Fiber Optics Lab

Station 1 | Lesson 1: Introduction to Fiber Optics

- **Materials:**
  - Fiber optic cable - 50 Ft Roll of Single (250 total) Mode Fiber and 50ft Multi
  - Connectors (10 each of SC, LC)
  - 10 ea of SC
  - 10 each of LC
  - 3 each of ST, FC, MTP/MPO to show
  - Splicing equipment (1 fusion splicer)
  - Power meter (1)
  - Alcohol Wipes- prepackaged
- **Tools:**
  - Fiber optic stripper (5)
  - Cleaver (5)
- **Time Estimate: 2 hours**
- **Activities:**
  - Overview of fiber optics and its uses (15 minutes)
  - Hands-on demonstration of fiber stripping and cleaving (30 minutes)
  - Introduction to connector types and their uses (30 minutes)
  - Hands-on practice of connector termination techniques (45 minutes)
  - Measurement and testing of terminated fibers using a power meter (30 minutes)

Station 2 | Lesson 2: RJ45 Termination

- **Materials:**
  - Fiber optic cable (5 meters of each type: single-mode, multimode)
  - Connectors (10 each of SC, LC)
  - Termination equipment
  - Power meter (1)
  - Alcohol Wipes- prepackaged
- **Tools:**
  - Fiber optic stripper (5)
  - Cleaver (5)
- **Time Estimate: 2 hours**
- **Activities:**

- Terminate T568 B termination on the cable and test it to ensure termination is correct
- Hands-on practice of connector termination techniques (1 hour)

Station 3| Lesson 3: Fiber Optic Color Coding

- **Materials:**
  - 10 sets of 12 colors - Construction Paper or Card Stock cut in strips with colors
  - Number matching to color - student to determine colors based off of numbers
  - Fiber optic cable samples with different color coating (10)
  - Laminated color code charts (5)
- **Tools: None**
  - Time Estimate: 1 hour
- **Activities:**
  - Introduction to fiber optic color coding and its importance (15 minutes)
- **Interactive game:** "Fiber Optic Color Match" (30 minutes)
  - Each student will be given a set of fiber optic cable samples with different color coating and a color code chart.
  - Students will work in teams to match the colors of the cable samples to the corresponding color codes on the chart.
  - The team with the most correct matches in the shortest amount of time wins.
  - Group discussion on the importance of accurate color coding in fiber optic installation and maintenance (15 minutes)

Station 4 | Lesson 4: Fiber Splicing

- **Materials:**
  - Fiber optic cable (5 meters of each type: single-mode, multimode)
  - Connectors (10 each of SC, LC)
  - Splicing equipment (1 fusion splicer)
  - Power meter (1)
  - Alcohol Wipes- prepackaged
- **Tools:**
  - Fiber optic stripper (5)
  - Cleaver (5)

- **Time Estimate: 2 hours**
- **Activities:**
    - Hands-on practice of fusion splicing techniques (45 minutes)
    - Introduction to mechanical splicing methods (30 minutes)
    - Measurement and testing of spliced fibers using a power meter (45 minutes)
    - Troubleshooting and resolution of common fiber optic splicing issues (30 minutes)

Station 5 | Lesson 5: Fiber Optic Network Design and Installation

- **Materials:**
    - Fiber optic cable (5 meters of each type: single-mode, multimode)
    - Splicing equipment (1 fusion splicer)
    - Power meter (1)
    - Alcohol Wipes- prepackaged
- **Tools:**
    - Fiber optic stripper (5)
    - Cleaver (5)
- **Time Estimate: 2 hours**
- **Activities:**
    - Overview of fiber optic network design principles (30 minutes)
    - Hands-on practice of fusion splicing
    - installation techniques for outside plant and inside plant fiber optic cabling (1 hour)
    - Introduction to safety and regulatory compliance requirements for fiber optic installation (30 minutes)

Station 6 | Lesson 6: Fiber Testing and Troubleshooting

- **Materials:**
    - Fiber optic cable (5 meters of each type: single-mode, multimode)
    - Connectors (10 each of SC, LC)
    - Testing equipment (1 visual fault locator, 1 optical time-domain reflectometer (OTDR))
    - Power meter (1)
    - Alcohol Wipes- prepackaged
- **Tools:**

  - Fiber optic stripper (5)
  - Cleaver (5)

- **Time Estimate: 2 hours**
- **Activities:**
  - Introduction to common fiber optic testing methods (30 minutes)
  - Hands-on practice using a visual fault locator and optical time-domain reflectometer (OTDR) (1 hour)
  - Troubleshooting and resolution of common fiber optic issues (30 minutes)

Lesson 7 | Customer Service and Critical Thinking for Cable and Fiber Optics Installers

- **Materials:**
  - Scenario cards (10)
  - Role-playing props (5 sets)
- **Time Estimate: 1 hour**
- **Activities:**
  - Introduction to the importance of customer service in the cable and fiber optics industry (15 minutes)
  - Interactive role-playing activity (30 minutes)
  - Students will be divided into teams and given a set of scenario cards, each describing a different customer service situation.
  - Each team will select a scenario and use the provided props to act out the situation.
  - After each scenario, the class will discuss the team's approach and how it could have been handled differently.
  - Group discussion on the importance of effective communication and problem-solving skills in customer service (15 minutes)
- This lesson aims to teach students the importance of customer service in the cable and fiber optics industry and how to effectively handle different situations. Through the interactive role-playing activity, students will have the opportunity to practice their communication and problem-solving skills in a fun and safe environment. The group discussion will allow students to reflect on the scenarios and how the skills they learned apply to their future careers as cable and fiber optics installers. The scenario cards can be designed to include different type of

customer interactions like dealing with an angry customer, providing technical support, or helping a customer with the installation process.

- Scenarios
    - An angry customer has called to report that their internet has been down for several hours. The technician arrives at the customer's home and discovers that the issue is due to a loose connector on the fiber optic cable. The technician must explain the problem to the customer and provide a solution in a calm and professional manner.
        - Great ways of handling:
            - Apologize for the inconvenience and reassure the customer that you understand their frustration. "I apologize for the inconvenience you are experiencing. I understand how frustrating it can be to have your internet down for several hours. Let's see what we can do to get it back up and running as soon as possible."
            - Explain the problem in a clear and easy-to-understand manner and provide a solution. "I've checked the issue, and it appears that there is a loose connector on the fiber optic cable. I can fix that for you now, which should resolve the issue. Is that okay with you?"
        - Poor ways of handling:
            - Blaming the customer for the problem. "It's not our fault your internet is down, you must have done something to cause the problem."
            - Being dismissive of the customer's concerns. "It's just a small issue, it'll be back up in no time. There's no need to worry."
    - A customer has called to report that their internet speed is slow. The technician must diagnose the problem and explain the cause to the customer in a way that is easy to understand. They must also provide the customer with a solution and answer any questions they may have.
        - Great ways of handling:
            - Acknowledge the customer's issue and apologize for the inconvenience. "I understand you're having trouble with your internet speed. I'm sorry for the inconvenience this has caused you. Let's see if we can figure out what's causing the problem."

        - Provide a clear explanation of the problem and a solution. "I've checked your internet connection, and it appears that there is an issue with your modem. I can send a technician to replace it for you, which should improve your internet speed. Would you like to schedule a visit for that?"
    - Poor ways of handling:
        - Blaming the customer for the problem. "You must be doing something wrong, that's why your internet is slow."
        - Being dismissive of the customer's concerns. "It's just a small issue, you're probably just imagining it."
- A customer has called to request an upgrade to their fiber optic service. The technician must explain the different options available, the costs associated with each, and the benefits of each option. They must also answer any questions the customer may have.
    - Great ways of handling:
        - Acknowledge the customer's request and explain the different options available. "I understand you're interested in upgrading your fiber optic service. We have several options available, including faster speeds and additional features. Which one would you like to know more about?"
        - Provide clear information on the costs and benefits of each option. "The 100 Mbps package costs $50 per month and includes faster internet speeds. The 200 Mbps package costs $75 per month and includes even faster internet speeds and access to additional features. Which one would you like to proceed with?"
    - Poor ways of handling:
        - Being dismissive of the customer's request. "You don't really need an upgrade, the service you have is fine."
        - Providing incomplete or incorrect information about the options available. "You can only upgrade to the 200Mbps package, and it's too expensive."
- A customer has called to report that they have accidentally cut their fiber optic cable while doing some landscaping. The technician must explain the situation to the customer, provide a solution, and answer any questions they may have.
    - Great ways of handling:

- Acknowledge the customer's mistake and apologize for the inconvenience. "I understand that you've accidentally cut the fiber optic cable while doing landscaping. I apologize for the inconvenience this has caused you."
- Provide a clear explanation of the situation and a solution. "I can send a technician to repair the cable and get your service back up and running. Is that okay with you?"

- Poor ways of handling:
  - Blaming the customer for the problem. "You should be more careful, it's your fault the cable is cut."
  - Being dismissive of the customer's concerns. "It's just a small cut, it'll be back up in no time. There's no need to worry."

- A customer has called to report that they are having difficulty with their fiber optic equipment. The technician must listen to the customer's problem and troubleshoot the issue over the phone. They must provide the customer with clear instructions on how to resolve the problem and answer any questions they may have.
  - Great ways of handling:
    - Acknowledge the customer's problem and offer to help troubleshoot. "I understand you're having difficulty with your fiber optic equipment. Let's see if we can figure out what's causing the problem."
    - Provide clear instructions and answer any questions the customer may have. "Can you please unplug the equipment and wait for 30 seconds before plugging it back in? That should resolve the issue. Do you have any other questions I can help you with?"
  - Poor ways of handling:
    - Blaming the customer for the problem. "It's not our equipment that's causing the problem, you must be doing something wrong."
    - Being dismissive of the customer's concerns. "It's just a small issue, you can figure it out on your own."
- A customer has called to report that they are moving and would like to have their fiber optic service transferred to their new address. The

technician must explain the process, the timeline, and the costs involved, and answer any questions the customer may have.

- Great ways of handling:
  - Acknowledge the customer's request and explain the process for transferring service. "I understand you're moving and would like to transfer your fiber optic service to your new address. We can do that for you. Can you please provide me with your new address and the date you would like the service transferred?"
  - Provide clear information on costs and timelines. "The transfer process will take up to 5 business days, and there is a one-time fee of $50. Are you ready to proceed with the transfer?"
- Poor ways of handling:
  - Being dismissive of the customer's request. "It's too much trouble to transfer your service, you should just cancel it."
  - Providing incorrect or incomplete information about the process or costs involved. "It's going to cost you a lot of money and take a long time."

Lesson 8 | Critical Thinking and Best Practice for Cable and Fiber Optics Installers

- When a homeowner is not available to let the installer in but has provided a key or code for entry, the installer should ensure that they have the correct key or code before entering the premises. They should also make sure to lock all doors and windows before leaving and to leave the premises in the same condition as when they arrived. They should also leave a note for the homeowner with their contact information in case of any issues or questions.
- When the installer encounters pets that may be aggressive or protective, they should take appropriate precautions to ensure their safety and the safety of the pets. This may include asking the homeowner to keep the pets in a separate room or area during the installation, using protective gear such as gloves or masks, and being aware of their body language and movements around the pets.
- When the installer encounters a cluttered or tight working area, they should take appropriate measures to ensure their safety, such as using protective gear, requesting assistance from the homeowner to clear the area, and being aware of

potential hazards such as tripping hazards or sharp objects. They should also keep the area as clean and organized as possible during the installation to minimize disruptions and maintain a professional appearance.

- When the installer encounters outdated or faulty wiring, they should first assess the situation and determine the extent of the problem. They should then take appropriate measures to ensure the wiring is safe and meets current standards. This may include upgrading the wiring, adding new outlets or switches, or calling in a licensed electrician if necessary.
- When the installer must work in a shared space, such as an apartment complex, they should be aware of the potential for interruption or interference from neighboring units. They should work in a professional and respectful manner to minimize disruptions to the other residents by taking steps such as using protective gear, working during non-peak hours, and giving prior notice to the residents. They should also make sure to leave the common areas as clean and organized as possible once the installation is complete.

Scenario 1: The homeowner is not available to let the installer in, but has provided a key or code for entry.

- **Preparation:** Create cards with different scenarios related to entering a home or business without the homeowner being present. These cards should include different options for the installer to choose from, such as using a key or code provided by the homeowner, checking ID, or calling the homeowner to confirm entry.
- **Execution:** Give the student a card with a scenario and ask them to choose the best course of action. Once they make their choice, discuss the pros and cons of their decision and what they should consider in similar situations in the future.

Scenario 2: The homeowner has pets that may be aggressive or protective.

- **Preparation:** Create cards with different scenarios related to encountering pets during an installation. These cards should include different options for the installer to choose from, such as asking the homeowner to keep the pets in a separate room, using protective gear, or avoiding certain areas of the house.
- **Execution:** Give the student a card with a scenario and ask them to choose the best course of action. Once they make their choice, discuss the pros and cons of their decision and what they should consider in similar situations in the future.

Scenario 3: The installer encounters a cluttered or tight working area.

- **Preparation:** Create cards with different scenarios related to working in a cluttered or tight area. These cards should include different options for the installer to choose from, such as requesting assistance from the homeowner to

clear the area, using protective gear, or requesting the homeowner to move furniture or other items.

- **Execution:** Give the student a card with a scenario and ask them to choose the best course of action. Once they make their choice, discuss the pros and cons of their decision and what they should consider in similar situations in the future.

Scenario 4: The installer encounters outdated or faulty wiring.

- **Preparation:** Create cards with different scenarios related to encountering outdated or faulty wiring. These cards should include different options for the installer to choose from, such as upgrading the wiring, adding new outlets or switches, or calling in a licensed electrician.
- **Execution:** Give the student a card with a scenario and ask them to choose the best course of action. Once they make their choice, discuss the pros and cons of their decision and what they should consider in similar situations in the future.

Scenario 5: The installer must work in a shared space, such as an apartment complex.

- **Preparation:** Create cards with different scenarios related to working in shared spaces. These cards should include different options for the installer to choose from, such as working during non-peak hours, giving prior notice to the residents, or using protective gear.
- **Execution:** Give the student a card with a scenario and ask them to choose the best course of action. Once they make their choice, discuss the pros and cons of their decision and what they should consider in similar situations in the future.

Lesson 9 | Putting It All Together

For the final competency task, students will demonstrate their proficiency in fiber optic installation by terminating and testing a fiber optic cable. This task will incorporate the skills learned in the previous lessons, as well as the important customer service skills introduced in the previous lesson.

- The first step of the task will involve stripping and cleaving the fiber in preparation for termination. Students will use the tools and techniques learned in Lesson 2 to carefully remove the outer coating of the fiber and expose the bare ends for termination.
- Next, students will use the connector types and termination techniques learned in Lesson 4 to terminate the fiber with a connector. They will need to select the appropriate connector and follow the correct termination procedures to ensure a secure and effective connection.
- Once the fiber is terminated, students will test it using a power meter and an OTDR, as demonstrated in Lesson 5. They will need to accurately measure the power and loss of

the signal to verify the quality of the connection. Students will also use the OTDR to measure the length of the fiber and detect any faults or breaks in the line.

- To complete the task, students will need to document the test results, as outlined in Lesson 5. They will need to accurately record the power and loss measurements, as well as any other important details about the connection.
- Finally, and perhaps most importantly, students will interact with a simulated customer to provide technical support and ensure customer satisfaction. The simulated customer will present a technical issue related to the fiber optic installation, and the student will need to use the customer service skills learned in Lessons 7 and 8 to effectively communicate and problem-solve with the customer. This will involve listening to the customer's needs, addressing their concerns, and providing clear and helpful solutions to their problem.

Overall, this final competency task will serve as a comprehensive assessment of the skills and knowledge learned throughout the course. Students will need to demonstrate not only their technical expertise in fiber optic installation but also their ability to communicate effectively with customers and provide excellent customer service. Students will be allowed to demonstrate this task with multiple attempts.