COURSE DESIGN

COURSE TITLE : ELECTRICAL INSTALLATION AND MAINTENANCE

NOMINAL DURATION : 1,200 HRS

QUALIFICATION LEVEL : NC II

COURSE DESCRIPTION : This course covers knowledge, skills, and desirable attitudes in electrical installation. It deals with good housekeeping and safety, basic electricity, preparation of electrical materials and tools, performing roughing-in activities, installing wiring devices, installing electrical protection systems, installing electrical and auxiliary equipment, and commissioning electrical systems.

ADMISSION TO THE PROGRAM

The students shall be admitted in Public Technical-Vocational High Schools upon compliance with the following requirements/qualifications:

- Must have potential skill in any specialization of the components of TVE as reflected in the High School Occupational Interest Inventory (HSOII) results
- Must possess a desirable and healthy attitude towards skill activity
- Must have passed interview and aptitude test
- Must submit the following documents upon enrolment:
  o Form 138
  o Parental consent for the students to undergo other related activities outside the school
  o Medical Certificate issued by a government physician
  o Certification of good moral character from the elementary school principal
## COURSE STRUCTURE

<table>
<thead>
<tr>
<th>YEAR LEVEL</th>
<th>GRADING PERIOD</th>
<th>UNIT OF COMPETENCY</th>
<th>MODULE TITLE</th>
<th>LEARNING OUTCOME</th>
<th>NO. OF HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SECOND</td>
<td>FIRST</td>
<td>1. Prepare Construction Materials and Tools</td>
<td>1.1. Preparing Construction Materials and Tools</td>
<td>LO 1. Identify different basic hand tools and materials</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LO 2. Prepare appropriate tools and materials needed in electrical wiring installation</td>
<td></td>
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<td></td>
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<td></td>
<td>LO 3. Store basic electrical tools upon completion of the job</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LO 4. Maintain basic electrical tools and equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SECOND</td>
<td>2. Perform Mensurations and Calculations</td>
<td>2.2. Performing Mensurations and Calculations</td>
<td>LO 1. Select measuring tools and instruments</td>
<td>40</td>
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<tr>
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<td></td>
<td>Total</td>
<td>100</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>LO 2. Carry out measurements and calculations</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>THIRD</td>
<td>1. Interpret Technical Drawings and Plans</td>
<td>1.1. Interpreting Technical Drawings and Plans</td>
<td>LO 1. Analyze signs, symbols, and data</td>
<td>60</td>
</tr>
<tr>
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<td></td>
<td>Total</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LO 3. Apply freehand sketching</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Observe Procedures, Specifications</td>
<td>1.1. Observing Procedures, Specifications</td>
<td>LO 1. Identify, access, and interpret</td>
<td>70</td>
</tr>
</tbody>
</table>
### Competency-Based Curriculum

**Electrical Installation and Maintenance NC II**

#### YEAR LEVEL

<table>
<thead>
<tr>
<th>THIRD YEAR</th>
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</thead>
</table>

#### FIRST

<table>
<thead>
<tr>
<th>UNIT OF COMPETENCY</th>
<th>MODULE TITLE</th>
<th>LEARNING OUTCOME</th>
<th>NO. OF HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Install Electrical Lighting Systems on Auxiliary Outlets and Lighting Fixtures</td>
<td>1.1. Installing Electrical Lighting Systems on Auxiliary Outlets and Lighting Fixtures</td>
<td>LO 1. Lay out and install electrical wiring using knob and tube method</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LO 2. Lay out and install PVC raceway/molding</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LO 3. Lay out and install rigid non-metallic conduit</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LO 4. Lay out and install flexible</td>
<td>100</td>
</tr>
</tbody>
</table>

#### FOURTH

<table>
<thead>
<tr>
<th>MODULE TITLE</th>
<th>LEARNING OUTCOME</th>
<th>NO. OF HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Maintain Tools and Equipment</td>
<td>LO 1. Check condition of tools and equipment</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>LO 2. Perform basic preventive and corrective maintenance</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>LO 3. Store tools and equipment</td>
<td>50</td>
</tr>
<tr>
<td>2. Prepare Electrical Power and Hydraulic Tools</td>
<td>LO 1. Prepare electrical power tools</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>LO 2. Prepare hydraulic tools</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>LO 3. Store electrical power and hydraulic tools</td>
<td>50</td>
</tr>
</tbody>
</table>

Total 100
<table>
<thead>
<tr>
<th>YEAR LEVEL</th>
<th>UNIT OF COMPETENCY</th>
<th>MODULE TITLE</th>
<th>LEARNING OUTCOME</th>
<th>NO. OF HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST</td>
<td>1. Perform Roughing-in Activities for Communication and Distribution System</td>
<td>1.1. Performing Roughing-in Activities for Communication and Distribution System</td>
<td>LO 1. Lay out and install telephone terminal cabinet and frames</td>
<td>80</td>
</tr>
</tbody>
</table>

SECOND

<table>
<thead>
<tr>
<th>LEARNING OUTCOME</th>
<th>NO. OF HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO 5. Assemble fluorescent lighting fixtures</td>
<td>100</td>
</tr>
<tr>
<td>LO 6. Lay out and install fluorescent lighting fixtures</td>
<td>100</td>
</tr>
<tr>
<td>LO 7. Lay out and install incandescent lamps</td>
<td>100</td>
</tr>
</tbody>
</table>

THIRD

<table>
<thead>
<tr>
<th>LEARNING OUTCOME</th>
<th>NO. OF HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO 1. Lay out and install electrical boxes on wood, metal studs, and concrete walls</td>
<td>100</td>
</tr>
<tr>
<td>LO 2. Select wiring devices</td>
<td>100</td>
</tr>
<tr>
<td>LO 3. Lay out and install wiring devices</td>
<td>100</td>
</tr>
</tbody>
</table>

FOURTH

<table>
<thead>
<tr>
<th>LEARNING OUTCOME</th>
<th>NO. OF HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO 1. Lay out and install fuse panel</td>
<td>100</td>
</tr>
<tr>
<td>LO 2. Lay out and install panel board</td>
<td>100</td>
</tr>
<tr>
<td>LO 3. Lay out and install conventional atmospheric lightning protection and grounding system</td>
<td>100</td>
</tr>
<tr>
<td>Competency-Based Curriculum</td>
<td>Electrical Installation and Maintenance NC II</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td><strong>Second</strong></td>
<td></td>
</tr>
<tr>
<td>1.2. Performing Rough-in Activities for Communication and Distribution System Using Electrical Metallic Conduit</td>
<td>LO 1. Lay out and install electrical metallic tubing</td>
</tr>
<tr>
<td></td>
<td>LO 2. Lay out and install rigid metal conduit</td>
</tr>
<tr>
<td></td>
<td>LO 3. Lay out and install flexible metal conduit</td>
</tr>
<tr>
<td></td>
<td>LO 4. Lay out and install intermediate metal conduit</td>
</tr>
<tr>
<td><strong>Third</strong></td>
<td></td>
</tr>
<tr>
<td>2. Install Communication, Signaling Devices and Remote Control System on Auxiliary Equipment</td>
<td>LO 1. Lay out and install alarm system</td>
</tr>
<tr>
<td></td>
<td>LO 2. Lay out and install intercommunication system</td>
</tr>
<tr>
<td></td>
<td>LO 3. Lay out and install relay and magnetic starter</td>
</tr>
<tr>
<td><strong>Fourth</strong></td>
<td></td>
</tr>
<tr>
<td>3. Commission Installed Electrical System</td>
<td>LO 1. Perform preliminary activities for commissioning</td>
</tr>
<tr>
<td></td>
<td>LO 2. Perform testing of electrical system</td>
</tr>
<tr>
<td></td>
<td>LO 3. Finalize commissioning activities</td>
</tr>
</tbody>
</table>
ASSESSMENT METHOD:
Upon completion of each module, the students will be assessed through the following methods:
- Written examination
- Demonstration
- Interview
- Direct observation
- Oral examination

COURSE DELIVERY OR METHODOLOGY:
The program will build on the present knowledge, skills, and attitudes of the students; thus, the conduct will be highly participative. The strategies will focus on interactive, self-directed, and reflective approaches. Lecture-discussion, demonstration method, and hands on workshop will be included in the delivery of the program.

RESOURCES:

<table>
<thead>
<tr>
<th>Learning Elements/Handouts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Safety</td>
</tr>
<tr>
<td>Diagrams</td>
</tr>
<tr>
<td>Measuring resistance using VOM</td>
</tr>
<tr>
<td>Bending metallic conduit</td>
</tr>
<tr>
<td>Installing rigid metal conduit</td>
</tr>
<tr>
<td>Installing rigid non-metallic conduit</td>
</tr>
<tr>
<td>Installing flexible metal conduit</td>
</tr>
<tr>
<td>Installing electrical mouldings</td>
</tr>
<tr>
<td>Identifying and selecting electrical materials and tools</td>
</tr>
<tr>
<td>Installing electrical wiring</td>
</tr>
<tr>
<td>Installing wiring devices</td>
</tr>
<tr>
<td>Installing circuit protection system</td>
</tr>
<tr>
<td>Splicing and joining electrical conductors</td>
</tr>
<tr>
<td>Performing mensurations and calculations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selections/Collections of Video Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Practices in Workshop</td>
</tr>
<tr>
<td>Electrical Safety</td>
</tr>
<tr>
<td>Electrical Installation</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Transparency</th>
</tr>
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<tbody>
<tr>
<td>Electrical Safety</td>
</tr>
<tr>
<td>Diagrams</td>
</tr>
<tr>
<td>Meter scale reading</td>
</tr>
<tr>
<td>Measuring Voltage using VOM</td>
</tr>
<tr>
<td>Parts of multi-tester</td>
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<table>
<thead>
<tr>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiring Booth</td>
</tr>
<tr>
<td>Pipe Vise</td>
</tr>
<tr>
<td>Electric Drill</td>
</tr>
<tr>
<td>Fiber glass ladders</td>
</tr>
<tr>
<td>Magnetic starter switch</td>
</tr>
</tbody>
</table>
### Strengthened Technical-Vocational Education Program

#### Competency-Based Curriculum

### Electrical Installation and Maintenance NC II

- Annunciator
- Intercom System
- Personal Protective Equipment
  - Safety goggles
  - Rubber gloves
  - Safety shoes

### Tools
- Electrician’s holster
- Linesman’s pliers
- Long nose pliers
- Diagonal cutting pliers
- Pipe wrench
- Pipe cutter
- Pipe reamer
- Pipe bender
- Gimlet
- Hacksaw
- Claw Hammer
- Ball peen hammer
- Bar level
- Plumb bob
- Try square
- Steel rule
- Set of screw drivers
- Fish tape reel
- Wire stripper
- Measuring tools
- Insulation resistance tester
- Multi-tester
- Frequency meter
- Voltmeter
- Ohmmeter
- Wattmeter
- Kilowatt-hour meter
- American wire gauge
- Micrometer clipper

### Materials
- Boxes and fittings
  - Junction box
  - Utility box
  - Pull box
  - Condulets
  - PVC adapters
  - EMT adapters
  - Lock nut and bushing
  - C-clamps
- Electrical conductors
  - Solid wire 2.0 mm²
  - Solid wire 3.5 mm²
  - Solid wire 2.6 mm²
  - Annunciator wire
QUALIFICATION OF TEACHERS:

The teacher who will handle this course must possess the following qualifications:

- Must be a holder of Building Wiring Installation (BWI) NC II
- Must have undergone training on Training Methodology II (TM II)
- Must be computer literate
- Must be physically and mentally fit
- Must be a civil service-eligible or hold an appropriate professional license issued by the Professional Regulatory Commission (for government position)
- *Must have at least 2 years job/ industry experience

*Optional: Only when required by hiring institution
MODULES OF INSTRUCTION

SECOND YEAR
COURSE : BUILDING WIRING INSTALLATION

UNIT OF COMPETENCY : PREPARE CONSTRUCTION MATERIALS AND TOOLS

MODULE TITLE : PREPARING CONSTRUCTION MATERIALS AND TOOLS

NOMINAL DURATION : 60 HOURS

CERTIFICATE LEVEL : NC II

MODULE DESCRIPTION : This unit covers the knowledge, skills, and desirable attitudes on identifying, preparing, storing, and maintaining construction materials and tools based on the required performance.

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the students should be able to:

LO1. identify different basic hand tools and materials.
LO2. prepare appropriate tools and materials needed in electrical wiring installation.
LO3. store basic electrical tools upon completion of the job.
LO4. maintain basic electrical tools and equipment.
LO 1. Identify Different Basic Hand Tools and Materials

ASSESSMENT CRITERIA:
1. Electrical tools and materials are identified as per classification, uses, and functions
2. Electrical tools and materials are identified as per job requirements

CONTENTS:
- Different types of electrical tools and materials
  - Classification
  - Uses and functions

CONDITIONS:
The following resources are needed:
- Tools
  - basic hand tools and equipment
  - Personal Protective Equipment (PPE)
- Learning Materials
  - tool manuals
- Learning elements
  - books
  - wiring diagram

METHODOLOGIES:
- Discussion
- Demonstration

ASSESSMENT METHODS:
- Interview
- Written test
LO 2. Prepare Appropriate Tools and Materials Needed in Electrical Wiring Installation

**ASSESSMENT CRITERIA:**
1. Electrical tools and materials are prepared in line with the job specifications.
2. Quantity/quality and ratings of tools, materials, and accessories are checked in line with the job requirements.
3. Damaged electrical tools and materials are reported to the person concerned.

**CONTENTS:**
- Preparing of different types of electrical hand tools and materials
- Safe handling of tools
- Selecting specification and rating of electrical materials

**CONDITIONS:**
The following resources are needed:
- Tools
  - basic hand tools and equipment
  - Personal Protective Equipment (PPE)
- Learning Materials
  - tool manuals
  - learning elements
  - books
  - wiring diagram

**METHODOLOGIES:**
- Demonstration
- Discussion

**ASSESSMENT METHODS:**
- Interview
- Written test
LO 3. Store Basic Electrical Tools upon the Completion of the Job

**ASSESSMENT CRITERIA:**
1. Electrical tools are stored in line with the manufacturer’s specifications.
2. Proper inventory of electrical tools is kept.

**CONTENTS:**
- Factors to consider in proper storage of tools
  - Temperature
  - Corrosion
- Inventory of tools

**CONDITIONS:**
The following resources are needed:
- Tools
  - linesman’s pliers
  - long nose pliers
  - set of screw drivers
- Learning Materials
  - manuals and catalogs
  - learning elements
  - books

**METHODOLOGIES:**
- Demonstration
- Discussion

**ASSESSMENT METHODS:**
- Demonstration
- Observation
- Oral examination
LO 4. Maintain Basic Electrical Tools and Equipment

ASSESSMENT CRITERIA:
1. Basic hand tools are lubricated and maintain properly upon completion of the job in line with the manufacturer’s specifications.
2. Defective hand tools are segregated and reported to the person concerned in line with the company standards.

CONTENTS:
- Maintaining and storing basic electrical hand tools:
  - Abrasive
  - Oil lubricant

CONDITIONS:
The following resources are needed:
- Tools
  - hacksaw pliers
  - diagonal cutting pliers
  - electrician’s knife
  - sharpening tools
  - sets of screw drivers
- Materials
  - lubricating materials
- Learning Materials
  - tools manuals and catalogs
  - learning elements
  - books
  - checklist
  - forms and writing materials

METHODOLOGIES:
- Demonstration
- Discussion

ASSESSMENT METHODS:
- Interview
- Written test
- Observation
<table>
<thead>
<tr>
<th>COURSE BUILDING</th>
<th>WIRING INSTALLATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIT OF COMPETENCY</td>
<td>PERFORM MENSURATIONS AND CALCULATIONS</td>
</tr>
<tr>
<td>MODULE TITLE</td>
<td>PERFORMING MENSURATIONS AND CALCULATION</td>
</tr>
<tr>
<td>NOMINAL DURATION</td>
<td>80 HOURS</td>
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<td>CERTIFICATE LEVEL</td>
<td>NC II</td>
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<tr>
<td>MODULE DESCRIPTION</td>
<td>This module covers the knowledge, skills, and desirable attitudes in identifying and measuring objects based on the required performance standards</td>
</tr>
</tbody>
</table>

**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module, the students should be able to:

- LO 1. select measuring tools and instruments.
- LO 2. carry out measurements and calculations.
LO 1. Select Measuring Tools and Instruments

**ASSESSMENT CRITERIA:**
1. Measuring instruments are selected according to the job requirements.
2. Measuring tools are selected/identified as per job requirements.

**CONTENTS:**
- Measuring instruments
  - multi-tester
  - clamp meter
  - megger
  - voltmeter
  - ammeter
  - kilowatt hour meter
- Measuring tools
  - metric rule
  - wire gauge
  - tri-square
  - branch rule
  - steel rule
  - straight edge

**CONDITIONS:**
The following resources are needed:
- Classroom for discussion
- Workplace location
- Problems to solve
- Measuring instruments
- Instructional materials relevant to the proposed activity

**METHODOLOGIES:**
- Actual demonstration
- Classroom discussion

**ASSESSMENT METHODS:**
- Written test
- Oral test
LO 2. Carry Out Measurements and Calculations

ASSESSMENT CRITERIA:
1. Systems of measurement are identified and converted according to the job requirements.
2. Electrical measuring instruments are selected according to the job requirements.
3. Proper handling of measuring instruments is strictly followed.
4. Workpieces are measured according to job requirements.

CONTENTS:
- Systems of measurement
  - English
  - Metric
- Measuring instruments
  - resistance reading
  - voltage reading
  - current reading
  - insulation resistance test
- Proper handling of measuring instruments

CONDITIONS:
The following resources are needed:
- Classroom for discussion
- Workplace location
- Problems to solve
- Measuring tools and instruments
- Work pieces
- Instructional materials relevant to the proposed activity

METHODOLOGIES:
- Lecture
- Group discussion
- Demonstration
- Self-paced instruction

ASSESSMENT METHODS:
- Written test
- Interview
- Direct observation
COURSE BUILDING : WIRING INSTALLATION
UNIT OF COMPETENCY : INTERPRET TECHNICAL DRAWINGS AND PLANS
MODULE TITLE : INTERPRETING TECHNICAL DRAWINGS AND PLANS
NOMINAL DURATION : 90 HOURS
CERTIFICATE LEVEL : NC II
MODULE DESCRIPTION : This module covers the knowledge, skills, and desirable attitudes in analyzing and interpreting symbols, data and work plans based on the required performance standards.

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the students should be able to:

LO 1. analyze signs, symbols, and data.
LO 2. interpret technical drawings and plans.
LO 3. apply freehand sketching.
LO 1. Analyze Signs, Symbols and Data

**ASSESSMENT CRITERIA**
1. Electrical signs, symbols, and data are identified according to the job specifications.
2. Work plans are drawn according to the specifications in the working/technical drawing.

**CONTENTS**
- Electrical symbols, signs, and data
- Reading electrical plans and blueprints

**CONDITIONS**
The following resources are needed:
- Classroom for discussion
- Workplace location
- Drawing instruments
- Measuring instruments
- Blueprints of plan
- Working drawing
- Instructional materials

**METHODOLOGIES**
- Demonstration
- Classroom discussion
- Self-paced learning

**ASSESSMENT METHODS**
- Written test
- Oral test
- Demonstration
LO 2. Interpret Technical Drawings and Plans

**ASSESSMENT CRITERIA:**
1. Necessary tools, materials, and equipment are identified according to a plan.
2. Components, assemblies, or objects are recognized as per job requirements.
3. Dimensions and specifications are identified according to the job requirements.

**CONTENTS:**
- Basic technical drawing
- Technical plans and schematic diagram
  - Symbols and abbreviations

**CONDITIONS:**
The following resources are needed:
- Classroom for discussion
- Workplace location
- Measuring instruments
- Blueprints of plan
- Instructional materials

**METHODOLOGIES:**
- Demonstration
- Classroom discussion
- Self-paced learning

**ASSESSMENT METHODS:**
- Written test
- Oral test
- Demonstration
- Direct observation
LO 3. Apply Freehand Sketching

ASSESSMENT CRITERIA
1. Correct freehand sketching is produced in accordance with the job requirements.
2. Work plan is drawn according to the specifications.

CONTENT
- Free hand sketching
- Preparation of electrical layout

CONDITIONS:
The following resources are needed:
- Pencil and paper
- Instructional materials

METHODOLOGIES:
- Classroom discussion
- Self-paced learning

ASSESSMENT METHODS:
- Direct observation
- Written test
- Oral test
COURSE BUILDING : WIRING INSTALLATION

UNIT OF COMPETENCY : OBSERVE PROCEDURES, SPECIFICATIONS, AND MANUALS OF INSTRUCTIONS

MODULE TITLE : OBSERVING PROCEDURES, SPECIFICATIONS, AND MANUALS OF INSTRUCTIONS

NOMINAL DURATION : 70 HOURS

CERTIFICATE LEVEL : NC II

MODULE DESCRIPTION : This module covers the knowledge, skills, and desirable attitudes in identifying, interpreting, applying services to specifications, manuals, and storing manuals.

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the students should be able to:
LO 1. identify, access, and interpret specifications/manuals.
LO 2. apply information obtained from manuals.
LO 3. store manuals.
LO 1. Identify, Access, and Interpret Specifications/Manuals

**ASSESSMENT CRITERIA:**
1. Manuals are identified and accessed as per job requirements.
2. Version and date of manual are checked to ensure correct specifications and procedures.
3. Relevant sections, chapters of specifications/manuals are located in relation to the work to be conducted.
4. Information symbols and procedures in the manual are interpreted in accordance with the industry practices.

**CONTENTS:**
- Types of manuals used in construction sector
- Access information and data

**CONDITIONS:**
The following resources are needed:
- Manuals/catalogues relative to construction sector
  - Manual of specifications
  - Repair manual
  - Maintenance manual
- Instructional materials

**METHODOLOGIES:**
- Discussion/Lecture
- Self-paced learning

**ASSESSMENT METHODS:**
- Written test
- Oral test
LO 2. Apply Information Obtained from Manuals

ASSESSMENT CRITERIA:
1. Work steps are correctly followed in accordance with the manufacturer’s specifications.
2. Manual data are applied according to the given task.
3. Adjustments are interpreted in accordance with the information contained in the manual or specifications.

CONTENTS:
- Identification of work steps and procedures
- Manual/specification application
- Interpreting specifications

CONDITIONS:
The following resources are needed:
- Classroom for discussion
- Manuals
- Workplace location
- Measuring instruments
- Instructional materials

METHODOLOGIES:
- Practical application
- Discussion
- Self-paced learning

ASSESSMENT METHODS:
- Demonstration
- Oral test
- Written test
LO 3. Store Manuals

**ASSESSMENT CRITERIA:**
1. Manuals are stored in a designated location.
2. Arrangement of stored manuals is implemented in accordance with the established policies.

**CONTENT:**
- Proper storing of manuals in accordance with the shop rules

**CONDITIONS:**
The following resources are needed:
- Kinds of manuals
  - manufacturer’s specification manual
  - repair manual
  - maintenance procedure manual
  - periodic maintenance manual
  - store area
  - learning materials

**METHODOLOGIES:**
- Practical application
- Discussion

**ASSESSMENT METHODS:**
- Oral test
- Written test
COURSE : BUILDING WIRING INSTALLATION
UNIT OF COMPETENCY : MAINTAIN TOOLS AND EQUIPMENT
MODULE TITLE : MAINTAINING TOOLS AND EQUIPMENT
NOMINAL DURATION : 50 HOURS
CERTIFICATE LEVEL : NC II

MODULE DESCRIPTION : This module covers the knowledge, skills and desirable attitudes in checking condition, performing preventive and corrective maintenance, and storing of tools and equipment based on the required performance standards.

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the students should be able to:

LO1. check condition of tools and equipments.
LO2. perform basic preventive and corrective maintenance.
LO3. store tools and equipment.
LO 1. Check Condition of Tools and Equipment

**ASSESSMENT CRITERIA:**
1. Tools and equipment are identified according to their classification and to the job requirements.
2. Non-functional tools and equipment are segregated and labeled according to their classification.
3. Safety of tools and equipment are observed in accordance with the manufacturer’s instructions.

**CONTENTS:**
- Types and classification of tools and equipment
- Identification of non-functional tools and equipment
- Safety practices
  - Use of Personal Protective Equipment (PPE)

**CONDITIONS:**
The following resources are needed:
- **Materials**
  - lubricants
  - cleaning materials
  - rust remover
  - rugs
  - spare parts
- **Tools and equipment**
  - cutting tools – back saw, cross cut saw, rip saw
  - boring tools – auger bit, gimlet bit, drill bit,
  - holding tools – vise grip, c-clamp, bench vise
  - electrical power tool
- **Measuring instruments/equipment**
- **Personal Protective Equipment (PPE)**
  - goggles
  - gloves
  - safety shoes
  - coveralls
  - hard hat

**METHODOLOGIES:**
- Lecture/multi-media presentation
- Self-paced instruction

**ASSESSMENT METHODS:**
- Written test
- Demonstration
- Oral test
LO 2. Perform Basic Preventive and Corrective Maintenance

ASSESSMENT CRITERIA:
1. Appropriate lubricants are identified according to the type of equipment.
2. Tools and equipment are lubricated according to the preventive maintenance schedule or to the manufacturer’s specification.
3. Measuring instruments are calibrated in accordance with the manufacturer’s instructions.
4. Tools are cleaned and lubricated according to the standard procedures.
5. Defective instruments, equipment, and accessories are inspected and replaced according to the manufacturer’s specifications.
6. Tools are inspected, repaired, and replaced after use.
7. Work place is cleaned and kept safe according to the Occupational Health and Safety (OHS) regulations.

CONTENTS:
- Types and uses of lubricants
- Preventive maintenance
- Good housekeeping (5S)

CONDITIONS:
The following resources are needed:
- Tools
  - cutting tools – back saw, cross cut saw, rip saw
  - boring tools – auger bit, brace, gimlet, hand drill
  - holding tools – vise grip, c-clamp, bench vise
  - measuring tools – pull-push rule, meter, ruler, zigzag rule
  - electrical power tools
- Personal Protective Equipment (PPE)
  - goggles
  - gloves
  - safety shoes
  - Coveralls
  - hard hat

METHODOLOGIES:
- Lecture
- Demonstration
- Self-paced learning

ASSESSMENT METHODS:
- Direct observation
- Written test
- Demonstration
LO 3. Store Tools and Equipment

ASSESSMENT CRITERIA:
1. Inventories of tools, instruments, and equipment are conducted and recorded as per shop practices.
2. Tools and equipment are stored in safe and appropriate locations in accordance with the manufacturer’s specifications or company procedures.
3. Workplace is cleaned and kept safe in line with the Occupational Health and Safety (OHS) regulations.

CONTENTS:
- Tools inventory
- Proper storing of tools and equipment
- Good housekeeping (5S)

CONDITIONS:
The following resources are needed:
- Forms
  - maintenance schedule form
  - requisition slip
  - inventory slip
  - inspection form
  - other related forms

METHODOLOGIES:
- Lecture
- Self-paced learning
- Practical application

ASSESSMENT METHODS:
- Written test
- Interview
- Demonstration
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<td>UNIT OF COMPETENCY</td>
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<td>MODULE TITLE</td>
<td>PREPARING ELECTRICAL POWER AND HYDRAULIC TOOLS</td>
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<tr>
<td>MODULE DESCRIPTION</td>
<td>This module covers the knowledge, skills, and desirable attitudes needed in preparing electrical power tools and hydraulic tools. It also covers topics in maintaining and storing electrical and hydraulic power tools.</td>
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<td>NOMINAL DURATION</td>
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**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module, the students should be able to:
- LO1. prepare electrical power tools.
- LO2. prepare hydraulic tools.
- LO3. store electrical power and hydraulic tools.
LO 1. Prepare Electrical Power Tools

ASSESSMENT CRITERIA:
1. Parts and functions of electrical power tools are identified in accordance with the manufacturer's manual.
2. Electrical power tools are inspected for damage in line with a prescribed checklist.
3. Defective parts, components, and accessories are replaced according to the manufacturer's specification.
4. Electrical power tools are stored in line with the manufacturer’s requirements.

CONTENTS:
- Parts and functions of electric portable hand drill, portable grinder, and power saw
- Indicators of defective power tools
- Procedures in checking the condition of tools

CONDITIONS:
The following resources are needed:
- Electrical power tools
  - power drills
  - portable grinder
  - power saw
- Lubricants
- Hydraulic tools
  - pipe bender
  - pipe
- Service report form
- Manufacturer’s manual
- Personal Protective Equipment (PPE)

METHODOLOGIES:
- Group Discussion
- Demonstration

ASSESSMENT METHODS:
- Written test
- Interview
LO 2. Prepare Hydraulic Tools

ASSESSMENT CRITERIA:
1. Parts and functions of hydraulic tools are identified in accordance with the manufacturer’s manual.
2. Hydraulic tools are inspected for damage in line with a prescribed checklist.
3. Defective parts, components, and accessories are replaced according to the manufacturer’s specifications.

CONTENTS:
- Parts and functions of hydraulic tools
  - pipe bender and hydraulic bender, hydraulic crimper
- Indicators of defective hydraulic tools
- Procedures in checking the condition of hydraulic tools
- Procedure in replacing bearings and gaskets of hydraulic tools

CONDITIONS:
The following resources are needed:
- Hydraulic tools
  - pipe bender
  - hydraulic bender
- Lubricating oil
- Replacement bearings
- Replacement gaskets
- Manufacturer’s manual
- Personal Protective Equipment (PPE)
- Requisition form

METHODOLOGIES:
- Group Discussion
- Lecture/Demonstration

ASSESSMENT METHODS:
- Demonstration
- Written test
- Performance test
LO 3. Store Electrical Power and Hydraulic Tools

**ASSESSMENT CRITERIA:**
1. Electrical and hydraulic tools are stored in line with the manufacturer’s requirements.
2. Safety procedure in using and storing tools is strictly followed according to the occupational health and safety procedure.
3. Electrical tools and equipment are safely stored in line with the prescribed requirements.
4. Tools are properly kept according to their classification.
5. Damaged tools are reported.

**CONTENTS:**
- Safety procedure in storing electrical power and hydraulic tools
- Safety procedures in handling electrical power and hydraulic tools
- Inventory of damaged tools

**CONDITIONS:**
The following resources are needed:
- Electrical power tools
  - power drills
  - portable grinder
  - power saw
- Hydraulic tools
  - pipe bender
  - hydraulic jack
- Manufacturer’s manual
- Personal Protective Equipment (PPE)
- Inventory form
- Tool cabinet

**METHODOLOGIES:**
- Group Discussion
- Demonstration

**ASSESSMENT METHODS:**
- Demonstration
- Written test
- Interview
MODULES OF INSTRUCTION

THIRD YEAR
COURSE : BUILDING WIRING INSTALLATION

UNIT OF COMPETENCY : INSTALL ELECTRICAL LIGHTING SYSTEM ON AUXILIARY OUTLETS AND LIGHTING FIXTURES

MODULE TITLE : INSTALLING ELECTRICAL LIGHTING SYSTEM ON AUXILIARY OUTLETS AND LIGHTING FIXTURES

NOMINAL DURATION : 200 HOURS

CERTIFICATE LEVEL : NC II

MODULE DESCRIPTION : This module covers the knowledge, skills, and desirable attitudes required in installing the lighting fixtures. Specifically, this module covers installation of knob and tube, Polyvinyl Chloride conduit (PVC) raceway/molding, rigid non-metallic conduit, flexible non-metallic conduit, fluorescent lighting fixtures, and incandescent lamps.

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the students should be able to:

   LO 1. lay out and install electrical wiring using knob and tube method.
   LO 2. lay out and install PVC raceway/molding.
   LO 3. lay out and install rigid non-metallic conduit.
   LO 4. lay out and install flexible non-metallic conduit.
   LO 5. assemble fluorescent lighting fixtures.
   LO 6. lay out and install fluorescent lighting fixtures.
   LO 7. lay out and install incandescent lamps.
   LO 8. lay out and install high intensity lamp.
LO 1. Lay Out and Install Electrical Wiring Using Knob and Tube Method

ASSESSMENT CRITERIA:
1. Electrical wiring is installed in line with the job requirements.
2. Electrical wiring is installed in line with Philippine Electrical Code/National Electrical Code (PEC/NEC).
3. Safety procedures in installing electrical wiring are strictly followed in line with the Occupational Safety and Health (OHS) Standards.

CONTENTS:
- PEC/NEC provisions in installing knob and tube wiring
- Safety procedures in installing electrical wiring using knob and tube
- Installing electrical wiring using knob and tube method

CONDITIONS:
The following resources are needed:
- Tools
  - linesman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - level bar
  - try square
  - push tape rule
  - claw hammer
  - Philips screwdriver
  - flat screwdriver
  - tool holster
- Supplies and Materials
  - switches
  - surface type
  - single pole
  - 3 way switch
  - 4 way switch
  - lamp socket
  - knob and tube
  - electrical tape
  - solid/stranded wires
  - fastening devices
  - bolts and nuts
- Learning Materials
  - learning elements
  - drawing plan
  - books, manuals, and catalogs
- Equipment
  - simulated work place or actual work place
  - ladder
- PPE
  - safety shoes
  - coverall
  - hard hat
  - gloves
  - goggles
METHODOLOGIES:
- Group discussion
- Demonstration

ASSESSMENT METHODS:
- Demonstration
- Written test
- Demonstration
LO 2. Lay Out and Install PVC Raceway/Molding

ASSESSMENT CRITERIA:
1. Materials, tools and equipment for installing Polyvinyl Chloride (PVC) conduit raceway are prepared in line with the job requirements.
2. PVC raceway is installed in line with the job requirements.
3. Workplace is cleaned and made safe upon completion of the job.
4. Philippine Electrical Code (PEC) provisions concerning PVC raceway installations are strictly followed.
5. Final report is prepared upon completion of the job.

CONTENTS:
- PVC raceway theories and principles
- Fastening devices
- Procedure in installing electrical molding
- PEC provisions concerning PVC raceway installations

CONDITIONS:
The following resources are needed:
- Tools
  - linesman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - level bar
  - try square
  - push tape rule
  - claw hammer
  - Philip screwdriver
  - flat screwdriver
  - plumb bob
  - hack saw
  - cold chisel
- Supplies and Materials
  - PVC molding
  - utility box or metal box
  - junction box
  - switches (flush type)
    - (S1 S2 S3 S3w S4w)
  - safety switch
  - solid and stranded wire
  - fastening devices
  - bolts and nuts
- Learning Materials
  - learning elements
  - drawing plan
  - books, manuals, and catalogs
- Equipment
  - simulated work place or actual work place
  - ladder
- Personal Protective Equipment (PPE)
METHODOLOGIES:
- Group discussion
- Lecture/Demonstration

ASSESSMENT METHOD:
- Demonstration
- Written test
- Demonstration
LO 3. Lay Out and Install Rigid Non-Metallic Conduit

ASSESSMENT CRITERIA:
1. Philippine Electrical Code (PEC) provisions in installing rigid non-metallic conduit are strictly followed.
2. Personal safety in installing rigid non-metallic conduit is followed.
3. Tools, materials, and equipment needed for the installation are prepared in line with the job requirements.
4. Rigid non-metallic conduit is installed in line with the job requirements.
5. Final report is prepared upon completion of the job.

CONTENTS:
- PEC provisions in installing rigid non-metallic conduit uses and application of rigid non-metallic conduit
- Cutting rigid non-metallic conduit to the required length
- Laying out and installing rigid non-metallic conduit

CONDITIONS:
The following resources are needed:
- Tools
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - level bar
  - try square
  - push tape rule
  - claw hammer
  - Philips screw driver
  - flat screw driver
  - hacksaw
  - heat gun
  - pipe vise
  - reamer
- Supplies and Materials
  - rigid non-metallic conduit (PVC)
  - locknut, bushing, adapters
  - straight connector
  - angular connector
  - utility box
  - junction box
  - switches (SPST, S3W, S4W)
  - lamp socket
  - solid stranded wires
  - PVC clamp
- Learning Materials
  - learning elements
  - drawing plan
  - books, manuals, and catalogs
- Equipment
  - simulated work place or actual work place
  - ladder
- Personal Protective Equipment (PPE)
METHODOLOGIES:
- Class/Group discussion
- Demonstration

ASSESSMENT METHODS:
- Written test
- Demonstration
LO 4. Lay Out and Install Flexible Non-Metallic Conduit

ASSESSMENT CRITERIA:
1. Philippine Electrical Code (PEC) provisions in installing flexible non-metallic conduit are strictly followed.
2. Uses and application of flexible non-metallic conduit are discussed according to the PEC.
3. Electrical flexible non-metallic conduit are leveled horizontally and vertically aligned to the structure specified within the job requirements.
4. Workplace is cleaned and made safe upon completion of work according to the established standards.
5. Tools, materials, and equipment needed for the installation are prepared in line with the job requirements.
6. Flexible non-metallic conduit is installed in line with the job requirements.
7. Final report is prepared upon completion of the job.

CONTENTS:
- PEC provisions in installing flexible non-metallic conduit
- Types, uses, and application of flexible non-metallic conduits and their electrical supports
- Preparing flexible non-metallic conduit for installation
- Lay out and installation of flexible non-metallic conduit

CONDITIONS:
The following resources are needed:
- Tools
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - level bar
  - try square
  - push tape rule
  - claw hammer
  - Philips screw driver
  - flat screw driver
  - hacksaw
  - heat gun
- Supplies and Materials
  - flexible non-metallic conduit
  - locknut, bushing, adapters
  - straight connector
  - angular connector
  - utility box
  - junction box
  - switches (SPST, S3W, S4W)
    - Single Pole, Single Throw Switch (SPST)
    - Three Way Switch (S3W)
    - Four Way Switch (S4W)
  - lamp socket
  - solid/stranded wires
  - electrical supports
• Learning Materials
  o learning elements
  o drawing plan
  o books, manuals, and catalogs
• Equipment
  o simulated work place or actual work place
  o ladder
• Personal Protective Equipment (PPE)

METHODODOLOGIES:
• Group Discussion
• Demonstration

ASSESSMENT METHODS:
• Demonstration
• Written test
LO 5. Assemble Fluorescent Lighting Fixtures

ASSESSMENT CRITERIA:
1. Fluorescent lighting fixtures are identified and described according to the specifications.
2. Parts and functions of fluorescent fixture are explained.
3. Sizes, shapes, and ratings of fluorescent lighting fixtures are identified and described.
4. Schematic diagram of fluorescent lighting fixtures is interpreted.
5. Tools, instruments, and materials are selected in line with the job requirements.
6. Fluorescent lighting fixtures are assembled in line with the job requirements.
7. Fluorescent lighting fixtures are wired according to the schematic diagram.
8. Workplace is cleaned and made safe upon completion of the job.

CONTENTS:
- Principle and operation of fluorescent lamp
- Characteristics of fluorescent lighting fixtures
- Parts and functions of fluorescent lighting fixtures
- Interpretation of schematic diagram of fluorescent lighting fixtures
- Fluorescent sizes, shapes, and ratings available in the market
- Different kinds of ballasts used in fluorescent fixture
- Factors that affect the life span of fluorescent fixtures
- Procedure in assembling fluorescent lighting fixtures

CONDITIONS:
The following resources are needed:
- Tools
  - lineman's pliers
  - long nose pliers
  - diagonal cutting pliers
  - Philips screwdriver
  - flat screwdriver
- Supplies and Materials
  - electrical tape
  - ballasts
  - fluorescent tube
  - fluorescent lamp holder
  - starter
  - starter holder
  - wires
  - fluorescent frame
- Learning Materials
  - learning elements
  - drawing plan
  - books, manuals, and catalogs
- Philippine Electrical Code
- Equipment
  - simulated work place or actual work place
  - multi-tester
- Personal Protective Equipment (PPE)
METHODOLOGIES:

- Group Discussion
- Demonstration

ASSESSMENT METHODS:

- Written test
- Demonstration
LO 6. Lay Out and Install Fluorescent Lighting Fixtures

**ASSESSMENT CRITERIA:**
1. Materials, tools, and instruments are prepared in accordance with the job requirements.
2. Functionality of fluorescent lighting fixtures is checked and tested in accordance with the plan specifications.
3. Fluorescent lighting fixtures are installed in line with the job requirements.
4. Switching control is applied in accordance with the work plan.
5. Workplace is cleaned and made safe upon completion of the job.

**CONTENTS:**
- Preparation of materials, tools and instruments
- Application of switches in controlling lights
- Procedures of mounting/installing of recessed/surfaced fluorescent lighting fixtures

**CONDITIONS:**
The following resources are needed:
- Tools
  - lineman’s pliers
  - long nose pliers
  - Philips screwdriver
  - flat screwdriver
  - gimlet
  - hammer
  - metric rule
  - level bar
  - try square
- Supplies and Materials
  - electrical tape
  - switches
  - fluorescent fixtures
  - wires
- Learning Materials
  - learning elements
  - books
  - manuals
  - wiring plan
- Equipment Supplies
  - wiring booth
  - multi-tester
- Personal Protective Equipment (PPE)

**METHODOLOGIES:**
- Group Discussion
- Demonstration

**ASSESSMENT METHODS:**
- Demonstration
- Written test
LO 7. Lay Out and Install Incandescent Lamps

**ASSESSMENT CRITERIA:**
1. Types and sizes of incandescent lamps are identified.
2. Tools, instruments, and materials are selected and identified according to the job requirements.
3. Incandescent lamps are installed according to the plan.
4. Correct sizes of lamp sockets are strictly followed as per job requirements.

**CONTENTS:**
- Principle and operation of incandescent lamp
- Types and sizes of incandescent lamps
- Uses of incandescent lamps
- Procedure in installing incandescent lamps

**CONDITIONS:**
The following resources are needed:
- Tools
  - Lineman’s pliers
  - long nose pliers
  - Philips screwdriver
  - flat screwdriver
  - diagonal cutting pliers
  - hammer
  - gimlet
- Supplies and Materials
  - electrical tape
  - incandescent lamp
    - large lamp
    - miniature lamp
    - photographic lamp
  - receptacle
  - switches
  - wiring support
  - wires
- Learning Materials
  - learning elements
  - books
  - manuals
  - wiring plan
- Equipments Supplies
  - wiring booth
  - multi-tester
- Personal Protective Equipment (PPE)

**METHODOLOGIES:**
- Class/Group Discussion
- Demonstration

**ASSESSMENT METHODS:**
- Demonstration
- Written test
LO 8. Lay Out and Install High Intensity Lamp

ASSESSMENT CRITERIA:
1. Types and sizes of high intensity lamps are identified.
2. Tools, instruments and materials are selected and identified according to the job requirement.
3. High intensity lamps are installed according to the plan
4. Correct size of lamp sockets are strictly followed as per job requirements.

CONTENTS:
- Principles and operation of high intensity lamp
- Kinds of high intensity discharge lamp
- Procedure of installing high intensity lamp

CONDITIONS:
The following resources are needed:
- Tools
  - Lineman’s pliers
  - long nose pliers
  - Philips screwdriver
  - flat screwdriver
  - diagonal cutting plier
  - hammer
  - gimlet
- Supplies and Materials
  - electrical tape
  - incandescent lamp
  - flood light
  - track light
  - receptacle
  - switches
  - wiring support
  - wires
- Learning Materials
  - learning elements
  - books
  - manuals
  - wiring plan
- Equipments Supplies
  - wiring booth
  - multi-tester
- Personal Protective Equipment (PPE)

METHODOLOGIES:
- Class/Group Discussion
- Demonstration

ASSESSMENT METHODS:
- Demonstration w/ questioning
- Written test
COURSE : BUILDING WIRING INSTALLATION

UNIT OF COMPETENCY : INSTALL WIRING DEVICES FOR FLOOR AND GROUND FAULT CURRENT INTERRUPTING OUTLETS

MODULE TITLE : INSTALLING WIRING DEVICES FOR FLOOR AND GROUND FAULT CURRENT INTERRUPTING OUTLETS

NOMINAL DURATION : 100 HOURS

CERTIFICATE LEVEL : NC II

MODULE DESCRIPTION : This module covers the knowledge, skills, and desirable attitudes required in selecting, installing, and documenting floor outlets and ground fault current interrupting outlets. Specifically, this module covers installation of electrical boxes on wood, metal studs and concrete walls, fabricate special support, installing wiring devices.

SUMMARY OF LEARNING OUTCOMES:
Upon completion of this module, the students should be able to:
   LO 1. lay out and install electrical boxes on wood, metal studs, and concrete walls.
   LO 2. select wiring devices.
   LO 3. lay out and install wiring devices.
LO 1. Lay out and Install Electrical Boxes on Wood, Metal Studs, and Concrete Walls

ASSESSMENT CRITERIA:
1. Boxes are selected according to capacity rating listed in the Philippine Electrical Code (PEC).
2. Electrical boxes are installed according to the job requirements and PEC standards.
3. Electrical boxes are identified and selected as per job requirements.
4. Boxes are knocked out in line with the job requirements.
5. Boxes are mounted and vertically/horizontally aligned.
6. Workplace is cleaned and made safe upon completion of the job.
7. Final report is prepared upon completion of the job.

CONTENTS:
- PEC provisions on installing boxes
- Types of electrical boxes
- Clips, supports, and fastening devices for boxes on woods, metal studs, and concrete walls
- Installing electrical boxes

CONDITIONS:
The following resources are needed:
- Tools
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - level bar
  - try square
  - screwdrivers
  - push tape rule
  - claw hammer
  - Philips screwdriver
  - flat screwdriver
  - chalk line reel
  - plumb bob
  - cross cut saw
  - cold chisel
  - riveter
- Supplies and Materials
  - boxes and fittings
  - utility box
  - junction box
  - fastening devices
  - clips and caddy
- Learning Materials
  - learning elements
  - drawing plan
  - books, manuals, and catalogs
- Equipment
  - simulated work place or actual work place
  - ladder
- portable electric drill

**METHODOLOGIES:**
- Demonstration
- Discussion

**ASSESSMENT METHODS:**
- Demonstration
- Interview
LO 2. Select Wiring Devices

ASSESSMENT CRITERIA:
1. Wiring devices are selected according to the job requirements.
2. Wiring devices are inspected for damage according to the manufacturer's specifications.

CONTENTS:
- Selection of wiring devices
  - Ground Floor Current Interrupter (GFCI) protected outlets
  - Floor outlets

CONDITIONS:
The following resources are needed:
- Supplies and Materials
  - wiring devices
- Learning Materials
  - learning elements
  - drawing plan
  - books, manuals, and catalogs

METHODOLOGIES:
- Demonstration
- Discussion
- Research

ASSESSMENT METHODS:
- Interview
- Written test
- Demonstration
LO 3. Lay Out and Install Wiring Devices

ASSESSMENT CRITERIA:
Wiring devices are installed according to the latest edition of the Philippine Electrical Code (PEC) and National Electrical Code (NEC).
1. Wiring devices are installed according to the job requirements
2. Devices for floor and ground fault circuit interrupter outlets are wired.
3. Working drawing circuit is checked for operation based on the established procedure.
4. Safety procedures in installing wiring devices are strictly observed according to the Occupational Health Standard (OHS) guidelines and procedures.

CONTENTS:
- PEC provisions on wiring devices
- Work plan reading
- Procedures in installing wiring devices
- Safety measures in installing wiring devices
- Ground Fault Current Interrupter (GFCI) protected outlets

CONDITIONS:
The following resources are needed:
- Equipment
  - wiring booth
  - ladder
  - portable electric drill
- Tools
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - level bar
  - try square
  - screwdrivers
  - push tape rule
  - claw hammer
  - Philips screwdriver
  - flat screw driver
  - chalk line reel
  - plum bob
  - cross cut saw
  - cold chisel
- Supplies and Materials
  - boxes and fittings
  - utility box
  - junction box
  - fastening devices
  - clips and caddy
  - floor outlet
  - GFCI outlet
  - wires
- Learning Materials
  - learning elements
Competency-Based Curriculum
Electrical Installation and Maintenance NC II
### COURSE
BUILDING WIRING INSTALLATION

### UNIT OF COMPETENCY
INSTALL ELECTRICAL PROTECTION SYSTEM FOR LIGHTING AND GROUNDING

### MODULE TITLE
INSTALLING ELECTRICAL PROTECTION SYSTEM FOR LIGHTING AND GROUNDING

### NOMINAL DURATION
100 HOURS

### CERTIFICATE LEVEL
NC II

### MODULE DESCRIPTION
This module covers the knowledge, skills, and desirable attitudes required in installing electrical protection systems. Specifically, this module covers installation of fuse panels and installation of panel boards.

### SUMMARY OF LEARNING OUTCOMES:
Upon completion of this module, the students should be able to:
- LO 1. lay out and install fuse panel.
- LO 2. lay out and install panel board.
- LO 3. lay out and install conventional atmospheric lightning protection and grounding system.
LO 1. Lay Out and Install Fuse Panel

**ASSESSMENT CRITERIA:**
1. Tools and materials for installing fuse panels are selected in line with the job requirements.
2. Fuse panel is installed according to the job requirements.
3. Safety procedures are strictly followed according to the Occupational Health and Safety (OHS) Standard.
4. Electrical conductors on fuse panel are properly harnessed in line with the established standards.
5. Workplace is cleaned upon the completion of the job.

**CONTENTS:**
- Philippine Electrical Code (PEC) provisions for circuit protection
- Tools for installing fuse panels
- Uses and classification of fuse
- Fuse rating
- Fastening materials
- Procedures in harnessing electrical conductors
- Advantage/disadvantage of fuse over circuit breaker
- Functions of fuse in electrical circuits
- Installing fuse panels

**CONDITIONS:**
The following resources are needed:
- **Tools**
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - level bar
  - try square
  - push tape ruler
  - claw hammer
  - Philips screwdriver
  - flat screwdriver
- **Equipment**
  - wiring booth
  - ladder
  - electrical drill
- **Materials**
  - different kinds and types of fuse
  - fastening materials
  - fuse panel (enclosure)
- **Learning Materials**
  - learning elements
  - drawing plan/sketch
  - diagrams
  - books, manuals, and catalogs
- **Personal Protective Equipment (PPE)**
METHODOLOGIES:

- Lecture/Discussion
- Demonstration

ASSESSMENT METHOD:

- Demonstration
- Written exam
LO 2. Lay out and Install Panel Board

**ASSESSMENT CRITERIA:**
1. Tools and materials for installing panel boards, are prepared in line with the job requirements.
2. Panel boards are installed according to the job requirements.
3. Electrical conductors are properly harnessed in line with the established standards.
4. Safety procedures are strictly followed according to the Occupational Health and Safety Standard (OHSS).
5. Panel board is knocked out in line with the job requirements.
6. Workplace is cleaned upon completion of the job.

**CONTENTS:**
- Principles of operation, uses and classification of circuit breakers and panel boards
- Advantage/disadvantage of circuit breaker over fuse
- Functions of circuit breaker in electrical circuits
- Standard ampere rating of circuit breakers
- Factors to consider when replacing circuit breakers
- Philippine Electrical Code (PEC) provisions in installing panel board
- Installing panel board

**CONDITIONS**
The following resources are needed:
- **Tools**
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - level bar
  - tri square
  - push tape rule
  - claw hammer
  - Philips screw driver
  - flat screw driver
  - knock out puncher
  - adjustable wrench
- **Equipment**
  - simulated work place or actual work place
- **Personal Protective Equipment (PPE)**
- **Materials**
  - types of circuit breakers
  - fastening materials
  - panel board
- **Learning Materials**
  - learning elements
  - drawing plan/sketch
  - diagrams
  - books, manuals, and catalogs
METHODOLOGIES:
- Lecture/Discussion
- Demonstration

ASSESSMENT METHODS:
- Demonstration
- Written exam
LO 3. Lay out and Install Conventional Atmospheric Lightning Protection and Grounding System

ASSESSMENT CRITERIA:
1. Tools and materials for installing lightning protection, are prepared in line with job requirements.
2. Conventional atmospheric lightning protection and grounding system are installed according to the job requirement.
3. Safety procedures are strictly followed according to the Occupational Health and Safety standard (OHSs).
4. Workplace is cleaned upon completion of the job.

CONTENTS:
- Theory of lightning protection
- Basis of convention lightning protection system
- Primary components of lightning protection system

CONDITIONS
The following resources are needed:
- Tools
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - push tape rule
  - claw hammer
  - Philips screw driver
  - flat screw driver
- Equipment
  - actor workplace
- Materials
  - lightning arrestor
  - conductors
  - fastening materials
- Learning Materials
  - learning elements
  - drawing plan/sketch
  - diagrams
  - books, manuals, and catalogs

METHODOLOGIES:
- Discussion
- Demonstration

ASSESSMENT METHODS:
- Demonstration
- Written exam
- Interview
MODULES OF INSTRUCTION

FOURTH YEAR
### COURSE
: BUILDING WIRING INSTALLATION

### UNIT OF COMPETENCY
: PERFORM ROUGHING-IN ACTIVITIES FOR COMMUNICATION AND DISTRIBUTION SYSTEM

### MODULE TITLE
: PERFORMING ROUGHING-IN ACTIVITIES FOR COMMUNICATION AND DISTRIBUTION SYSTEM

### MODULE DESCRIPTION
: This module covers the knowledge, skills, and desirable attitudes needed to perform roughing-in activities for communication and distribution system. Specifically, this module covers installation of telephone terminals cabinet and frames, wire ways, cable tray, and cable bridge.

### NOMINAL DURATION
: 80 HOURS

### CERTIFICATE LEVEL
: NC II

### SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the students should be able to:
- LO 1. lay out and install telephone terminal cabinet and frames.
- LO 2. lay out and install wire ways.
- LO 3. lay out and install cable tray/cable bridge.
LO 1. Lay out and Install Telephone Terminal Cabinet and Frames

**ASSESSMENT CRITERIA:**
1. Philippine Electrical Code (PEC) provisions in the uses, application, and installation of telephone terminal cabinets are strictly followed.
2. Telephone terminal cabinets are leveled horizontally and vertically aligned to the structure specified within the job requirements.
3. Telephone terminal cabinet is installed in line with the job requirements.
4. Tools, materials, and equipment needed for the installation are prepared in line with the job requirements.
5. Personal safety in installing telephone terminal cabinet is followed.
6. Workplace is cleaned and made safe upon the completion of work according to the established standards.

**CONTENTS:**
- PEC provisions in installing telephone terminal cabinet
- Laying out telephone cabinet and frames
- Specifications of materials, tools, and equipment needed in installing telephone terminal cabinet and frames
- Procedure in installing telephone terminal cabinet and frames

**CONDITIONS:**
The following resources are needed:
- **Tools**
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - level bar
  - try square
  - push tape rule
  - claw hammer
  - Philips screwdriver
  - flat screw driver
  - chalk line reel
  - plumb bob
  - cross cut saw
  - cold Chisel
- **Supplies and Materials**
  - telephone terminal cabinets
  - frames
  - fittings
  - adhesive solvent
  - fastening devices
    - bolts and nuts
    - screw with tox
- **Learning Materials**
  - learning elements
  - drawing plan
  - books, manuals, and catalogs
- **Simulated work place or actual work place**
METHODOLOGIES:
- Group Discussion
- Demonstration
- Location visit

ASSESSMENT METHODS:
- Demonstration
- Written test
LO 2. Lay out and Install Wire Ways

**ASSESSMENT CRITERIA:**
1. Philippine Electrical Code (PEC) provisions in the use, application, and installation of wire ways are strictly followed.
2. Tools, materials, and equipment needed for the installation are prepared in line with the job requirements.
3. Wire ways are installed in line with the job requirements.
4. Personal safety in installing wire ways is observed.
5. Workplace is cleaned and made safe upon completion of work according to the established standards.

**CONTENTS:**
- PEC provisions in installing wire ways
- Types of wire ways
- Laying out wire ways
- Procedure in installing wire ways

**CONDITIONS:**
The following resources are needed:
- **Tools**
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - level bar
  - tri square
  - push tape rule
  - claw hammer
  - set of screw drivers
    - Philips screwdriver
    - flat screw driver
  - chalk line reel
  - plumb bob
  - hack saw
  - cold chisel
- **Supplies and Materials**
  - wire ways/c-furling
  - flat bar/brackets
  - fastening device for wood, concrete and steel
- **Learning Materials**
  - learning elements
  - drawing plan
  - books, manuals, and catalogs
- **Equipment**
  - ladder
- **Simulated work place or actual work place**

**METHODOLOGIES:**
- Group discussion
- Lecture-demonstration
- Location visit
ASSESSMENT METHODS:
- Demonstration
- Written test
LO 3. Lay out and Install Cable Tray/Cable Bridge

**ASSESSMENT CRITERIA:**
1. Philippine Electrical Code (PEC) provisions in cable tray/cable bridge are strictly followed.
2. Tools, materials, and equipment needed for the installation are prepared in line with the job requirements.
3. Cable tray/cable bridge is installed in line with the job requirements.
4. Personal safety in installing cable tray/cable bridge is followed according to the established standards.
5. Final report is prepared upon completion of the job.

**CONTENTS:**
- PEC provisions in installing cable tray/cable bridge
- Types, uses, and application of cable tray/cable bridge and their electrical supports
- Different types of cable tray fittings
- Preparing cable tray/cable bridge for installation
- Laying out and installing cable tray/cable bridge

**CONDITIONS:**
The following resources are needed:
- **Tools**
  - lineman's pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - level bar
  - tri square
  - push tape ruler
  - claw hammer
  - Set of screwdrivers
    - Philips screwdriver
    - flat screwdriver
  - chalk line reel
  - plumb bob
  - cross cut saw
  - cold chisel
  - hack saw
- **Supplies and Materials**
  - cable tray
  - cable bridge
  - flat bar/brackets
  - Fastening device for wood, concrete and steel
- **Learning Materials**
  - learning elements
  - drawing plan
- **Equipment**
  - ladder
- Simulated work place or actual work place
**METHODOLOGIES:**
- Group discussion
- Demonstration
- Location visit

**ASSESSMENT METHOD:**
- Demonstration
- Written test
COURSE: BUILDING WIRING INSTALLATION

UNIT OF COMPETENCY: PERFORM ROUGHING-IN ACTIVITIES FOR COMMUNICATION AND DISTRIBUTION SYSTEMS

MODULE TITLE: PERFORMING ROUGHING-IN ACTIVITIES FOR COMMUNICATION AND DISTRIBUTION SYSTEM USING ELECTRICAL METALLIC CONDUIT

NOMINAL DURATION: 120 HRS

CERTIFICATE LEVEL: NC II

MODULE DESCRIPTION: This module covers the knowledge, skills and desirable attitudes needed to install different types of metallic conduit. Specifically, skills development is focused on installation of electrical metallic tubing, installing rigid steel conduit, and installing intermediate metal conduit.

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the students should be able to:
LO1. lay out and install electrical metallic tubing.
LO2. lay out and install rigid metal conduit.
LO3. lay out and install flexible metal conduit.
LO4. lay out and install intermediate metal conduit.
LO 1. Lay out and Install Electrical Metallic Tubing

ASSESSMENT CRITERIA:
1. Philippine Electrical Code (PEC) provisions in installing Electrical Metallic Tubing (EMT) are strictly followed.
2. Tools, equipment, and materials needed for the installation are prepared in line with the job requirements.
3. Electrical metallic tubing bends are free from any defects according to the job requirements and to the specifications and Occupational Health Standard (OHS).
4. Electrical metallic tubing is installed according to the job requirements and specifications of the OHS.
5. Personal Safety in installing EMT is observed.
6. Workplace is cleaned and made safe upon the completion of work according to the established standard.
7. Final report is prepared upon completion of the job.

CONTENTS:
- PEC provisions on EMT
- Preparing EMT for installation
- Laying out and installing electrical metallic tubing
- Measurement of length and diameter
- Written report

CONDITIONS:
The following resources are needed:
- Tools
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - level bar
  - tri square
  - measuring tools
  - claw hammer
  - set of screwdrivers
  - chalk line reel
  - pipe vise
  - hack saw
  - pipe cutter
  - conduit bender/hickey
  - reamer
  - round file
  - dies and dies stock (pipe threader)
  - oiler
- Supplies and Materials
  - electrical metallic tubing
  - lock nuts
  - fastening devices
  - metal strap (saddle)
  - utility box
  - junction box
  - fastening devices
Strengthened Technical-Vocational Education Program

- conduit fitting

Learning Materials
- learning elements
- drawing plan/job order
- books, manuals, and catalogs

Equipment
- ladder
- portable electric drill

Facilities
- simulated work place or actual work place
- wiring booth/wiring board

**METHODOLOGIES:**
- Group discussion
- Demonstration

**ASSESSMENT METHODS:**
- Demonstration
- Written test
LO 2. Lay out and Install Rigid Metal Conduit

ASSESSMENT CRITERIA:
1. Uses and application of rigid steel conduit are strictly followed according to the Philippine Electrical Code (PEC) standard.
2. Tools/equipment and materials needed for the installation are prepared in line with the job requirements.
3. Rigid metal conduit bends are free from any defects according to the established standards.
4. Rigid Metal Conduit (RMC) is installed according to the job requirements and specifications.
5. RMC support is fabricated according to the job requirements.
6. Personal safety in installing RMC is observed.
7. Workplace is cleaned and made safe upon the completion of job according to the established standard.
8. Final report is prepared upon the completion of the job.

CONTENTS:
- PEC provisions on RMC
- Preparation of RMC for installation
- Measurement of length and diameter
- Types of conduit support
- Layout and installation of RMC

CONDITIONS:
The following resources are needed:
- Tools
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - level bar
  - tri square
  - measuring tools
  - claw hammer
  - set of screw drivers
  - chalk line reel
  - pipe vise/tripod
  - hack saw
  - dies and dies stock (pipe threader)
    - pipe bender/hickey
    - pipe cutter
    - oiler
    - round file
- Supplies and Materials
  - rigid metal conduit
  - lock nuts and bushing
  - fastening devices
  - metal strap
  - utility box
  - junction box
  - fastening devices
  - conduit
• Learning Materials
  o learning elements
  o drawing plan
    ▪ books, manuals, and catalogs
• Equipment
  o ladder
  o portable electric drill
• Facilities
  o simulated work place or actual work place
  o wiring booth/wiring board

**METHODOLOGIES:**
• Group discussion
• Demonstration

**ASSESSMENT METHOD:**
• Demonstration
• Written test
LO 3. Lay Out and Install Flexible Metal Conduit

**ASSESSMENT CRITERIA:**
1. Philippine Electrical Code (PEC) provisions in installing Flexible Metal Conduit (FMC) are strictly followed.
2. Tools and equipment needed for the installation are prepared in line with the job requirements.
3. Flexible metallic conduit is installed in line with the job requirements.
4. Personal safety in installing FMC is observed.
5. Workplace is cleaned and made safe upon the completion of work according to the established standard.
6. Final report is prepared upon the completion of the job.

**CONTENTS:**
- PEC provisions in installing FMC
- Preparation of flexible metallic conduit
- Laying out and installing flexible metallic conduit

**CONDITIONS:**
The following resources are needed:
- **Tools**
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - gimlet
  - level bar
  - tri square
  - measuring tools
  - claw hammer
  - set of screw drivers
  - chalk line reel
  - hack saw
- **Supplies and Materials**
  - electrical flexible metallic tubing
  - lock nuts
  - fastening devices
  - metal strap
  - fastening devices
  - lock nut and bushing
  - conduit fitting
  - utility box
  - junction box
  - fastening devices
- **Learning Materials**
  - learning elements
  - drawing plan
  - books, manuals, and catalogs
- **Equipment**
  - ladder
  - portable electric drill
- **Facilities**
  - simulated work place or actual work place
  - wiring booth
METHODOLOGIES:
- Group discussion
- Demonstration

ASSESSMENT METHODS:
- Demonstration
- Written test
LO 4. Lay out and Install Intermediate Metal Conduit

ASSESSMENT CRITERIA:
1. Philippine Electrical Code (PEC) provisions in installing Intermediate Metal Conduit (IMC) are strictly followed.
2. Tools, equipment, and materials needed for the installation are prepared in line with the job requirements.
3. Bending of intermediate metal conduit is performed in accordance with the prescribed procedure and work requirements.
4. IMC is installed according to the job requirements and specifications.
5. Workplace is cleaned and made safe upon the completion of work according to the established standard.
6. Final report is prepared upon the completion of the job.

CONTENTS:
• PEC provisions in installing IMC
• Uses and application of intermediate metallic conduit
• Cutting intermediate metal conduit to the required length
• Bending, threading and reaming intermediate metal conduit.
• Laying out and installing intermediate metal conduit

CONDITIONS:
The following resources are needed:
• Tools
  o lineman’s pliers
  o long nose pliers
  o diagonal cutting pliers
  o gimlet
  o level bar
  o tri square
  o metric rule
  o claw hammer
  o set of screw drivers
  o chalk line reel
  o pipe vise
  o hack saw
  o dies and dies stock (pipe threader)
  o pipe bender/hickey
  o oiler
• Supplies and Materials
  o IMC pipe
  o lock nuts and bushing
  o fastening devices
  o metal strap
  o utility box
  o junction box
  o fastening device
  o conduit fitting
• Learning Materials
  o learning elements
  o drawing plan
  o books, manuals, and catalogs
• Equipment  
  o ladder  
  o portable electric drill  
• Facilities  
  o simulated work place or actual work place  
  o wiring booth  

**METHODOLOGIES:**  
• Group discussion  
• Demonstration  

**ASSESSMENT METHODS:**  
• Demonstration  
• Written test
**COURSE**: BUILDING WIRING INSTALLATION

**UNIT OF COMPETENCY**: INSTALL COMMUNICATION, SIGNALING DEVICES AND REMOTE CONTROL SYSTEM ON AUXILIARY EQUIPMENT

**MODULE TITLE**: INSTALLING COMMUNICATION, SIGNALING DEVICES AND REMOTE CONTROL SYSTEM ON AUXILIARY EQUIPMENT

**NOMINAL DURATION**: 100 HOURS

**CERTIFICATE LEVEL**: NC II

**MODULE DESCRIPTION**: This module covers the knowledge, skills, and desirable attitudes needed to install communication, signaling devices, and remote control system on auxiliary equipment. Specifically, it covers installation of alarm system: an intercom, relay, and magnetic contactor system.

**SUMMARY OF LEARNING OUTCOMES**: Upon completion of this module, the students should be able to:

1. **LO1.** Lay out and install alarm system.
2. **LO2.** Lay out and install intercommunication system.
3. **LO3.** Lay out and install relay and magnetic starter.
LO 1. Lay out and Install Alarm System

ASSESSMENT CRITERIA:
1. Alarm devices are mounted in line with the working drawing, Philippine Electrical Code (PEC) standards, and the prescribed procedure.
2. Types of sensors and detectors are identified according to this application.
3. Condition of alarm devices are tested in line with the manufacturer’s instructions.
4. Alarm system is wired following the prescribed procedure and working drawing.

CONTENTS:
- PEC provision in installing signal and alarm system
- Parts of electric bells, buzzers on chimes
- Procedure in installing annunciator system

CONDITIONS:
The following resources are needed:
- Tools
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - set of screwdrivers
  - chalk line reel
- Supplies and Materials
  - buzzer, electric bells, and/or electric chimes
  - lamps with receptacle
  - wire connector
- Learning Materials
  - learning elements
  - video clip related to alarm system
  - drawing plan/job order
  - books, manuals, and catalogs
- Equipment
  - wiring booth
  - multi-tester
  - annunciator (control simulator)
- Facilities
  - Simulated work place or actual work place
**METHODOLOGIES:**
- Group discussion
- Demonstration
- Film viewing

**ASSESSMENT METHODS:**
- Demonstration
- Written test
LO 2. Lay out and Install Intercommunication System

ASSESSMENT CRITERIA:
1. Intercom wirings are installed in accordance with the latest provision of the Philippine Electrical Code (PEC).
2. Personal Protective Equipment (PPE) are selected and used.
3. Intercom diagram is read and installed in accordance with the job requirement.
4. Work scheduled activity is strictly followed to ensure the completion of work at an agreed time.
5. Workplace is cleaned and made safe upon the completion of the job.
6. Final report is prepared upon the completion of the job.

CONTENTS:
- PEC provisions in installing intercom system
- Specification of tools, materials, and equipment used in installation of intercom system
- Reading simple intercom diagram
- Procedure in installing intercom system
- Safety precautions in installing intercom system

CONDITIONS:
The following resources are needed:

- Tools
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - set of screwdrivers
  - chalk line reel
  - crimper

- Supplies and Materials
  - intercom set including master panel and power supply
  - intercom wires (8 pairs)
  - wire connector

- Learning Materials
  - learning elements
  - drawing plan/job order
  - books, manuals, and catalogs

- Equipment
  - ladder
  - multi-tester
  - intercom trainer
  - wiring booth/wiring board
  - control simulator

- Facilities
  - simulated work place or actual work place
  - installed wire ways and cabinets for intercom system

METHODOLOGIES:
- Group discussion
- Demonstration
ASSESSMENT METHODS:
- Demonstration
- Written test
LO 3. Lay out and Install Relay and Magnetic Starter

ASSESSMENT CRITERIA:
1. Parts and function of relay and magnetic contractor are identified.
2. Control system is installed in line with the job requirements.
3. Work area is cleaned and made safe upon the completion of job.
4. Work report is prepared in line with the established policy.

CONTENTS:
- Parts and operations of:
  - relay
  - magnetic contractor
- Parts and operations of:
  - photo electric sensors
  - motion detector
  - smoke detector

CONDITIONS:
The following resources are needed:
- Tools
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - set of screw drivers
- Supplies and Materials
  - relay
  - magnetic contractor
  - push button switch
  - light indicator
  - overload relay
  - smoke detector
  - photoelectric scissors
  - motion detector
- Learning Materials
  - learning elements
  - drawing plan
  - books, manuals, and catalogs
- Equipment
  - wiring booth
  - multi-tester
  - control simulator
- Facilities
  - simulated work place or actual work place
  - installed wire ways and cabinets for intercom system

METHODOLOGIES:
- Group discussion
- Demonstration
ASSESSMENT METHODS:

- Demonstration
- Written test
COURSE : BUILDING WIRING INSTALLATION

UNIT OF COMPETENCY : COMMISSION INSTALLED ELECTRICAL SYSTEM

MODULE TITLE : COMMISSIONING INSTALLED ELECTRICAL SYSTEM

NOMINAL DURATION : 100 HOURS

CERTIFICATE LEVEL : NC II

MODULE DESCRIPTION : This module covers the knowledge, skills, and desirable attitudes needed to commission electrical system. Specifically, it covers open circuit detection, short circuit detection, supply voltage verification, insulation testing, earth fault detection, system finalization, and reporting.

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the students should be able to:

- **LO1.** perform preliminary activities in commissioning.
- **LO2.** perform testing of electrical system.
- **LO3.** finalize commissioning activities.
LO 1. Perform Preliminary Activities in Commissioning

**ASSESSMENT CRITERIA:**
1. Scope of work is confirmed to ensure clear understanding of the job elements.
2. Planning on commissioning activity is performed in line with the work requirements.
3. Materials, tools, and equipment needed in commissioning are prepared according to the work requirements.

**CONTENTS:**
- Different work activities needed in commissioning
- Equipment needed in commissioning
  - Insulation tester (megger)
  - Phase sequence tester
  - Multi-tester

**CONDITIONS:**
The following resources are needed:
- Tools
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - set of screwdrivers
  - chalk line reel
- Supplies and Materials
  - incandescent bulb
  - fluorescent bulb
  - fastening devices
- Learning Materials
  - learning elements
  - drawing plan
  - books, manuals, and catalogs
- Equipment
  - ladder
  - multi-tester
  - phase sequence tester
  - insulation tester (megger)
- Facilities
  - simulated work place or actual work place
  - installed electrical system

**METHODOLOGIES:**
- Group discussion
- Demonstration
- Role playing

**ASSESSMENT METHODS:**
- Demonstration
- Written test
LO 2. Perform Testing of Electrical System

ASSESSMENT CRITERIA:
1. Continuity of circuit is measured following the prescribed procedure.
2. Insulation resistance is performed following the prescribed procedure.
3. Supply voltage is measured following the prescribed procedure.
4. Earth resistance test is performed following prescribed procedure.
5. Phase sequence testing is performed following the prescribed procedure.

CONTENTS:
- Open circuit detection
- Short circuit detection
- Voltage detection
- Earth fault detection
- Phase sequencing

CONDITIONS:
The following resources are needed:
- Tools
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - set of screwdrivers
  - chalk line reel
- Learning Materials
  - learning elements
  - drawing plan
  - books, manuals, and catalogs
- Equipment
  - ladder
  - multi-tester
  - phase sequence tester
  - insulation tester (megger)
- Facilities
  - simulated work place or actual work place
  - installed electrical system

METHODOLOGIES:
- Group discussion
- Demonstration
- Role playing

ASSESSMENT METHODS:
- Demonstration
- Written test
LO 3. Finalize Commissioning Activities

**ASSESSMENT CRITERIA:**
1. Defects are checked or repaired following the prescribed procedure.
2. Work reports are prepared in line with the established policies.
3. Workplace is cleaned and made safe in line with the established policies.
4. Tools, equipment, and surplus materials are cleaned, checked, and stored in line with the established procedure.
5. Final testing is undertaken in line with the established procedures.

**CONTENTS:**
- Things to consider in final testing of electrical circuits
- Accountability in declaring system as commissioned
- Final activities in commissioning process

**CONDITIONS:**
The following resources are needed:

- **Tools**
  - lineman’s pliers
  - long nose pliers
  - diagonal cutting pliers
  - set of screwdrivers
- **Supplies and Materials**
  - incandescent bulb
  - fluorescent bulb
  - fastening devices
- **Learning Materials**
  - learning elements
  - drawing plan
  - books, manuals, and catalogs
- **Equipment**
  - ladder
  - multi-tester
  - phase sequence tester
  - insulation tester (megger)
- **Facilities**
  - simulated work place or actual work place
  - installed electrical system

**METHODOLOGIES:**
- Class/Group discussion
- Demonstration

**ASSESSMENT METHODS:**
- Demonstration
- Written report