same diameter.*<br>○ *Applications: Connecting straight lengths of pipe to extend the system.*<br>○ *Advantages: Easy to install, provides a secure and leak-proof connection.*<br>• **Tees**<br>○ *Description: T-shaped fittings that allow a branch to be connected to a main line.* |

| | |
|---|---|
| | ○ *Applications: Used to split or combine flow in a piping system, commonly used in water distribution and drainage systems.*<br>○ *Advantages: Versatile, allows for the addition of new lines without disrupting the existing system.*<br>• **Unions**<br>○ *Description: Fittings that allow for easy disconnection and reconnection of pipes.*<br>○ *Applications: Used in areas where maintenance is required, such as near valves or pumps.*<br>○ *Advantages: Facilitates easy access for repairs, maintenance, or replacement of pipe sections without cutting the pipe.*<br><br>*3.* **Exercise (5 minutes)**<br><br>• **In-Class Activity***:*<br>○ *Provide students with physical samples of various fittings and ask them to identify each one and describe its application.*<br>○ *Present different plumbing scenarios and have students select the appropriate fittings, explaining their reasoning.*<br><br>*Use a Google Form to collect responses and discuss the solutions in class.* |
| **Closure** | *1.Review the different types of pipe fittings discussed, focusing on their applications and importance in plumbing systems.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*https://onlinecourses.nptel.ac.in/noc20_ce23/preview*<br>*https://ncert.nic.in/vocational/pdf/iepg104.pdf*<br><br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No.4.1 | Course Name: Building Services & Maintenance<br>**Topic:** *Introduction to safety Services and classification of fires* | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>*a. Define safety services and understand their importance.*<br>*b. Describe the different types of safety services.*<br>*c. Identify and classify fires based on their sources and characteristics.* |
| **Teaching Aids (if any)** | *a. Chalk & Talk*<br>*b. PPT* |
| **Teaching Development** | **4. Introduction** *(5 minutes)*<br>- *Begin the class by asking students about their understanding of safety services and fires.*<br>- *Explain the significance of safety services in maintaining public safety and preventing accidents. Discuss how safety services encompass various measures, such as fire protection, emergency medical services, and law enforcement.*<br>- *Introduce the concept of fires and their classification. Emphasize the importance of understanding different types of fires for effective fire prevention and firefighting.*<br>**5. Development (30 minutes)**<br>*a. Types of Safety Services :*<br>• *Discuss different types of safety services, including:*<br>- *Fire departments: Responsible for firefighting, rescue operations, and fire prevention.*<br>- *Emergency medical services (EMS): Provide pre-hospital emergency medical care.*<br>- *Law enforcement agencies: Ensure public safety and enforce laws.*<br>- *Hazardous materials (HAZMAT) teams: Handle incidents involving hazardous substances.*<br>**b. Classification of Fires :**<br>• *Introduce the classification system for fires based on their sources and characteristics. The most common classification system is based on the NFPA 704 standard, which categorizes fires into classes A, B, C, D, and K.*<br>• *Explain each fire class:*<br>- *Class A: Fires involving ordinary combustible materials such as wood, paper, and cloth.*<br>- *Class B: Fires fueled by flammable liquids or gases.*<br>- *Class C: Fires involving energized electrical equipment.*<br>- *Class D: Fires fueled by combustible metals.*<br>- *Class K: Fires involving cooking oils and fats.*<br>• *Provide examples and discuss the appropriate* |

| | |
|---|---|
| | *extinguishing agents for each fire class.*<br>**3. Exercise**<br>*- Divide the class into small groups.*<br>*- Assign each group to identify the type of fire based on the combustible materials.* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>*- "Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>*- Explain the types of fires in buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| | | |
|---|---|---|
| **Lesson Plan No.4.2** | **Course Name: Building Services & Maintenance**<br>**Topic:** *Introduction to Portable Fire Extinguishers* | **Course No.: CE-201** |

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>*a. Understand the importance of portable fire extinguishers in fire safety.*<br>*b. Identify different types of portable fire extinguishers and their uses.*<br>*c. Demonstrate the proper technique for operating a portable fire extinguisher.* |
| **Teaching Aids (if any)** | *c. Chalk & Talk*<br>*d. PPT* |
| **Teaching Development** | **1. Introduction** *(5 minutes)*<br>*- Start the lesson by asking the students about their knowledge of fire safety measures.*<br>*- Discuss the importance of fire safety in both residential and commercial settings.*<br>*- Introduce the topic of portable fire extinguishers as essential tools for fire suppression.*<br>*- Explain that portable fire extinguishers are crucial for controlling small fires before they escalate into larger emergencies.*<br>**2. Development (30 minutes)**<br>**a. Types of Fire Extinguishers:** |

| | |
|---|---|
| | - *Explain the different types of portable fire extinguishers, such as water, foam, dry powder, CO2, and wet chemical.*<br>- *Discuss the classes of fires each type of extinguisher is suitable for (e.g., Class A, B, C, D, and K fires).*<br>- *Describe the color codes and labels used to differentiate between various types of fire extinguishers.*<br>**b. Components and Operation:**<br>- *Show students the main components of a portable fire extinguisher, including the body, nozzle, pressure gauge, safety pin, and operating lever.*<br>- *Demonstrate how to properly inspect a fire extinguisher for any signs of damage or tampering.*<br>- *Explain the PASS technique (Pull, Aim, Squeeze, and Sweep) for operating a fire extinguisher effectively.*<br>**3. Exercise**<br>*- Divide the class into small groups.*<br>*- Assign each group to identify the type of fire based on the combustible materials.* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>- *Explain the PASS technique*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No.4.3 | Course Name: Building Services & Maintenance<br>**Topic:** *Introduction to Pumps, Primers, and Breathing Apparatus* | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>a. *Understand the basic principles of pumps, primers, and breathing apparatus.*<br>b. *Recognize the importance of these tools in various applications, including firefighting.*<br>c. *Familiarize with the components and operation of pumps, primers, and breathing apparatus.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | **1. Introduction** *(5 minutes)*<br>- *Start with a brief discussion on the importance of pumps, primers, and breathing apparatus in various fields.*<br>- *Highlight real-life scenarios where these tools are crucial, such as firefighting operations.*<br>- *Explain the significance of maintaining proper equipment and knowledge for safety and efficiency.*<br>**2. Development (30 minutes)**<br>**a. Pumps:**<br>- *Define what a pump is: a device used to move fluids (liquids or gases) from one place to another.*<br>- *Discuss the types of pumps, including centrifugal pumps, positive displacement pumps, and diaphragm pumps.*<br>- *Illustrate the components of a pump, such as the impeller, casing, and suction/discharge lines.*<br>- *Demonstrate how pumps are used in firefighting*<br>**b. Primers:**<br>- *Introduce the concept of primers as devices used to initiate the pumping action in certain types of pumps, particularly centrifugal pumps.*<br>- *Explain the function of a primer in creating a vacuum or providing initial suction to start the pumping process.*<br>- *Describe common types of primers, such as manual primers, vacuum primers, and air-driven primers.*<br>- *Discuss the importance of primers in situations where pumps need to be started quickly or where self-priming capability is required.*<br>**c. Breathing Apparatus:**<br>- *Define breathing apparatus as equipment designed to provide breathable air in environments where it is limited or absent.*<br>- *Introduce different types of breathing apparatus, including self-contained breathing apparatus (SCBA), supplied air* |

| | |
|---|---|
| | *respirators (SAR), and rebreathers.*<br>- *Explain the components of a typical breathing apparatus, such as the face mask, regulator, air tank, and harness.*<br>- *Discuss the applications of breathing apparatus in firefighting, hazardous material response, and confined space entry.*<br>**3. Exercise**<br>*- Design a scenario where proper use of breathing apparatus is critical to safety* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>- *Explain the scenario where proper use of breathing apparatus is critical to safety*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| | | |
|---|---|---|
| **Lesson Plan No.4.4** | **Course Name: Building Services & Maintenance**<br>**Topic:** *Electrical fire hazards* | **Course No.: CE-201** |

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>*a. Define electrical fire hazards and identify common causes.*<br>*b. Explain the importance of electrical safety measures in preventing fires.*<br>*c. Recognize potential electrical hazards in various environments.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | **1.Introduction** *(5 minutes)*<br>- *Start the lesson by asking students if they have ever seen sparks from an electrical outlet. Briefly discuss their experiences and any safety measures they took.*<br>- *Introduce the topic of electrical fire hazards, explaining that electrical fires can occur due to various factors such as faulty wiring, overloaded circuits, or malfunctioning appliances.*<br>- *Emphasize the importance of understanding electrical safety to prevent accidents and protect lives and property.*<br>**2. Development (30 minutes)** |

| | |
|---|---|
| | *a. Understanding Electrical Fire Hazards:*<br>• *Define electrical fire hazards as situations where electrical equipment or wiring ignites due to various factors.*<br>• *Discuss common causes of electrical fires, such as:*<br>- *Overloaded circuits*<br>- *Frayed wires*<br>- *Faulty electrical appliances*<br>- *Improper use of extension cords*<br>- *Flammable materials near electrical sources*<br>*b. Preventing Electrical Fires:*<br>• *Explain safety measures to prevent electrical fires, including:*<br>- *Regular inspection and maintenance of electrical systems*<br>- *Proper installation of electrical appliances and wiring by qualified professionals*<br>- *Avoiding overloading circuits and using surge protectors*<br>- *Keeping flammable materials away from electrical sources*<br>- *Using extension cords properly and avoiding daisy-chaining*<br>• *Discuss the importance of unplugging appliances when not in use and practicing electrical safety in the kitchen, bathroom, and outdoor areas.*<br>*c. Identifying Electrical Hazards:*<br>• *Engage students in a discussion or activity where they identify potential electrical hazards in different scenarios, such as:*<br>- *A messy home office with tangled cords*<br>- *A kitchen with appliances near the sink*<br>**3. Exercise**<br>*- Engage students in a discussion or activity where they identify potential electrical hazards in different scenarios* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>- *Explain the mitigation of electrical fire hazards*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.* |

| | |
|---|---|
| | *Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| **Lesson Plan No.4.5** | **Course Name: Building Services & Maintenance**<br>**Topic:** *Requirements of Fire-Resistant Buildings* | **Course No.: CE-201** |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>a. *Understand the importance of fire-resistant buildings.*<br>b. *Identify key requirements outlined in IS and NBC 2005 regarding fire-resistant buildings.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | **1.Introduction** *(5 minutes)*<br>- *Start the class with a question to engage students, such as: "Why do you think it's important for buildings to be fire-resistant?"*<br>- *Provide a brief explanation of the importance of fire safety in buildings.*<br><br>**2.Development (30 minutes)**<br>*a.* **Explanation of IS and NBC 2005:** *Explain what IS (Indian Standard) and NBC (National Building Code) 2005 are and their significance in ensuring safety standards in building construction.*<br>**b. Key Requirements:** *Outline the key requirements for fire-resistant buildings as per IS and NBC 2005, including:*<br>- *Building materials and construction techniques*<br>- *Fire detection and suppression systems*<br>- *Means of egress*<br>- *Compartmentation*<br>- *Fire-resistance ratings for structural elements*<br><br>**3. Exercise**<br>*- Divide the class into groups and provide them with a scenario of a building construction project. Ask each group to identify and discuss the fire-resistant measures they would implement based on the requirements of IS and NBC 2005.* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>- *Explain the various fire resistant requirements for residential* |

| | |
|---|---|
| | *and commercial buildings as NBC 2005*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| **Lesson Plan No.4.6** | **Course Name: Building Services & Maintenance**<br>**Topic:** *Fire Fighting Installations for Horizontal Exit* | **Course No.: CE-201** |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>*a. Understand the concept of horizontal exits in fire safety.*<br>*b. Identify different types of fire fighting installations used in horizontal exits.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | **1.Introduction** *(5 minutes)*<br>- *Start the lesson by asking students what they know about fire safety and evacuation procedures.*<br>- *Explain that in some buildings, especially large ones, horizontal exits are crucial for safe evacuation during a fire.*<br>- *Define horizontal exits as pathways that allow occupants to move from one area of a building to another, providing a safe route away from fire and smoke.*<br>**2.Development (30 minutes)**<br>*a. Types of Fire Fighting Installations***:**<br>• *Discuss different types of fire fighting installations commonly found in horizontal exits, such as:*<br>- *Fire extinguishers: Portable devices for extinguishing small fires.*<br>- *Fire hoses: Connected to a water supply, used to extinguish larger fires.*<br>- *Fire sprinkler systems: Automatically activated systems that release water to control or extinguish fires.*<br>- *Smoke detectors and alarms: Alert occupants to the presence of smoke or fire.*<br>- *Emergency lighting: Illuminates escape routes in case of power failure.*<br>• *Explain the purpose and proper use of each type of installation.*<br>**b.** *Procedures for Using Fire Fighting Installations:*<br>- *Demonstrate how to operate a fire extinguisher, including the PASS technique (Pull, Aim, Squeeze, Sweep).* |

| | |
|---|---|
| | - *Explain how to operate a fire hose, emphasizing the importance of aiming at the base of the fire and controlling the nozzle.*<br>- *Discuss the importance of maintaining clear access to fire fighting installations and keeping them in good working condition.*<br>- *Highlight the need for regular inspection and maintenance of fire fighting installations to ensure their effectiveness during emergencies.*<br>**3. Exercise**<br>• *- Divide students into small groups and assign each group a scenario involving a fire in a building with horizontal exits.* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>- *Explain the various fire resistant requirements for residential and commercial buildings as NBC 2005*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No.4.7 | Course Name: Building Services & Maintenance<br>Topic: External Stairs | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>*At the end of the lesson, the student shall be able to:*<br>*a. Understand the design principles and considerations for external stairs.*<br>*b. Identify different types of external stairs and their appropriate applications.*<br>*c. Apply knowledge of design standards to plan and design external stairs that are functional, safe, and aesthetically pleasing.*<br>*d. Recognize the importance of compliance with building codes and regulations in stair design.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Importance of External Stairs**<br>• *Discuss the role of external stairs in providing access to different levels of a building or site, particularly in areas where internal space is limited or where there is a need for emergency egress.*<br>*2.* **Development (30 minutes)**<br>*a.* **Types of External Stairs**<br>• **Straight Stairs**<br>○ *Description: Stairs that have a single flight with no changes in direction.*<br>○ *Applications: Simple designs for residential and commercial buildings where space is available.*<br>• **L-Shaped Stairs**<br>○ *Description: Stairs with a landing that changes direction at a 90-degree angle.*<br>○ *Applications: Common in residential buildings where a turn is required to fit the stairs into the design.*<br>• **U-Shaped Stairs**<br>○ *Description: Stairs that form a U-shape with two parallel flights connected by a landing.*<br>○ *Applications: Used in residential and commercial buildings where more space is available.*<br>• **Spiral Stairs**<br>○ *Description: Stairs that wind around a central axis, creating a spiral shape.*<br>○ *Applications: Ideal for limited space or as a decorative feature.*<br>• **Circular Stairs**<br>○ *Description: Similar to spiral stairs but with a broader radius and more gradual incline.*<br>○ *Applications: Used in high-end residential or commercial designs for an elegant look.* |

| | |
|---|---|
| | • **Exterior Fire Escapes**<br>  ○ *Description: Metal staircases designed for emergency egress from buildings.*<br>  ○ *Applications: Installed on the exterior of buildings to provide a safe exit in case of fire.*<br><br>*b.* **Design Considerations**<br><br>• **Building Codes and Regulations***:*<br>  ○ *Discuss the importance of adhering to local building codes and regulations, including requirements for handrails, riser heights, tread depths, and landings.*<br>• **Material Selection***:*<br>  ○ *Explain the considerations for choosing materials based on durability, weather resistance, and aesthetic preferences (e.g., wood, metal, concrete).*<br>• **Safety Features***:*<br>  ○ *Discuss the inclusion of handrails, non-slip surfaces, and adequate lighting to ensure safety.*<br>• **Accessibility***:*<br>  ○ *Considerations for accommodating users with disabilities, including the potential need for ramps or elevators as alternatives to stairs.*<br>• **Maintenance***:*<br>  ○ *Discuss the importance of selecting materials and designs that are easy to maintain and repair.*<br><br>*3.* **Exercise (5 minutes)**<br>• **In-Class Activity***:*<br>  ○ *Provide students with different scenarios and have them design an external staircase that meets the given requirements. They should consider factors such as space, material, and code compliance.*<br>  ○ *Present a set of external stair designs and ask students to identify their type and discuss their potential applications and advantages.* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>- *Explain the various external stairs for residential and commercial buildings as NBC 2005*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |

| | |
|---|---|
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| | | |
|---|---|---|
| **Lesson Plan No.4.8** | **Course Name: Building Services & Maintenance**<br>**Topic:** *Characteristics of Fire-Resisting Materials* | **Course No.: CE-201** |

| | |
|---|---|
| **Objectives** | *At the end of the lesson*<br>a. *Students will understand the importance of fire-resisting materials in building construction.*<br>b. *Students will be able to identify key characteristics of fire-resisting materials.*<br>c. *Students will learn about different types of fire-resisting materials and their applications.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | **1.Introduction** *(5 minutes)*<br>• *Begin the lesson by asking students about their familiarity with fire safety measures in buildings.*<br>• *Introduce the concept of fire-resisting materials and their significance in building construction.*<br>**2.Development (30 minutes)**<br>*a. Definition and Importance:*<br>- *Define fire-resisting materials as substances or structures that are resistant to fire and do not contribute to its spread.*<br>- *Discuss the importance of using fire-resisting materials in buildings to comply with safety regulations and to mitigate fire hazards.*<br>*b. Characteristics of Fire-Resisting Materials:*<br>- *Heat Resistance: Explain how fire-resisting materials should have high resistance to heat to prevent combustion or melting.*<br>- *Insulation: Discuss the importance of insulation properties to minimize heat transfer during a fire.*<br>- *Non-Combustibility: Emphasize the necessity for materials that do not ignite or contribute to the fire load.*<br>- *Durability: Highlight the need for materials that can withstand fire exposure for a sufficient duration.*<br>- *Structural Integrity: Explain how fire-resisting materials should maintain their structural integrity during a fire to support the building's stability.*<br>- *Smoke Production: Mention the importance of materials* |

| | |
|---|---|
| | *that produce minimal smoke during combustion to facilitate evacuation.*<br>*c. Types of Fire-Resisting Materials:*<br>- *Concrete and Masonry*<br>- *Fire-Rated Gypsum Board*<br>- *Fireproof Glass*<br>- *Fire-Retardant Treated Wood*<br>**3. Exercise**<br>• *Ask students explain various fire resistant materials commonly used in buildings* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>- *Explain various fire resistant materials commonly used in buildings*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 5.1 | Course Name: Building Services & Maintenance<br>**Topic:** *Introduction to Electrical Services in the Building* | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>*a. Define basic terms related to electrical services in buildings.*<br>*b. Identify components of electrical systems commonly found in buildings.*<br>*c. Understand safety considerations when working with electrical systems.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | **1.Introduction** *(5 minutes)*<br>- *Ask students what they already know about electrical systems in buildings.*<br>- *Introduce the topic: "Introduction to Electrical Services in the Building."*<br>- *Discuss the importance of understanding electrical systems in buildings for safety and functionality.*<br>**2.Development** *(30 minutes)*<br>*a. Basic Concepts*<br>- *Define key terms: voltage, current, resistance, circuit, conductor, and insulator.*<br>- *Explain the relationship between voltage, current, and resistance*<br>- *using simple examples.*<br>*b. Components of Electrical Systems*<br>- *Present a PowerPoint slide showing the main components of electrical systems:*<br>▪ *Service entrance*<br>▪ *Meter*<br>▪ *Main distribution panel*<br>▪ *Circuit breakers*<br>▪ *Wiring (conductors)*<br>▪ *Outlets and switches*<br>▪ *Light fixtures*<br>- *Discuss the function of each component and how they work together.*<br>*c. Safety Considerations*<br>- *Distribute safety guidelines handout.*<br>- *Discuss the importance of safety when working with electrical systems.*<br>- *Highlight safety practices such as using insulated tools,* |

| | |
|---|---|
| | *turning off power before working, and avoiding water contact.*<br>**3. Exercise**<br>*- Divide the class into small groups.*<br>*- Assign each group a specific task.* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>- *Explain the primary functions of electrical systems in buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| | | |
|---|---|---|
| **Lesson Plan No. 5.2** | **Course Name: Building Services & Maintenance**<br>**Topic:** *Symbols for electrical installations and accessories of wiring* | **Course No.: CE-201** |

| | |
|---|---|
| **Objectives** | *At the end of the lesson the student shall be able to:*<br>*a. Define basic terms related to electrical services in buildings.*<br>*b. Identify components of electrical systems commonly found in buildings.*<br>c. *Understand safety considerations when working with electrical systems.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | **1.Introduction** *(5 minutes)*<br>*- Ask students what they already know about electrical systems in buildings.*<br>*- Introduce the topic: "Introduction to Electrical Services in the Building."*<br>*- Discuss the importance of understanding electrical systems in buildings for safety and functionality.*<br>**2.Development** *(30 minutes)*<br>*a. Basic Concepts*<br>*- Define key terms: voltage, current, resistance, circuit,* |

| | |
|---|---|
| | *conductor, and insulator.*<br>- *Explain the relationship between voltage, current, and resistance*<br>- *using simple examples.*<br>*b. Components of Electrical Systems*<br>- *Present a PowerPoint slide showing the main components of electrical systems:*<br>▪ *Service entrance*<br>▪ *Meter*<br>▪ *Main distribution panel*<br>▪ *Circuit breakers*<br>▪ *Wiring (conductors)*<br>▪ *Outlets and switches*<br>▪ *Light fixtures*<br>- *Discuss the function of each component and how they work together.*<br>*c. Safety Considerations*<br>- *Distribute safety guidelines handout.*<br>- *Discuss the importance of safety when working with electrical systems.*<br>- *Highlight safety practices such as using insulated tools, turning off power before working, and avoiding water contact.*<br>**3. Exercise**<br>*- Divide the class into small groups.*<br>*- Assign each group a specific task.* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>- *Explain the primary functions of electrical systems in buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 5.3 | Course Name: Building Services & Maintenance<br>**Topic: Systems of wiring** | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Identify and describe different systems of wiring used in residential, commercial, and industrial settings.*<br>*b. Understand the advantages, disadvantages, and applications of various wiring systems.*<br>*c. Apply knowledge of wiring systems to design and evaluate electrical installations.*<br>*d. Recognize the importance of compliance with electrical codes and standards in wiring design.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Importance of Wiring Systems**<br>• *Discuss the role of wiring systems in distributing electrical power throughout a building, ensuring safety, efficiency, and functionality of electrical installations.*<br>*2.* **Development (30 minutes)**<br>*a.* **Types of Wiring Systems**<br>• **Conduit Wiring**<br>○ *Description: Wiring where electrical wires are enclosed in a conduit, which protects the wires from damage and environmental factors.*<br>○ *Applications: Common in industrial and commercial settings, as well as in outdoor installations.*<br>• **PVC Wiring**<br>○ *Description: Wiring using Polyvinyl Chloride (PVC) conduits, known for its resistance to moisture, chemicals, and physical damage.*<br>○ *Applications: Used in residential, commercial, and some industrial applications.*<br>• **Surface Wiring**<br>○ *Description: Wiring that runs along the surface of walls or ceilings, often within surface-mounted conduit or trunking.*<br>○ *Applications: Common in retrofit installations where the wiring needs to be added to existing structures.*<br>• **Flush Wiring**<br>○ *Description: Wiring embedded within the walls, floors, or ceilings, typically within conduit or cable trunking.*<br>○ *Applications: Common in new construction or renovation projects where a clean appearance is desired.*<br>• **Three-Phase Wiring** |

| | |
|---|---|
| | ○ *Description: A wiring system used for distributing three-phase electrical power, providing a more balanced load and increased efficiency.*<br>○ *Applications: Common in industrial and large commercial settings requiring high power loads.*<br><br>*b.* **Design Considerations**<br>• **Load Requirements***:*<br>○ *Discuss the importance of calculating the electrical load to determine the appropriate wiring system and components.*<br>• **Safety and Compliance***:*<br>○ *Highlight the need to follow local electrical codes and standards to ensure safety and avoid potential hazards.*<br>• **Material Selection***:*<br>○ *Explain the factors influencing material choice, including durability, insulation properties, and environmental conditions.*<br>• **Accessibility and Maintenance***:*<br>○ *Considerations for making wiring systems accessible for maintenance and future modifications.*<br><br>*3.* **Exercise (5 minutes)**<br><br>• **In-Class Activity***:*<br>○ *Provide students with different scenarios and have them select and design an appropriate wiring system, considering factors such as load, environment, and aesthetics.*<br>○ *Present a set of wiring diagrams and ask students to identify the type of wiring system used and discuss its advantages and potential issues.* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>- *Explain the primary functions of electrical wiring systems in buildings.*<br><br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| Lesson Plan No. 5.4 | Course Name: Building Services & Maintenance<br>**Topic: Types of insulation** | Course No.: CE-201 |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Identify and describe various types of insulation materials and their properties.*<br>*b. Understand the applications and advantages of different insulation types in building construction.*<br>*c. Evaluate insulation options based on factors such as thermal performance, cost, and environmental impact.*<br>*d. Recognize the importance of proper insulation in energy efficiency and comfort of buildings.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Importance of Insulation**<br>• *Discuss the role of insulation in maintaining indoor comfort, improving energy efficiency, and reducing heating and cooling costs.*<br>*2.* **Development (30 minutes)**<br>*a.* **Types of Insulation**<br>• **Thermal Insulation**<br>○ **Fiberglass Insulation**<br>▪ *Description: Made from fine glass fibers, often found in batts or rolls.*<br>▪ *Applications: Common in walls, ceilings, and floors of residential and commercial buildings.*<br>○ **Foam Board Insulation**<br>▪ *Description: Rigid panels made from polystyrene, polyisocyanurate, or polyurethane foam.*<br>▪ *Applications: Used in walls, roofs, and foundations, often in both residential and commercial buildings.*<br>○ **Spray Foam Insulation**<br>▪ *Description: Applied as a liquid that expands into a foam, providing a seal against air and moisture.*<br>▪ *Applications: Used in walls, ceilings, and around windows and doors.*<br>○ **Cellulose Insulation**<br>▪ *Description: Made from recycled paper products treated with fire retardants.*<br>▪ *Applications: Blown into wall cavities, attics, and floors.* |

| | |
|---|---|
| | *b.* **Factors Influencing Insulation Selection**<br>• **Thermal Performance***:*<br>• **Cost***:*<br>• **Environmental Impact***:*<br>• **Installation Requirements***:*<br><br>*3.* **Exercise (5 minutes)**<br><br>• **In-Class Activity***:*<br>○ *Provide students with different scenarios (e.g., residential, commercial, or industrial buildings) and ask them to select the most appropriate type of insulation based on factors such as thermal performance, cost, and environmental impact.*<br>○ *Present a set of insulation materials and ask students to match each one with its applications, advantages, and disadvantages.* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>- *Explain the primary functions of electrical wiring insulation systems in buildings.*<br><br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | **6.** *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| | | |
|---|---|---|
| **Lesson Plan No. 5.5** | **Course Name: Building Services & Maintenance**<br>**Topic: Electrical layout for a residential building** | **Course No.: CE-201** |

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Understand the key components and principles of an electrical layout for a residential building.*<br>*b. Design a basic electrical layout that includes lighting, power outlets, and circuit distribution.*<br>*c. Apply knowledge of electrical codes and standards to ensure safety and* |

| | |
|---|---|
| | *functionality in residential electrical systems.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Importance of Electrical Layout**<br>• *Discuss the role of an electrical layout in ensuring safe, efficient, and functional electrical distribution within a residential building.*<br>*2.* **Development (30 minutes)**<br>*a.* **Components of Electrical Layout**<br>• **Main Electrical Panel**<br>○ *Description: Central point where electricity enters the house and is distributed to various circuits.*<br>• **Circuit Breakers**<br>○ *Description: Safety devices that protect electrical circuits from overload or short circuits.*<br>• **Lighting**<br>○ *Types: Overhead lights, recessed lights, wall sconces, and pendant lights.*<br>• **Power Outlets**<br>○ *Types: Standard outlets, GFCI outlets (for areas prone to moisture), and USB outlets.*<br>• **Switches**<br>○ *Types: Single-pole switches, three-way switches (for controlling lights from two locations), dimmer switches.*<br>• **Wiring**<br>○ *Types: Non-metallic sheathed cable (Romex), conduit, and armored cable.*<br>*b.* **Designing a Basic Electrical Layout**<br>• **Step 1: Assess Electrical Needs**<br>• **Step 2: Create a Floor Plan**<br>• **Step 3: Plan Electrical Circuits**<br>• **Step 4: Position Electrical Components**<br>• **Step 5: Ensure Compliance with Codes**<br>*3.* **Exercise (5 minutes)**<br>• **In-Class Activity**<br>○ *Provide students with a floor plan of a residential building and ask them to design a basic electrical layout, including placement of the main panel, circuits, lighting, outlets, and switches.*<br>○ *Review and discuss the designs, focusing on compliance with codes and practicality.* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.* |

| | |
|---|---|
| | *2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>- *Explain the primary steps involved in the layout of wiring system in buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |

| **Lesson Plan No. 5.6** | **Course Name: Building Services & Maintenance**<br>**Topic: Electrical layout for a commercial building** | **Course No.: CE-201** |
|---|---|---|

| | |
|---|---|
| **Objectives** | *At the end of the lesson, the student shall be able to:*<br>*a. Understand the key components and principles of an electrical layout for a residential building.*<br>*b. Design a basic electrical layout that includes lighting, power outlets, and circuit distribution.*<br>*c. Apply knowledge of electrical codes and standards to ensure safety and functionality in residential electrical systems.* |
| **Teaching Aids (if any)** | *PPT* |
| **Teaching Development** | *1.* **Introduction (5 minutes)**<br>*a.* **Importance of Electrical Layout**<br>• *Discuss the role of an electrical layout in ensuring safe, efficient, and functional electrical distribution within a residential building.*<br>*2.* **Development (30 minutes)**<br>*a.* **Components of Electrical Layout**<br>• **Main Electrical Panel**<br>○ *Description: Central point where electricity enters the house and is distributed to various circuits.*<br>• **Circuit Breakers**<br>○ *Description: Safety devices that protect electrical circuits from overload or short circuits.*<br>• **Lighting**<br>○ *Types: Overhead lights, recessed lights, wall sconces, and pendant lights.*<br>• **Power Outlets** |

| | |
|---|---|
| | ○ *Types: Standard outlets, GFCI outlets (for areas prone to moisture), and USB outlets.*<br>• **Switches**<br>○ *Types: Single-pole switches, three-way switches (for controlling lights from two locations), dimmer switches.*<br>• **Wiring**<br>○ *Types: Non-metallic sheathed cable (Romex), conduit, and armored cable.*<br>*b.* **Designing a Basic Electrical Layout**<br>• **Step 1: Assess Electrical Needs**<br>• **Step 2: Create a Floor Plan**<br>• **Step 3: Plan Electrical Circuits**<br>• **Step 4: Position Electrical Components**<br>• **Step 5: Ensure Compliance with Codes**<br>*3.* **Exercise (5 minutes)**<br>• **In-Class Activity**<br>○ *Provide students with a floor plan of a residential building and ask them to design a basic electrical layout, including placement of the main panel, circuits, lighting, outlets, and switches.*<br>○ *Review and discuss the designs, focusing on compliance with codes and practicality.* |
| **Closure** | *1.Summarize the Lesson Learning Outcomes and get affirmation from students on these.*<br>*2.Suggested Reading*<br>- *"Introduction to Building Services" by Christopher Hall, Paul Greening*<br>*3.Suggested reading*<br>*https://www.designingbuildings.co.uk/wiki/Building_services*<br>*4.Homework*<br>- *Explain the primary steps involved in the layout of wiring system in commercial buildings.*<br>*Spend 5 minutes to wrap up and consolidate the learnings* |
| **Evaluation** | *Reflective Questions (What, Why, Who?). Allow students to answer and discuss.*<br>*Spend 5 minutes to evaluate student assimilation of the lesson contents* |