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MINISTRY OF LABOR AND SKILLS

ELECTRICAL/ELECTRONICS EQUIPMENT SERVICING LEVEL – V



CURRICULUM

Based on October, 2021 (Version - I) Occupational standard (OS)

March, 2022
Addis Ababa, Ethiopia

Preface

The reformed TVET-System is an outcome-based system. It utilizes the needs of the labor market and occupational requirements from the world of work as the benchmark and standard for TVET delivery. The requirements from the world of work are analyzed and documented – taking into account international benchmarking – as occupational standards (OS).

In the reformed TVET-System, curricula and curriculum development play an important role with regard to quality driven comparable TVET-Delivery. The Curricula help to facilitate the training process in a way, that trainees acquire the set of occupational competences (skills, knowledge and attitude) required at the working place and defined in the occupational standards (OS).

This curriculum has been developed by a group of professional experts from different Regional TVET Bureaus, colleges, Industries, Institutes and universities based on the occupational standard for **Electrical/Electronic Equipment Servicing Level V.**

The curriculum development process has been actively supported and facilitated by **Ministry of Labor and Skills.**

TVET-Program Design

TVET-Program Title: Electrical/Electronic Equipment Servicing Level - V

1.1. TVET-Program Description

The Program is designed to develop the necessary knowledge, skills and attitude of the trainees to the standard required by the occupation. The contents of this program are in line with the occupational standard. The Trainees who successfully completed the Program will be qualified to work an **Electrical Worker** with competencies elaborated in the respective OS. Graduates of the program will have the required qualification to work in the **Electro - Technology** sector in the field of **Electrical/electronic equipment servicing.**

The prime objective of this training program is to equip the Trainees with the identified competences specified in the OS. Graduates are therefore expected to_Manage electro technology projects, Install and test microwave antennae and waveguides, Diagnose and rectify faults in digital transmission circuits and systems, Provide Advanced Training for Technicians, Perform Technical Consultation, install commercial video/audio system components, in accordance with the performance criteria and evidence guide described in the OS.

1.2. TVET-Program Training Outcomes

The expected outputs of this program are the acquisition and implementation of the following units of competences:

EISEEES5 01 0322 Manage electro technology projects

EISEEES5 02 0322 Install and test microwave antennae and waveguides

EISEEES5 03 0322 Diagnose and rectify faults in digital transmission circuits and systems

EISEEES5 04 0322 Provide Advanced Training for Technicians

EIS EEES5 05 0322 Perform Technical Consultation

EIS EEES5 06 0322 Install commercial video/audio system components

1.3. Duration of the TVET-Program

The Program will have duration of **520 hours** including the on school/ Institution training and on-the-job practice or cooperative training time. Such cooperative training based on realities of the industry, nature of the occupation, location of the TVET institution, and other factors will be considered in the training delivery to ensure that trainees acquire practical and workplace experience.

No	Unit competency	TVET Institution training		Cooperative training	Total hours	Remark
		Theory	Practical			
1.	Manage electro technology projects	27	36	27	90	
2.	Install and test microwave antennae and waveguides	30	40	30	100	
3.	Diagnose and rectify faults in digital transmission circuits and systems	27	36	27	90	
4.	Provide Advanced Training for Technicians	18	24	18	60	
5.	Perform Technical Consultation	18	24	18	60	
6.	Install commercial video/audio system components	36	48	36	120	
	Total hour	**156hrs**	**208hrs**	**156hrs**	**520hrs**	

1.4. Qualification Level and Certification

Based on the descriptors elaborated on the Ethiopian National TVET Qualification Framework (NTQF) the qualification of this specific TVET Program is Level V**.**

The trainee can exit after successfully completing the modules in one level and will be awarded the equivalent institutional certificate on the level completed. However, only institutional certificate of training accomplishment will be awarded.

1.5. Target Groups

Any citizen **with or without disability** who meets the entry requirements under items 1.7 and capable of participating in the training activities is entitled to take part in the Program.

1.7 Entry Requirements

The prospective participants of this program are required to possess the requirements or directive of the **Ministry of Labor and Skills**.

1.8 Mode of Delivery

This TVET-Program is characterized as a formal Program on middle level technical skills. The mode of delivery is co-operative training. The time spent by the trainees in the real work place/ industry will give them enough exposure to the actual world of work and enable them to get hands-on experience.

The co-operative approach will be supported with school-based lecture-discussion, simulation and actual practice. These modalities will be utilized before the trainees are exposed to the industry environment.

Hence based on the nature of the occupation, location of the TVET institutions, and interest of the industry alternative mode of cooperative training such as apprenticeships, internship and traineeship will be employed. In addition, in the areas where industry is not sufficiently available the established production and service centers/learning factories in TVET institutions will be used as cooperative training places. The Training-Institution and identified companies have forged an agreement to co-operate with regard to the implementation of this program.

1.9. TVET-Program Structure

Unit of Competence		Module Code & Title		Training Outcomes	Duration (In Hours)
EISEEES5 01 0322	Manage electro technology projects	EISEEES5 M01 0322	Manage electro technology projects	• Determine scope of the electro technology project • Manage the implementation of an electro technology project • Complete electro technology project	90
EISEEES5 02 0322	Install and test microwave antennae and waveguides	EISEEES5 M02 0322	Install and test microwave antennae and waveguides	• Prepare to install and test microwave antennae and waveguides • Install microwave antennae and waveguides • Test microwave antennae and waveguides and report	100
EISEEES5 03 0322	Diagnose and rectify faults in digital transmission circuits and systems	EISEEES5 M03 0322	Diagnose and rectify faults in digital transmission circuits and systems	• Prepare to diagnose and rectify faults. • Diagnose and rectify faults • Complete and report fault diagnosis and rectification activities..	90
EISEEES5 04 0322	Provide Advanced Training for	EISEEES5 M04 0322	Provide Advanced Training for Technicians	• Plan and prepare training program • Provide training	60

	Technicians			• Perform evaluation	
EIS EEES5 05 0322	Perform Technical Consultation	EISEEES2 M05 0322	Perform Technical Consultation	• Prepare to install audio/video components and systems • Install audio/video components and systems. • Complete installation work and report.	60
EIS EEES5 06 0322	Install commercial video/audio system components	EISEEES5 06 0322	Install commercial video/audio system components	• Conduct inspection. • Evaluate technical problems • Prepare technical recommendation on.	120

*The time duration (Hours) indicated for the module should include all activities in and out of the TVET institution.

1.10 Institutional Assessment

Two types of evaluation will be used in determining the extent to which training outcomes are achieved. The specific training outcomes are stated in the modules. In assessing them, verifiable and observable indicators and standards shall be used.

The ***formative assessment*** is incorporated in the training modules and form part of the training process. Formative evaluation provides the trainee with feedback regarding success or failure in attaining training outcomes. It identifies the specific training errors that need to be corrected, and provides reinforcement for successful performance as well. For the teacher, formative evaluation provides information for making instruction and remedial work more effective.

Summative Evaluation the other form of evaluation is given when all the modules in the program have been accomplished. It determines the extent to which competence have been achieved. And, the result of this assessment decision shall be expressed in the term of institutional Assessment implementation guidelines..

Techniques or tools for obtaining information about trainees' achievement include oral or written test, demonstration and on-site observation.

1.11 TVET Teachers Profile

The teachers conducting this particular TVET Program are A Level and above who have satisfactory practical experiences or equivalent qualifications.

LEARNING MODULE 01
TVET-PROGRAMME TITLE: **Electrical/Electronic Equipment Servicing V**
MODULE TITLE: **Managing Electro technology Project**
MODULE CODE: **EIS EEES5 M01 0322**
NOMINAL DURATION : **90 Hours**
MODULE DESCRIPTION: This module deals with the skills, attitudes and knowledge required in financial management of the project. It includes determining scope, managing an electro technology project and completing reporting/documentation, coupled with regular and timely coaching and feedback, provide the basis for performance management of an employees and equipment
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1. Determine scope of the electro technology project** **LO2. Manage the implementation of an electro technology project** **LO3. Complete electro technology project**
MODULE CONTENTS: **LO1.** Determine scope of the electro technology project 1.1. Applying WHS and OHS procedures 1.2. Determining project deliverables and budget 1.3. Identifying and evaluating measurable outcomes 1.4. Identifying resources 1.5. Developing processes and procedures **LO2.** Manage the implementation of an electro technology project 2.1 Implementing OHS policies and procedures 2.2 Delegating project tasks 2.3 Identifying, assessing and implementing project risks 2.4 Performing modification 2.5 Monitoring procurement 2.6 Completing verification of project. 2.6.1 Technical design of system and equipment parameters, 2.6.2 Modification of system and equipment parameters,

2.6.3 Installation of system and equipment parameters

2.6.4 Maintenance of system and equipment parameters

2.7 Monitoring project progress

2.6 Maintaining and completing project report

LO3. Complete electro technology project

3.1 Reviewing Project outcomes

3.1.1 Project plan,

3.1.2 Risk strategies,

3.1.3 Contract variations,

3.1.4 Safety performance and budget

3.1 Documentation produced in managing finances,

3.2.1 Cost estimates

3.2.2 Cost management plans and strategies

3.2.3 Cost breakdown structures

3.2.4 Expenditure forecasts

3.2.5 Revised budgets

3.2.6 Records of cost management lessons learned and

3.2.7 Recommendations for improvements

Learning Methods:				
For none impaired trainees	**Reasonable Adjustment for Trainees with Disability (TWD)**			
	Low Vision	**Deaf**	**Hard of hearing**	**Physical impairment**
Lecture-discussion	❖ Provide large print text ❖ Prepare the lecture in **Audio/video** ❖ Organize the class room seating arrangement to be accessible to trainees ❖ Write short notes on the black/white board using large text ❖ Make sure the luminosity of the light of class room is kept ❖ Use normal tone of voice ❖ Encourage trainees to record the lecture in audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	❖ Assign sign language interpreter ❖ Arrange the class room seating to be conducive for eye to eye contact ❖ Make sure the luminosity of the light of class room is kept ❖ Introduce new and relevant vocabularies ❖ Use short and clear sentences ❖ Give emphasis on visual lecture and ensure the attention of the trainees ❖ Avoid movement during lecture time ❖ Present the lecture in video format ❖ Summarize main points	❖ Organize the class room seating arrangement to be accessible to trainees ❖ Speak loudly ❖ Ensure the attention of the trainees ❖ Present the lecture in video format ❖ Ensure the attention of the trainees	❖ Organize the class room seating arrangement to be accessible for wheelchairs users. ❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note ❖ Provide Orientation on the physical feature of the work shop

Demonstration	❖ Conduct close follow up ❖ Use verbal description ❖ Provide special attention in the process of guidance ❖ facilitate the support of peer trainees ❖ Prepare & use simulation	❖ use Sign language interpreter ❖ Use video recorded material ❖ Ensure attention of the trainees ❖ Provide structured training ❖ Show clear and short method ❖ Use gesture ❖ rovide tutorial support (if necessary)	❖ Illustrate in clear & short method ❖ Use Video recorded material ❖ Ensure the attention of the trainees ❖ rovide tutorial support (if necessary)	❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipments/ machines ❖ Assign peer trainees to assist ❖ Conduct close follow up ❖ rovide tutorial support (if necessary
Group discussion	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	❖ Use sign language interpreters ❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	❖ Introduce the trainees with their peers

Exercise	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/practical training ❖ Introduce new and relevant vocabularies	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/ practical training	❖ Assign peer trainees ❖ Use additional nominal hours if necessary
Individual assignment	❖ prepare the assignment questions in large text ❖ Encourage the trainees to prepare and submit the assignment in large texts ❖ Make available recorded assignment questions ❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy	❖ Use sign language interpreter ❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having speech challenges
Written test	❖ Prepare the exam in large texts ❖ Use interview as an option if necessary ❖ Prepare the exam in audio format ❖ Assign human reader ❖ (if necessary) ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers ❖ Avoid essay writing ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.	❖ Use oral response as an option to give answer for trainees having severe upper limb impairment ❖ Time extension for trainees having severe upper limb impairment
Demonstration/Observation	❖ Brief the instruction or provide them in large text ❖ Time extension	❖ Use sign language interpreter ❖ Brief on the instruction of the exam ❖ Provide activity-based/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO1. Determine scope of the electro technology project

- Work health and safety (WHS)/occupational health and safety (OHS) procedures for relevant work area are identified and applied
- Project deliverables and budget are determined from relevant documentation and discussions with appropriate person/s
- Measurable outcomes to evaluate the electro technology project are identified from relevant documentation
- Resources needed to meet project outcomes are identified from relevant documentation
- Processes and procedures are developed for managing contract variations from discussions with relevant person/s and in accordance with contract

LO.2. Manage the implementation of an electro technology project

- WHS/OHS policies and procedures are implemented and monitored
- Project tasks are delegated to competent project person/s
- Project risks are identified, assessed and strategies implemented to ensure outcomes are achieved to relevant industry standards specified in the contract and in accordance with workplace procedures
- Procurement is monitored to ensure on-time supply of plant and materials in accordance with project plan and workplace procedures
- Verification of project technical design, modification, installation and/or maintenance of system and equipment parameters is completed against specifications and workplace procedures
- Project progress is monitored against schedule, quality requirements and budget
- Project/worksite conflicts are identified and managed in accordance with workplace procedures
- Variations in project are managed in accordance with agreed processes and the contract
- Project records are maintained and progress reports completed and provided to appropriate person/s

LO.3 Complete electro technology project

- Project outcomes are reviewed against project plan, risk strategies, contract variations, safety performance and budget
- Acceptance of project completion is sought from appropriate person/s and handover conducted in accordance with workplace policies and procedures

Annex: Resource Requirements

EIS EEES5 M01 0322: Managing Electro technology Project				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1	TTLM	Prepared by the trainer	25pcs	1:1
2	Computer Fundamentals and Windows with internet Technology	N.KRISHNAN SCITECH P.L.C	25pcs	1:1
3	Information Technology Principles and Application	AjoyKumarRay Tink Acharya Prentice Hall of India P.L.C	25pcs	1:1
B.	**Learning Facilities & Infrastructure**			
1.	Library	10 x 12 meter	1 room	1:25
2.	Lecture Room	6 x 7 meter	1 room	
3.	Work shop	10 x 8 meter	1 room	
C.	**Consumable Materials**			
1.	Drawing Papers	White plane paper with size of A4,A3,A1&A2	25pcs	1:1
2	Pencils	Wooden pencil and mechanical pencil	25pcs	1:1
3	Sharper	Standard	25pcs	1:1
4	Eraser	Gum type eraser	25pcs	1:1
D	**Tools and Equipment**			
1.	Driers	Ac/dc 12v/24v	5Pcs	1:5
2.	Blender (coffee maker)	220V/50HZ	5Pcs	1:5
3.	Toaster (waffle maker)	220V/50HZ	5Pcs	1:5
4.	Flat irons and presses	220V/50HZ	5Pcs	1:5
5.	Onion chopping	220V/50HZ, 2Liter	5Pcs	1:5
6.	Coffee grinding	220V/50HZ	5Pcs	1:5

LEARNING MODULE 02

TVET-PROGRAMME TITLE: **Electrical/Electronic Equipment Servicing Level V**

MODULE TITLE: **Installing and testing microwave antennae and waveguides**

MODULE CODE: **EISE EES4 M02 0322**

NOMINAL DURATION:**100 Hours**

MODULE DESCRIPTION: This module covers the installation and testing of waveguides and antennae for microwave communications systems. It encompasses working safely and to installation standards, matching hardware and accessories with that specified for a given location, installation techniques, pre commission adjustment of antennas and waveguides and following instruction and procedures

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

LO1. Prepare to install and test microwave antennae and waveguides

LO2. Install microwave antennae and waveguides

LO3. Test microwave antennae and waveguides and report

MODULE CONTENTS:

LO1 Prepare to install and test microwave antennae and waveguides

1.1 Basic concepts of microwave antennae and waveguides

1.2 Applying OHS procedures

1.3 Obtaining the work

1.4 Coordinating advice

1.5 Requiring of materials

1.6 Carrying out tools, equipment and testing devices

1.7 Reporting safety hazards

LO2. Install microwave antennae and waveguides

2.1 Following OHS

2.2 Checking circuits/components

2.3 Installing antennas

2.4 Installing hardware and accessories

2.5 Terminating cables and conductors

2.6 Following procedures for referring non-routine events

2.7 Carrying out the installation efficiently

LO3. Test microwave antennae and waveguides and report.

3.1 Following OHS

3.2 Making pre-commissioning

3.3 Cleaning and making safe the work site

3.4 Notifying completion of the installation work

Disability Inclusive Learning Modules

LEARNING METHODS:			
For None Impaired Trainees	**Reasonable Adjustment for Trainees with Disability (TWD)**		
	Deaf	**Hard of hearing**	**Physical impairment**
Lecture-discussion	❖ Assign sign language interpreter ❖ Arrange the class room seating to be conducive for eye to eye contact ❖ Make sure the luminosity of the light of class room is kept ❖ Introduce new and relevant vocabularies ❖ Use short and clear sentences ❖ Give emphasis on visual lecture and ensure the attention of the trainees ❖ Avoid movement during lecture time ❖ Present the lecture in video format ❖ Summarize main points	❖ Organize the class room seating arrangement to be accessible to trainees ❖ Speak loudly ❖ Ensure the attention of the trainees ❖ Present the lecture in video format ❖ Ensure the attention of the trainees	❖ Organize the class room seating arrangement to be accessible for wheelchairs users. ❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note ❖ Provide Orientation on the physical feature of the work shop
Demonstration	❖ use Sign language interpreter ❖ Use video recorded material ❖ Ensure attention of the trainees ❖ Provide structured training	❖ Illustrate in clear & short method ❖ Use Video recorded material ❖ Ensure the attention of the	❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipments/ machines ❖ Assign peer trainees to assist

	❖ Show clear and short method ❖ Use gesture ❖ provide tutorial support (if necessary)	trainees ❖ provide tutorial support (if necessary)	❖ Conduct close follow up ❖ Provide tutorial support (if necessary
Group discussion	❖ Use sign language interpreters ❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	❖ Introduce the trainees with their peers
Exercise	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/practical training ❖ Introduce new and relevant vocabularies	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/ practical training	❖ Assign peer trainees ❖ Use additional nominal hours if necessary
Individual assignment	❖ use sign language interpreter ❖ provide briefing /orientation on the assignment ❖ provide visual recorded material	Provide briefing /orientation on the assignment Provide visual recorded material	

Interview	❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having speech challenges
Written test	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers ❖ Avoid essay writing ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers if necessary	❖ Use oral response as an option to give answer for trainees having severe upper limb impairment ❖ Time extension for trainees having severe upper limb impairment
Demonstration /Observation	❖ Use sign language interpreter ❖ Brief on the instruction of the exam ❖ Provide activity-based/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having speech challenges
Written test	❖ Prepare the exam in large texts ❖ Use interview as an option if necessary ❖ Prepare the exam in audio format ❖ Assign human reader ❖ (if necessary) ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers ❖ Avoid essay writing ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.	❖ Use oral response as an option to give answer for trainees having severe upper limb impairment ❖ Time extension for trainees having severe

				upper limb impairment
Demonstration /Observation	❖ Brief the instruction or provide them in large text ❖ Time extension	❖ Use sign language interpreter ❖ Brief on the instruction of the exam ❖ Provide activity-based/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESMENT CRITERIA:

LO1. Prepare to install and test microwave antennae and waveguides.

- OHS procedures for a given work area are identified, obtained and understood through established routines.
- Established OHS risk control measures are followed in preparation for the work.
- Safety hazards that have not previously been identified are reported and advise on risk control measures are sought from the work supervisor.
- The nature and location of the work is obtained from work supervisor or other appropriate person to establish the scope of work to be undertaken.
- Advice is sought from the work supervisor and/or other appropriate person to ensure the work is coordinated effectively with others.
- Sources of materials that may be required for the work are established in accordance with established routines.
- Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.

LO2. Install microwave antennae and waveguides

- Established OHS risk control measures for carrying out the work are followed.
- Circuits/components are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
- Antennas are installed in their specified locations and within limitation imposed by regulation.
- Hardware and accessories are installed straight and square in the required locations and within acceptable tolerances.
- Cables and conductors are terminated at accessories in accordance with manufactures and job specifications and regulatory requirements
- Procedures for referring non-routine events to immediate supervisor for directions are

followed.

- The installation is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices.

LO3: Test microwave antennae and waveguides and report.

- OHS work completion risk control measures and procedures are followed.
- Pre-commissioning adjustments are made to the installation and the system to optimize performance in accordance with system specification.
- Work site is cleaned and made safe in accordance with established procedures.
- Work supervisor is notified of the completion of the installation work in accordance with established routines.

EIS EEES5 M02 0322 Installing and testing microwave antennae and waveguides				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	***Learning Materials***			
1.	TTLM	By trainers	25Pcs	1:1
2.	Reference Books			
2.1	COMPUTER - AIDED DESIGN OF ELECTRICAL MACHINES	Author :- MURTHY VISHNU KM, 2008 edited	.5	1:5
2.2	CONTINUOUS SIGNALS AND SYSTEMS WITH MATLAB, 2ND EDITION	EIALI TAAN S. ET. AL, edited 2008	5	1:5
2.3	DECISION DIAGRAM TECHNIQUES FOR MICRO- AND NANOELECTRONIC DESIGN HANDBOOK	YANUSHKEVICH SVETLANA N. ET.AL, edited 2013	5	1:5
B.	***Learning Facilities & Infrastructure***			
1	Library	10 x 12 meter	1 room	1:25
2	Lecture Room	6 x 7 meter	1 room	1:25
3	Work shop	10 x 8 meter	1 room	1 :25
C.	***Consumable Materials***			
1	Itching chemicals	. Ferric chloride	25Kg	1:1
2	Solder	1mm rosien flux	25roll	1:1
3	wire insulation cap 12mm diameter		25 pcs	1:1
4	wire insulation cap 14mm diameter		25 pcs	1:1
5	wire insulation cap 16 mm diameter		25 pcs	1:1
6	wire insulation cap 18mm diameter		25 pcs	1:1

7	wire insulation cap 20mm diameter		25 pcs	1:1
8	Female and male banana plug 4mm		200 pcs	1:1
9	PCB drilling bit	.2mm^2 -.6mm^2	25 pcs	1:1
10	servo motor	with driver 12v 5 pine	25 pcs	1:1
11	stepper motor	with driver 12v 5 pin	25 pcs	1:1
12	printed circuit board l	Solid type,30X18cm	25 pcs	1:1
13	power module	five out put mp3,and fm supporting	25 pcs	1:1
14	Wire zip	Small	25 pcs	1:1
15	Wire zip	Medium	25 pcs	1:1
16	Wire zip	Large	25 pcs	1:1
17	Motor Driver	L293D Driver	25 pcs	1:1
18	BIGPIC development system board	Support 80 pin, have LCD, have USB programmer, PIC18F8520 working at 40 MHZ	25 pcs	1:1
19	Ardino UNO	with full set and Sensor	25 pcs	1:1
20	Microcontroller development board	8051, have USB support	25 pcs	1:1
21	PIC flash	Have USB 2.0 programmer, micro LCD display support	25 pcs	1:1
22	Operational Amplifiers	LM358	25 pcs	1:1
23	Battery	12v-40(12v40AH) (solar Battery)	25 pcs	1:1
24	Battery Holder	for 9 Volts Battery	25 pcs	1:1
25	Battery, 12v	12 Volts battery	25 pcs	1:1
26	Bread board	10 x15cm	25 pcs	1:1
27	Buzzer	12v	25 pcs	1:1
28	Sensor	Blue tooth module for ardinouno R3	25 pcs	1:1
29	Sensor	GSM module for ardinouno R3	25 pcs	1:1
30	Sensor	RF module for ardinouno R3	25 pcs	1:1

31	Sensor	WIFI module for ardinouno R3	25 pcs	1:1
32	Sensor	LCD display module for ardinouno R3	25 pcs	1:1
33	Sensor	TF7 display module for ardinouno R3	25 pcs	1:1
34	Sensor	PIR sensor module for ardinouno R3	25 pcs	1:1
35	Sensor	Ultera sonic module for ardinouno R3	25 pcs	1:1
36	Sensor	37 in 1 sensor module for ardinouno R3	25 pcs	1:1
37	Fuse with holder	8 Amperes	25 pcs	1:1
38	Fuse with holder	2A	25 pcs	1:1
39	IC holder	16 legs	25 pcs	1:1
40	IC holder	24 legs	25 pcs	1:1
41	IC or INTEGRATED CIRCUIT	LNK304	25 pcs	1:1
42	IC or INTEGRATED CIRCUIT	CD 4017 (16 legs)	25 pcs	1:1
43	IC or INTEGRATED CIRCUIT	LM386	25 pcs	1:1
44	IC or INTEGRATED CIRCUIT	TLO72	25 pcs	1:1
45	IC or INTEGRATED CIRCUIT	CD4016	25 pcs	1:1
46	IC or INTEGRATED CIRCUIT	IC CA 3130 Op-amplifier	25 pcs	1:1
47	IC or INTEGRATED CIRCUIT	Timer 555	25 pcs	1:1
48	IC or INTEGRATED CIRCUIT	4517	25 pcs	1:1
49	IC or INTEGRATED CIRCUIT	NE555	25 pcs	1:1
50	IC or INTEGRATED CIRCUIT	LM7809	25 pcs	1:1
51	IC or INTEGRATED CIRCUIT	IC 74LS75,4-bit bistable latch	25 pcs	1:1
52	IC or INTEGRATED CIRCUIT	IC 74LS20, dual 4 input NAND gate	25 pcs	1:1
53	IC or INTEGRATED CIRCUIT	IC 74LS147, 9 lines to 4 lines priority encoder	25 pcs	1:1
54	IC or INTEGRATED CIRCUIT	IC 74LS47,BCD to seven segment	25 pcs	1:1

		decoder		
55	IC or INTEGRATED CIRCUIT	CD4047	25 pcs	1:1
56	IC or INTEGRATED CIRCUIT	ULN2003EN	25 pcs	1:1
57	IC or INTEGRATED CIRCUIT	LM324	25 pcs	1:1
58	IC or INTEGRATED CIRCUIT	L293D, steeper motor driver IC	25 pcs	1:1
59	Arduino At mega	At mega 2560	25 pcs	1:1
60	Horizontal transistor	D 2499	25 pcs	1:1
61	Universal power supply module	5V/12V/24Vuniversal LCD LEDpowersupplay module for 24/32/42/49 inch TV	25 pcs	1:1
62	PIC KIT 3	Programmer device	25 pcs	1:1
63	Raspberry pi	Raspberry pi 3	25 pcs	1:1
64	Raspberry pi	Raspberry pi 4	25 pcs	1:1
65	Arduino 37 in one	Sensor kit	25 pcs	1:1
66	Arduino sensor	PIR	25 pcs	1:1
67	Arduino module	Bluetooth module	25 pcs	1:1
68	Arduino module	GPS module	25 pcs	1:1
69	Arduino module	GSM module	25 pcs	1:1
70	Motor drive	L298N for robot	25 pcs	1:1
71	IR receiver module	TSOP family	25 pcs	1:1
72	Steeper motor drive	ULN 2003	25 pcs	1:1
73	Steeper	Compatible with Arduino	25 pcs	1:1
74	Dc motor	Compatible with Arduino	25 pcs	1:1
75	Servo motor	SG90	25 pcs	1:1
76	Buzzer	For Arduino	25 pcs	1:1
77	Seven segment	Single digit	25 pcs	1:1
78	Seven segment	Four digit	25 pcs	1:1
79	LCD display	16*02	25 pcs	1:1
80	LCD display	16*04	25 pcs	1:1
81	Relay module	5V two channel	25 pcs	1:1

82	Relay module	5V four channel	25 pcs	1:1
83	Temperature & humidity sensor	DHT 11 or 22	25 pcs	1:1
84	Barometric pressure sensor	BMP085	25 pcs	1:1
85	Acceleration measurement sensor	ADXL335	25 pcs	1:1
86	Infrared line sensor	QRE1113	25 pcs	1:1
87	Tilt &impact sensor	For Arduino	25 pcs	1:1
88	Flexor sensor	For Arduino	25 pcs	1:1
89	Keypad sensor	For Arduino	25 pcs	1:1
90	Micro SD	For Arduino	25 pcs	1:1
91	TX & RX module	433 MHZ	25 pcs	1:1
92	Moister sensor	For Arduino	25 pcs	1:1
93	Smoke detection	MQU2	25 pcs	1:1
94	Finger print	FPM10A	25 pcs	1:1
95	Solenoid valve	Normally close , 12 DCV ,3/4 inch	25 pcs	1:1
96	capacitor	68pF	25 pcs	1:1
97	capacitor	0.001µF	25 pcs	1:1
98	capacitor	0.0047µF	25 pcs	1:1
99	capacitor	0.0068µF	25 pcs	1:1
100	capacitor	4.7µF	25 pcs	1:1
101	capacitor	15pF	25 pcs	1:1
102	capacitor	1 µF	25 pcs	1:1
103	Variable resistor	10kΩ	25 pcs	1:1
104	Variable resistor	22kΩ	25 pcs	1:1
105	Resistor	18kΩ	25 pcs	1:1
106 107	Resistor	1.8kΩ	25 pcs	1:1
108	Resistor	220Ω	25 pcs	1:1
109	Resistor	1kΩ	25 pcs	1:1
110	Resistor	22kΩ	25 pcs	1:1
111	Resistor	33kΩ	25 pcs	1:1

112	Resistor	47kΩ	25 pcs	1:1
113	Resistor	5.6kΩ	25 pcs	1:1
114	Resistor	120Ω	25 pcs	1:1
115	Resistor	1.5kΩ	25 pcs	1:1
116	Resistor	10kΩ	25 pcs	1:1
117	Resistor	1kΩ	25 pcs	1:1
118	Resistor	22Ω	25 pcs	1:1
119	Resistor	1.2kΩ	25 pcs	1:1
120	Transistor	BF324	25 pcs	1:1
121	Transistor	2 N2905A	25 pcs	1:1
122	Transistor	BF494	25 pcs	1:1
123	Transistor	BF495	25 pcs	1:1
123	Transistor	2N3053A	25 pcs	1:1
124	Transistor	2N2222	25 pcs	1:1
125	Transistor	2N3904	25 pcs	1:1
126	Trimmer capacitor	1Pf-22pF	25 pcs	1:1
127	Trimmer capacitor	2Pf-50pF	25 pcs	1:1
128	Trimmer capacitor	100Pf-500pF	25 pcs	1:1
129	Electronic switch	Single phase	25 pcs	1:1
130	IC	Lm386	25 pcs	1:1
131	capacitor	100nF	25 pcs	1:1
132	capacitor	220nF	25 pcs	1:1
133	capacitor	2.2nF	25 pcs	1:1
134	Arduino UNO	R3 Development Board	25 pcs	1:1
135	UART GSM Module	SIM800/900	25 pcs	1:1
136	Nextion TFT Intelligent	LCD Touch Display	25 pcs	1:1
137	proximity sensor	MPU6050 Sensor	25 pcs	1:1
138	DC-DC BUCK CONVERTER	Rio Rand LM2596	25 pcs	1:1
139	Arduino Power Supply	5V DC Adapter	25 pcs	1:1
140	GSM Power Supply	12V DC Adapter	25 pcs	1:1

141	POWER MODULE	FIVE OUT PUT	25 pcs	1:1
142	BLUETOOTH MODULE	MP3,FM AND BLUETOOTH SUPORTING	25 pcs	1:1
143	Double side plaster	2 inch	25 pcs	1:1
144	Double side plaster	1 inch	25 pcs	1:1
145	Double side plaster	4 inch	25 pcs	1:1
146	Double side plaster	1/2 inch	25 pcs	1:1
147	Epoxy Glue (twin)	Twined Black and gray 16 gram each	25 pcs	1:1
148	ARDINO	AT MEGA 328P/AT MEGA16U2 with WI FI module with development environment.	25 pcs	1:1
149	Temperature sensor	LM35	25 pcs	1:1
150	LCD Display	16X2	25 pcs	1:1
151	Soil moisture sensor	DX259/KGSM	25 pcs	1:1
D.	Tools and equipment			
1.	UV light	KUNHEWUHUA 8.3x10.2 in UV Exposure Unit Screen Printing Exposure Machine for Hot Foil Pad Printing PCB with 8 pcs A4 Photopolymer Plates 6x8W lamp LCD 110V × 2	5Pcs	1:5
2	Flasher box	Z3 flasher box	5Pcs	1:5
3	flasher box,	Octo-plus flasher box	5Pcs	1:5
4	Flasher box	Miracle flasher box	5Pcs	1:5
5	Dongle	CM2 dongle	5Pcs	1:5
6	Dongle	Chimara dongle	5Pcs	1:5
7	External hard disk	1 tera byte	5Pcs	1:5
8	Hot-airgun	gordack	5Pcs	1:5

9	UV light	KUNHEWUHUA 8.3x10.2 in UV Exposure Unit Screen Printing Exposure Machine for Hot Foil Pad Printing PCB with 8 pcs A4 Photopolymer Plates 6x8W lamp LCD 110V × 2	5Pcs	1:5
10	Oscilloscope	□ Bandwidth (-3dB) DC-20MHz, X5MAG:10MHz □ Sensitivity 5mV/DIV-5V/DIV+/-3%. 10 Calibrated Steps, X5MAG:1mV/DIV-1V/DIV □ Display Mode CH1, CH2, DUAL (ALT/CHOP), ADD □ Rise Time 17.5ns □ Input Impedance 1 Mohm//25PF □ Input Coupling AC, DC, GND □ Max. Input Volt 400V DC + Peak AC **HORIZONTAL AXIS** □ Main Time Base 0.1uS/DIV-2S/DIV, 23 Calibrated Steps, X 10MAG: 10nS/DIV-200mS/DIV □ Delay Time Base 7025A(N/A), 7026A(YES) □ Delay Display Main, Mix, Delay **TRIGGER** □ Mode AUTO, NORM, TV-V, TV-H □ Source CH1, CH2, ALT, LINE, EXT □ Sensitivity INT: 0.5DIV,		

		EXT:0.5V □ Polarity +, - □ Level Adjustable □ Hold Off YES **X-Y** □ Mode CH1:X, CH2:Y □ Sensitivity 5mV/DIV-5V/DIV □ Bandwidth (-3dB) DC-1MHz □ Phase Difference 3 degree at 50KHz □ Z AXISZ Modulation 7025A(N/A), 7026A(YES) **CRT** □ Cursor Readout N/A □ Screen 6-inch Rectangular, Internal Graticule with % Scale □ Effective Area 8 X 10cm □ Acceleration Voltage 2.1KV □ Illumination 7025A(N/A), 7026A(YES) **GENERAL** □ CH2 Output 7025A(N/A), 7026A(YES) □ Component Test 7025A(N/A), 7026A(YES) □ Beam Find 7025A(N/A), 7026A(YES) □ Calibrator Square wave, 1KHz+/-10%, 2Vp-p+/-3% □ Trace Rotation Electrical, front panel adjustable		

		Dimension & Net/Gross Weight 324(W) x 132(H) x 398(H) mm & 7.8kg/12kg Power 115V/230V+/-10%, 50/60Hz		
11	Signal generator /function generator	Frequency generator Available in both 20 GHz and 40 GHz models. Phase coherent or phase continuous operation at all frequencies. Update frequency, amplitude, and phase in as little as 180 ns. Generate wide chirps that are 10 to 25% of carrier frequency Input voltage 220 Voltage Output voltage : square wave, triangular wave, sinusoidal and saw tooth wave signal	5Pcs	1:5
12	Printer	Laser jet Printer Print Resolution: 1200X1200dpi Duplex Printing: Automatic Printer color: Monochrome Duty cycle :50,000 pages per month	5Pcs	1:5
13	Desk Top computer	• Computer • Processor - dual core 2.4 GHz+ (i5 or i7 series Intel processor or equivalent AMD) • RAM - 8 GB • Hard Drive - 128 GB or larger solid state hard drive		

		• Graphics Card - any with DVI support - desktop only • Monitor - 23" widescreen LCD with DVI support - desktop only • Operating System - Windows 7 Home Premium or Professional with Service Pack 1 or Apple OS X 10.9.3 • Backup Device - External hard drive, USB Flash Drive and/or DVD+/-RW drive Having left and right speaker(external		

LEARNING MODULE 03
TVET-PROGRAMME TITLE: **Electrical/Electronic Equipment Servicing Level V**
MODULE TITLE: **Diagnosing and rectifying faults in digital transmission circuits and systems**.
MODULE CODE: **EIS EEES5 M03 0322**
NOMINAL DURATION: **90Hours**
MODULE DESCRIPTION: This module covers fault finding and repair of faults in digital transmission systems. The unit encompasses safe working practices, interpreting diagrams, applying logical diagnostic methods and knowledge of digital transmission systems circuit components, rectifying faults, safety and functional testing and completing the necessary service documentation.
LEARNING OUTCOMES. At the end of the module the trainee will be able to: **LO1. Prepare to diagnose and rectify faults.** **LO2. Diagnose and rectify faults** **LO3. Complete and report fault diagnosis and rectification activities.**
MODULE CONTENTS **LO1. Prepare to diagnose and rectify faults.** 1.1. Basic concepts about digital transmission system. 1.2. Obtaining OHS procedures. 1.3. Following established OHS risk control procedures. 1.4. Determining the extent of faults. 1.5. Consulting appropriate personnel. 1.6. Obtaining tools, equipment and testing devices 1.7. Identifying, documenting and implementing safety hazards **LO2. Diagnose and rectify faults** 2.1. Following OHS risk control measures and procedures. 2.2. Determining the need to test or measure 2.3. Checking Circuits/machines/plant. 2.4. Applying logical diagnostic methods. 2.4.1 Testing the suspected fault of digital tv 2.4.2 Rectifying faults of digital tv. **LO3**. **Complete and report fault diagnosis and rectification activities.** 3.1. Following OHS risk control procedures. 3.2. Making work site safe. 3.3. Documenting rectification of faults. 3.4. Notifying appropriate person.

LEARNING METHODS:			
For None Impaired Trainees	**Reasonable Adjustment for Trainees with Disability (TWD)**		
	Deaf	**Hard of hearing**	**Physical impairment**
Lecture-discussion	❖ Assign sign language interpreter ❖ Arrange the class room seating to be conducive for eye to eye contact ❖ Make sure the luminosity of the light of class room is kept ❖ Introduce new and relevant vocabularies ❖ Use short and clear sentences ❖ Give emphasis on visual lecture and ensure the attention of the trainees ❖ Avoid movement during lecture time ❖ Present the lecture in video format ❖ Summarize main points	❖ Organize the class room seating arrangement to be accessible to trainees ❖ Speak loudly ❖ Ensure the attention of the trainees ❖ Present the lecture in video format ❖ Ensure the attention of the trainees	❖ Organize the class room seating arrangement to be accessible for wheelchairs users. ❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note ❖ Provide Orientation on the physical feature of the work shop
Demonstration	❖ use Sign language interpreter ❖ Use video recorded material ❖ Ensure attention of the trainees ❖ Provide structured training	❖ Illustrate in clear & short method ❖ Use Video recorded material ❖ Ensure the attention of the	❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipments/ machines ❖ Assign peer trainees to assist

	❖ Show clear and short method ❖ Use gesture ❖ provide tutorial support (if necessary)	trainees ❖ provide tutorial support (if necessary)	❖ Conduct close follow up ❖ Provide tutorial support (if necessary
Group discussion	❖ Use sign language interpreters ❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	❖ Introduce the trainees with their peers
Exercise	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/practical training ❖ Introduce new and relevant vocabularies	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/ practical training	❖ Assign peer trainees ❖ Use additional nominal hours if necessary
Individual assignment	❖ use sign language interpreter ❖ provide briefing /orientation on the assignment ❖ provide visual recorded material	Provide briefing /orientation on the assignment Provide visual recorded material	

Interview	❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having speech challenges
Written test	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers ❖ Avoid essay writing ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers if necessary	❖ Use oral response as an option to give answer for trainees having severe upper limb impairment ❖ Time extension for trainees having severe upper limb impairment
Demonstration/ Observation	❖ Use sign language interpreter ❖ Brief on the instruction of the exam ❖ Provide activity-based/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having speech challenges
Written test	❖ Prepare the exam in large texts ❖ Use interview as an option if necessary ❖ Prepare the exam in audio format ❖ Assign human reader ❖ (if necessary) ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers ❖ Avoid essay writing ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.	❖ Use oral response as an option to give answer for trainees having severe upper limb impairment ❖ Time extension for trainees having severe

				upper limb impairment
Demonstration /Observation	❖ Brief the instruction or provide them in large text ❖ Time extension	❖ Use sign language interpreter ❖ Brief on the instruction of the exam ❖ Provide activity-based/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1 Prepare to diagnose and rectify faults

- OHS procedures for a given work area are obtained and understood.
- Established OHS risk control measures and procedures are followed in preparation for the work.
- Safety hazards, which have not previously been identified, are documented and risk control measures devised and implemented in consultation with appropriate personnel.
- The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
- Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
- Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
- OHS procedures for a given work area are obtained and understood.

LO.2. Diagnose and rectify faults

- OHS risk control measures and procedures for carrying out the work are followed.
- The need to test or measure live is determined in strict accordance with OHS requirements and when necessary, conducted within established safety procedures.
- Circuits/machines/plant is checked as being isolated where necessary in strict accordance OHS requirements and procedures.
- Logical diagnostic methods are applied to diagnose digital television apparatus faults employing measurements of circuit operating parameters referenced to apparatus operating specifications.
- Suspected fault scenarios are tested as being the source of apparatus problems.
- Faults in the electronic components of the digital television apparatus are rectified to raise digital television apparatus to its operation standard.

LO.3 Complete and report fault diagnosis and rectification activities

- OHS work completion risk control measures and procedures are followed.
- Work site is made safe in accordance with established safety procedures.
- Rectification of faults is documented in accordance with established procedures.
- Appropriate person or persons notified, in accordance with established procedures, that apparatus faults have been rectified

EIS EEES5 M03 0322: Diagnosing and rectifying faults in digital transmission circuits and systems				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	***Learning Materials***			
1.	TTLM	By Trainers	25pcs	1:1
2.	Reference Books			
2.1	2011 NATIONAL ELECTRICAL CODE CHAPTER-BY-CHAPTER	Author:- HERRES edited 2011	.5	1:5
2.2	ALTERNATIVE PRINCIPLES OF INSTRUMENT TRANSFORMERS AND SENSORS	Author :- Robert Bell edited 2014	5	1:5
2.3	ARDUINO + ANDROID PROJECTS FOR THE EVIL GENIUS: CONTROL ARDUINO WITH YOUR SMARTPHONE OR TABLET	Author :- MONK	5	1:5
2.4	AUTOMOTIVE EMBEDDED SYSTEMS HANDBOOK	Author :- NAVET, edited 2008	5	1:5
2.5	BASIC ELECTRONIC DEVICES AND CIRCUITS	PATIL ET.AL, edited 2013	5	1:5
2.6	BUILDING SENSOR NEWTORKS: FROM DESIGN TO APPLICATIONS	Author :- NIKOLAIDIS ET.AL, edited 2014	5	1:5
B.	***Learning Facilities & Infrastructure***			
1.	Lecture /Class room		1	1:25
2.	Laboratory/work shop room		1	1:25
3.	Library		1	1:25
4	Smart room	Sound proof (7X8) meter	1	1:25
C.Consumable Materials				

1.	***Graph paper***	A1	***5pcs***	1:5
2	A4 paper	80 gram	25Ream	1:1
3	Parker	Erasable type	25 pack	1:1
D.	Tools and equipment			
1.	Professional camera	-Shutter speed :-TV mode 1/6-1/2000 -HP mode 1/12.5-1/500 Low light mode ½-1/500 -Digital Zoom-400x(movie mode only) -Lens 20x optical zoom -Image sensor ½.84-inch -HD CMOS pro sensor HDMI out put		
4.	Photo camera	-Focal length- 4.8mm- -Effective Mega pixel 16 MP and above -Optical Zoom- 8x -Video resolution- 1280x720		
5.	LED TV	32”		
6.	LED TV	43”		
7	Sound Bar	2 Channel 300W with wireless Subwoofer		
8	Printer	Laser jet Printer Print Resolution: 1200X1200dpi Duplex Printing: Automatic Printer color: Monochrome Duty cycle :50,000 pages per month	5 pcs	1:5

9	Desk Top computer	• Computer • Processor - dual core 2.4 GHz+ (i5 or i7 series Intel processor or equivalent AMD) • RAM - 8 GB • Hard Drive - 128 GB or larger solid state hard drive • Graphics Card - any with DVI support - desktop only • Monitor - 23" widescreen LCD with DVI support - desktop only • Operating System - Windows 7 Home Premium or Professional with Service Pack 1 or Apple OS X 10.9.3 • Backup Device - External hard drive, USB Flash Drive and/or DVD+/-RW drive Having left and right speaker(external	5 pcs	1:5

LEARNING MODULE 04
TVET-PROGRAMME TITLE: **Electrical/Electronic Equipment Servicing V**
MODULE TITLE: **Providing Advanced Training for Technicians**
MODULE CODE: **EIS EEES5 M04 0322**
NOMINAL DURATION : **60Hours**
MODULE DESCRIPTION : This module covers the knowledge, skills and attitudes required to provide advanced training for technicians. It addresses training need assessment, training program development and training provision capability.
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1. Plan and prepare training program** **LO2. Provide training** **LO3. Perform evaluation**
MODULE CONTENTS: **LO1. Plan and prepare training program** 1.1 Performing training need assessment 1.2 Assessing skill, knowledge and attitude gap 1.3 Preparing training materials and facilities 1.4 Preparing schedule **LO2. Provide training** 2.1 Applying proper methodology of training 2.1.1 Fundamentals of coaching & mentoring 2.1.2 Theories of adult learning 2.1.3 Methods of teaching 2.2 Ensuring alignment of training 2.3 Addressing knowledge, skill and attitude 2.4 Ensuring OHS requirements 2.5 Providing continuous feedback **LO3. Perform evaluation** 3.1. Conducting assessment 3.2. Recording performance of trainees 3.3. Reporting the assessment result

Learning Methods:				
For none impaired trainees	**Reasonable Adjustment for Trainees with Disability (TWD)**			
	Low Vision	**Deaf**	**Hard of hearing**	**Physical impairment**
Lecture-discussion	❖ Provide large print text ❖ Prepare the lecture in **Audio/video** ❖ Organize the class room seating arrangement to be accessible to trainees ❖ Write short notes on the black/white board using large text ❖ Make sure the luminosity of the light of class room is kept ❖ Use normal tone of voice ❖ Encourage trainees to record the lecture in audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	❖ Assign sign language interpreter ❖ Arrange the class room seating to be conducive for eye to eye contact ❖ Make sure the luminosity of the light of class room is kept ❖ Introduce new and relevant vocabularies ❖ Use short and clear sentences ❖ Give emphasis on visual lecture and ensure the attention of the trainees ❖ Avoid movement during lecture time ❖ Present the lecture in video format ❖ Summarize main points	❖ Organize the class room seating arrangement to be accessible to trainees ❖ Speak loudly ❖ Ensure the attention of the trainees ❖ Present the lecture in video format ❖ Ensure the attention of the trainees	❖ Organize the class room seating arrangement to be accessible for wheelchairs users. ❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note ❖ Provide Orientation on the physical feature of the work shop

Demonstration	❖ Conduct close follow up ❖ Use verbal description ❖ Provide special attention in the process of guidance ❖ facilitate the support of peer trainees ❖ Prepare & use simulation	❖ use Sign language interpreter ❖ Use video recorded material ❖ Ensure attention of the trainees ❖ Provide structured training ❖ Show clear and short method ❖ Use gesture ❖ rovide tutorial support (if necessary)	❖ Illustrate in clear & short method ❖ Use Video recorded material ❖ Ensure the attention of the trainees ❖ rovide tutorial support (if necessary)	❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipments/ machines ❖ Assign peer trainees to assist ❖ Conduct close follow up ❖ rovide tutorial support (if necessary
Group discussion	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	❖ Use sign language interpreters ❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	❖ Introduce the trainees with their peers

Exercise	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/practical training ❖ Introduce new and relevant vocabularies	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/ practical training	❖ Assign peer trainees ❖ Use additional nominal hours if necessary
Individual assignment	❖ prepare the assignment questions in large text ❖ Encourage the trainees to prepare and submit the assignment in large texts ❖ Make available recorded assignment questions ❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy	❖ Use sign language interpreter ❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having speech challenges
Written test	❖ Prepare the exam in large texts ❖ Use interview as an option if necessary ❖ Prepare the exam in audio format ❖ Assign human reader ❖ (if necessary) ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers ❖ Avoid essay writing ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.	❖ Use oral response as an option to give answer for trainees having severe upper limb impairment ❖ Time extension for trainees having severe upper limb impairment
Demonstration/Observation	❖ Brief the instruction or provide them in large text ❖ Time extension	❖ Use sign language interpreter ❖ Brief on the instruction of the exam ❖ Provide activity-based/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1 Plan and prepare training program

- Perform training need assessment
- Assess skill, knowledge and attitude gap
- Prepare training materials and facilities
- Prepare schedule

LO.2 Provide training

- Apply proper methodology of training
- Ensure alignment of training with the required objective
- Address knowledge, skill and attitude as per the need assessment
- Measures are taken to ensure that the technician understands OHS requirements and safe working procedures and practices for the particular training to be undertaken
- Provide continuous feedback to the trainee

LO.3 Perform evaluation

- Conduct assessment for every knowledge, skill and attitude entity
- Record performance of trainee against the knowledge, skill and attitude based on assessment result
- Report the assessment result to the concerned stake holders

Annex: Resource Requirements

EIS EEES5 M04 0322 Providing Advanced Training for Technicians				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A. Learning Materials				
1.	TTLM	prepared by the trainer	25	1:1
2.	The training of technicians	W.G. Sparrow	25	1:1
A. Learning Facilities & Infrastructure				
1	Library	10 x 12 meter	1room	1:25
2	Lecture Room	6 x 7 meter		
3	Work shop	10 x 8 meter		
B. Consumable Materials				
1.	Marker	White board	5Pkt	1:5
C. Tools and Equipments				
1.	Hook	6mm^2, length 6cm	5Pcs	1:5
2.	Hook	8mm^2, length 6cm	5Pcs	1:5
3.	Hook	10mm^2, length 6cm	5Pcs	1:5
4.	Sticker	Yellow, red, green	5Pcs	1:5
5.	Tools board	To display kaizen board	5Pcs	1:5
6.	White board	Portable	1Pcs	1:25

LEARNING MODULE 05

TVET-PROGRAMME TITLE: **Electrical/Electronic Equipment Servicing Level V**

MODULE TITLE: **Perform Technical Consultation**

MODULE CODE: **EIS EEES5 M05 0322**

NOMINAL DURATION:**60Hours**

MODULE DESCRIPTION: This module covers the competence required to conduct technical consultation, provide recommendation and solution for technical problems and operation procedures, improve the performance of operation and maintenance services and proposed guidelines and systematic approach on maintenance practices within the organization and to enhance the productivity and smooth operation of the industry

LEARNING OUTCOMES.

At the end of the module the trainee will be able to:

LO1. Conduct inspection.

LO2. Evaluate technical problems

LO3. Prepare technical recommendation on.

MODULE CONTENTS:

LO1. Conduct inspection

1.1 Addressing, analyzing and inspecting industry technical problems.

1.1.1. Inspection checklist
1.1.2. Action plan.
1.1.3. Maintenance checklist

1.2 Developing and/or implementing consultation processes.

2.1.1. Components of consultation process.
2.1.2. Meetings, interviewing, and brainstorm sessions.

1.3 Developing evaluation and work plans to create a systematic solution.

LO2. Evaluate technical problems

2.1. Identifying, evaluating technical problems.
2.2. Allocating required resources.

LO3. Prepare technical recommendation on.

3.1. Following OHS and risk control measures.

3.2. Developing policies and procedures.

3.3. Reviewing project proposal.

3.4. Preparing schedule of work activities.

3.5. Engaging appropriate competent persons.

3.6. Repairing/replacing level and frequency

LEARNING METHODS:			
For None Impaired Trainees	**Reasonable Adjustment for Trainees with Disability (TWD)**		
	Deaf	**Hard of hearing**	**Physical impairment**
Lecture-discussion	❖ Assign sign language interpreter ❖ Arrange the class room seating to be conducive for eye to eye contact ❖ Make sure the luminosity of the light of class room is kept ❖ Introduce new and relevant vocabularies ❖ Use short and clear sentences ❖ Give emphasis on visual lecture and ensure the attention of the trainees ❖ Avoid movement during lecture time ❖ Present the lecture in video format ❖ Summarize main points	❖ Organize the class room seating arrangement to be accessible to trainees ❖ Speak loudly ❖ Ensure the attention of the trainees ❖ Present the lecture in video format ❖ Ensure the attention of the trainees	❖ Organize the class room seating arrangement to be accessible for wheelchairs users. ❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note ❖ Provide Orientation on the physical feature of the work shop
Demonstration	❖ use Sign language interpreter ❖ Use video recorded material ❖ Ensure attention of the trainees ❖ Provide structured training	❖ Illustrate in clear & short method ❖ Use Video recorded material ❖ Ensure the attention of the	❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipments/ machines ❖ Assign peer trainees to assist

	❖ Show clear and short method ❖ Use gesture ❖ provide tutorial support (if necessary)	trainees ❖ provide tutorial support (if necessary)	❖ Conduct close follow up ❖ Provide tutorial support (if necessary
Group discussion	❖ Use sign language interpreters ❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	❖ Introduce the trainees with their peers
Exercise	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/practical training ❖ Introduce new and relevant vocabularies	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/ practical training	❖ Assign peer trainees ❖ Use additional nominal hours if necessary
Individual assignment	❖ use sign language interpreter ❖ provide briefing /orientation on the assignment ❖ provide visual recorded material	Provide briefing /orientation on the assignment Provide visual recorded material	

Interview	❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having speech challenges
Written test	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers ❖ Avoid essay writing ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers if necessary	❖ Use oral response as an option to give answer for trainees having severe upper limb impairment ❖ Time extension for trainees having severe upper limb impairment
Demonstration/Observation	❖ Use sign language interpreter ❖ Brief on the instruction of the exam ❖ Provide activity-based/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having speech challenges
Written test	❖ Prepare the exam in large texts ❖ Use interview as an option if necessary ❖ Prepare the exam in audio format ❖ Assign human reader ❖ (if necessary) ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers ❖ Avoid essay writing ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.	❖ Use oral response as an option to give answer for trainees having severe upper limb impairment ❖ Time extension for trainees having severe upper limb impairment
Demonstration/Observation	❖ Brief the instruction or provide them in large text ❖ Time extension	❖ Use sign language interpreter ❖ Brief on the instruction of the exam ❖ Provide activity-based/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1 Conduct inspection.

- Industry are inspected and technical problems are addressed, analyzed the problems and prepare document for evaluation and consultation with technical personnel, specialist and technical manager
- Consultation processes are developed and/or implemented as an integral part of the operational planning process
- Evaluation and work plans are develop to create a systematic solution for the technical problems

LO.2 Evaluate technical problems.

- Technical problems are identified, evaluated and create systematic solution/remedy and prioritized as directed
- Required resources are allocated as per requirements of the activity

LO.3. Rectify/correct defects in computer systems

- Established OHS and risk control measures and procedures in preparation for the work are followed.
- Policies and procedures are developed to include OHS practices, skills required and frequency and level of maintenance work.
- Project proposal are reviewed and ensure that all necessary documents, manuals and checklist are obtained
- Schedule of work activities are prepared according to manufacturer's recommendation
- Appropriately competent persons are engaged to assess the risks associated with individual equipment failure.
- Level and frequency of repair/replace to be done under maintenance work is established from risk assessment reports and manufacture's recommendations and standards reflecting acceptable exposure to risk of equipment failure.
- Systems are established to manage and record technical work activities in accordance with organization and regulatory requirements

EIS EEES3 06 0322: Maintain and repair computer				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	***Learning Materials***			
1.	TTLM	TTTLM prepared by the trainer	25	1:1
2.	Reference Books			
2.1	Audio Video Systems Principles Practices and Troubleshooting.	S P Bali Rajeev Bali Kahanna Book Publishing CO.LTD	.5	1:5
2.2	Audio and Video Systems Principles Maintenance and Troubleshooting	R G Gupta TATA McGraw	5	1:5
2.3	Modern Television Practice ,Principle, Technology &Servicing	R.R.GULATI New Age International(p)Limited	5	1:5
2.4	Television Principles & Practice 1997	J..S Zarach&NoelemM.Morls	5	1:5
B.	***Learning Facilities & Infrastructure***			
1.	Library	10 x 12 meter	1	1:25
2	Lecture Room	6 x 7 meter	1	1:25
3	Work shop	10 x 8 meter	1	1:25
4	White board	1.20mx2m	1Pcs	1:25
5	Smart room	Sound proof (7X8) meter	1	1:25
C.	***Consumable Materials***			
1.	***Satellite dish antenna***	90cm in diameter	***5***	1:5r
2	Solder	1mm rosien flux	25roll	1:1
3	wire insulation cap	12mmdiameter	25 pcs	1:1
4	wire insulation cap	14mm diameter	25 pcs	1:1

5	wire insulation cap	16 mm diameter	25 pcs	1:1
6	wire insulation cap	18mm diameter	25 pcs	1:1
7	wire insulation cap	20mm diameter	25 pcs	1:1
8	Female and male banana plug	 4mm	200 pcs	1:1
9	Wire zip	Small	25 pcs	1:1
10	Wire zip	Medium	25 pcs	1:1
11	Wire zip	Large	25 pcs	1:1
12	Battery	12v-40(12v40AH) (solar Battery)	25 pcs	1:1
13	Battery Holder	for 9 Volts Battery	25 pcs	1:1
14	Battery, 12v	12 Volts battery	25 pcs	1:1
15	TX & RX module	433 MHZ	25 pcs	1:1
16.	HDMI Cable	Max supported Video resolution 3840X2160@30Hz Max Supported Color Depth 24-bit True Color Length 3meter	5pcs	1:5
17	HDMI Cable	Max supported Video resolution 3840X2160@30Hz Max Supported Color Depth 24-bit True Color Length 5meter	5pcs	1:5
18	HDMI Cable	Max supported Video resolution 3840X2160@30Hz Max Supported Color Depth 24-bit True Color Length 10meter	5pcs	1:5
19	HDMI Cable	Max supported Video resolution 3840X2160@30Hz	5pcs	1:5

		Max Supported Color Depth 24-bit True Color Length 20 meter		
20	Coaxial cable	75 ohms	5 roll	1:5
21	Audio video cable (AV Cable)	Red, white and Yellow color length 2 meter	25	1:1
22	Audio video cable (AV Cable)	Red, white and Yellow color length 3 meter	25	1:1
23	Video editing soft ware	Camtesia software (Right to use minimum of 5 computer with manufacturer knowledge) produce without water mark.	5	1:5
D.	Tools and equipment			
1.	Consumer video camera (single –lens reflex digital camera	-Effective Mega pixel 16.9 million -AF, manual focus -Image sensor 23.6mm C MOC sensor -Screen 3 inch		
2.	Mixer	- 6 channels stereo Echo mixerEqualization :Bass &treble +5dB -Digital echo 20-400m/s. frequency -25Hz-25kHz MP3 player with USB& -MMCcard slot & Remote Control :Gain , pan. echo, fade		
3.	Professional camera	-Shutter speed :-TV mode 1/6-1/2000 -HP mode 1/12.5-1/500 Low light mode ½-1/500 -Digital Zoom-400x(movie mode only) -Lens 20x optical zoom -Image sensor ½.84-inch -HD CMOS pro sensor		

		HDMI out put		
4.	Photo camera	-Focal length- 4.8mm- -Effective Mega pixel 16 MP and above -Optical Zoom- 8x -Video resolution- 1280x720		
5.	LED TV	32”		
6.	LED TV	43”		
7	Sound Bar	2 Channel 300W with wireless Subwoofer		
8	Printer	Laser jet Printer Print Resolution: 1200X1200dpi Duplex Printing: Automatic Printer color: Monochrome Duty cycle :50,000 pages per month	5 pcs	1:5
9	Desk Top computer	• Computer • Processor - dual core 2.4 GHz+ (i5 or i7 series Intel processor or equivalent AMD) • RAM - 8 GB • Hard Drive - 128 GB or larger solid state hard drive • Graphics Card - any with DVI support - desktop only • Monitor - 23" widescreen LCD with DVI support - desktop only • Operating System - Windows 7 Home Premium or Professional with Service Pack 1 or Apple OS X 10.9.3 • Backup Device - External hard drive, USB Flash Drive and/or	5 pcs	1:5

		DVD+/-RW drive Having left and right speaker(external		

LEARNING MODULE 06

TVET-PROGRAMME TITLE: **Electrical/Electronic Equipment Servicing Level V**

MODULE TITLE: **Installing commercial video/audio system components**

MODULE CODE: **EISE EEES5 M06 0322**

NOMINAL DURATION:**120 Hours**

MODULE DESCRIPTION: This module covers the knowledge, skills and attitudes required to installation of components for audio/video facilities in buildings and premises. The module encompasses working safely and to specifications and standards, matching equipment with that specified for a given location, terminating and interconnecting cables/conductors and completing the necessary installation documentation.

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

LO1: Prepare to install audio/video components and systems

LO2: Install audio/video components and systems.

LO3: Complete installation work and report.

MODULE CONTENTS:

LO1: Prepare to install audio/video components and systems

1.1 Obtaining OHS police and procedures.

1.2 Obtaining nature and location of the work

1.3 Preparing necessary tools and test instruments

1.4 Establishing sources of required for the work.

1.5 Reporting and advising on risk control measures.

LO2. Install audio/video components and systems

2.1 Installing commercial audio/video system

2.1.1. Sound and video reproduction fundamentals

2.1.2. Audio/video reproduction, electronic components

2.1.3. Audio/video reproduction, speaker fundamentals

2.1.4. Loud speakers and microphones

2.2 Establishing OHS risk control

2.3 Checking circuits/components being isolated.

2.4 Terminating cables and conductors

2.5 Carrying out installation

LO3. Complete installation work and report

3.1 Following OHS work completion risk control measures

3.2 Cleaning and making safe work site

3.3 Notifying work supervisor.

Learning Methods:				
For none mpaired trainees	**Reasonable Adjustment for Trainees with Disability (TWD)**			
	Low Vision	**Deaf**	**Hard of hearing**	**Physical impairment**
Lecture-discussion	❖ Provide large print text ❖ Prepare the lecture in **Audio/video** ❖ Organize the class room seating arrangement to be accessible to trainees ❖ Write short notes on the black/white board using large text ❖ Make sure the luminosity of the light of class room is kept ❖ Use normal tone of voice ❖ Encourage trainees to record the lecture in audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	❖ Assign sign language interpreter ❖ Arrange the class room seating to be conducive for eye to eye contact ❖ Make sure the luminosity of the light of class room is kept ❖ Introduce new and relevant vocabularies ❖ Use short and clear sentences ❖ Give emphasis on visual lecture and ensure the attention of the trainees ❖ Avoid movement during lecture time ❖ Present the lecture in video format ❖ Summarize main points	❖ Organize the class room seating arrangement to be accessible to trainees ❖ Speak loudly ❖ Ensure the attention of the trainees ❖ Present the lecture in video format ❖ Ensure the attention of the trainees	❖ Organize the class room seating arrangement to be accessible for wheelchairs users. ❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note ❖ Provide Orientation on the physical

				feature of the work shop
Demonstration	❖ Conduct close follow up ❖ Use verbal description ❖ Provide special attention in the process of guidance ❖ facilitate the support of peer trainees ❖ Prepare & use simulation ❖ Use video	❖ use Sign language interpreter ❖ Use video recorded material ❖ Ensure attention of the trainees ❖ Provide structured training ❖ Show clear and short method ❖ Use gesture ❖ Provide tutorial support ❖ (if necessary)	❖ Illustrate in clear & short method ❖ Use Video recorded material ❖ Ensure the attention of the trainees ❖ Provide tutorial support ❖ (if necessary)	❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipments/ machines ❖ Assign peer trainees to assist ❖ Conduct close follow up ❖ rovide tutorial support

				❖ (if necessary
Group discussion	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	❖ Use sign language interpreters ❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	❖ Introduce the trainees with their peers

Exercise	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/practical training ❖ Introduce new and relevant vocabularies	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/ practical training	❖ Assign peer trainees ❖ Use additional nominal hours if necessary
Individual assignment	❖ prepare the assignment questions in large text ❖ Encourage the trainees to prepare and submit the assignment in large texts ❖ Make available recorded assignment questions ❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy	❖ Use sign language interpreter ❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	❖

ASSESSMENT METHODS:				
Written test	❖ Prepare the exam in large texts ❖ Use interview as an option if necessary ❖ Prepare the exam in audio format ❖ Assign human reader ❖ (if necessary) ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers ❖ Avoid essay writing ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.	❖ Use oral response as an option to give answer for trainees having severe upper limb impairment ❖ Time extension for trainees having severe upper limb impairment
Demonstration /Observation	❖ Brief the instruction or provide them in large text ❖ Time extension	❖ Use sign language interpreter ❖ Brief on the instruction of the exam ❖ Provide activity-based/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1: Install audio/video components and systems.

- OHS procedures for a given work area are identified, obtained and understood through established routines.
- Established OHS risk control measures are followed in preparation for the work.
- Safety hazards, which have not previously been identified, are reported and advise on risk control measures, are sought from the work supervisor.
- The nature and location of the work is obtained from work supervisor or other appropriate person to establish the scope of work to be undertaken.
- Advice is sought from the work supervisor and/or other appropriate person to ensure the work is coordinated effectively with others.
- Sources of materials that may be required for the work are established in accordance with established routines.

.**LO.2 : Prepare to install audio/video components and systems**

- Established OHS risk control measures for carrying out the work are followed.
- Circuits/components are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
- Audio/video components are installed to comply to standards and job specifications with sufficient excess to affect terminations.
- Accessories are installed straight and square in the required locations and within acceptable tolerances.
- Cables and conductors are terminated at accessories in accordance with manufacture's specifications and regulatory requirements.
- Procedures for referring non-routine events to immediate supervisor for directions are followed.
- The installation is carried out efficiently without waste of materials or damage to apparatus, circuits or the surrounding environment and using sustainable energy practices

LO.3: Complete installation work and report.

- OHS work completion risk control measures and procedures are followed.
- Work site is cleaned and made safe in accordance with established procedures.
- Work supervisor is notified of the completion of the installation work in accordance with established routines.

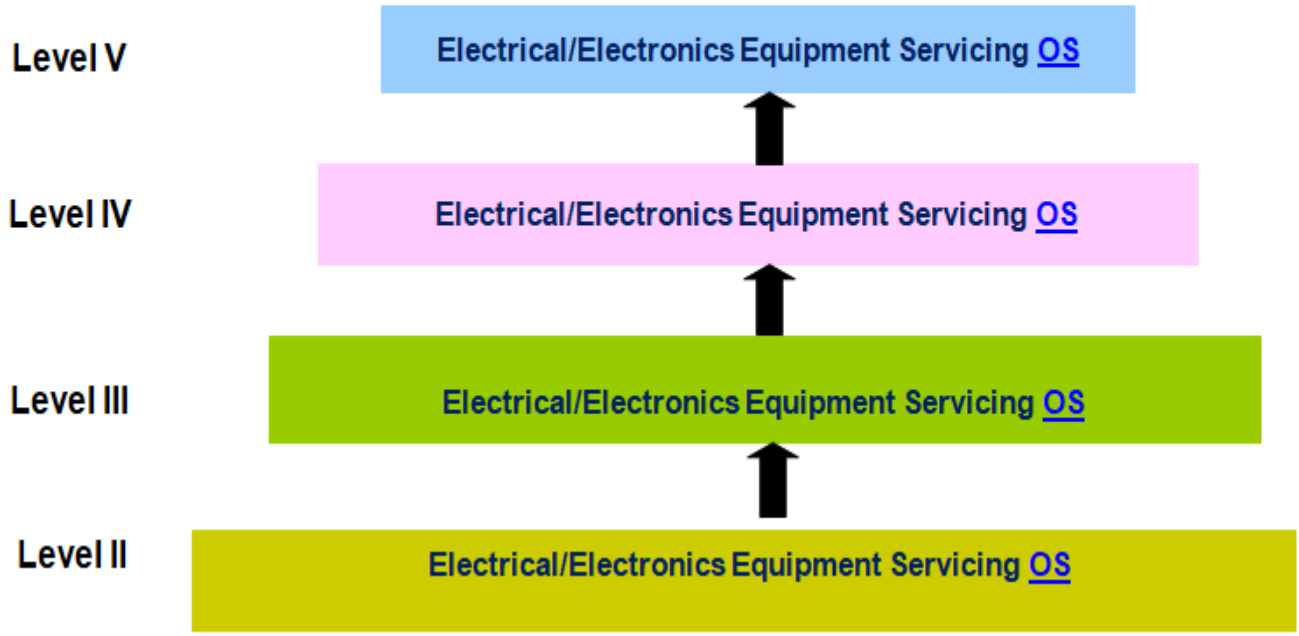
Annex: Resource Requirements

EISE EEES5 M06 0322 ; **Installing commercial video/audio system components**				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	Prepared by the trainer	5	1:5
2.	Audio and Video Systems Principles Maintenance and Troubleshooting	R G Gupta	5	1:5
B.	**Learning Facilities & Infrastructure**			
1.	Library	6 x 8 meter	1room	1 : 25
2.	Lecture Room	10 x 10 meter		1 : 25
3.	Work shop	6 x 8 meter		1 : 25
C.	**Tools and Equipments**			
1.	Screw drivers	With flat tip and insulated, split proof handle blade in set of blade size 2x60,3x80,4x1oo,6x125,8x150,10x200 mm	25pcs	1:1
2	Screw drivers	With flat tip and fully insulated, handled with test lamp up to 380v.blade size 3x60mm	25pcs	1:1
3	Screw drivers	Off set with Philips tip inset of four pieces with tip no. 1,2,3,4	25pcs	1:1
4	Screw drivers	With Philips tip and insulated, split proof handle blade in set of blade size and length of 100,125,200mm	25pcs	1:1
7	Soldering iron/gun	220V,50Hrz,25,40,60 W 220v,50Hrz,100W 220v,50Hrz,200W	25pcs	1:1

9	Multi-testers (analog/digital	DC voltage range 0.2,20,200,1000v AC voltage range 7.5,25,75,230,750v DC current range 0.2,5,10,30Am AC current range 2,20,200Am Ohmmeter 200Ohm,2K ohm,200K ohm,20M ohm	5pcs	1:5
10	Electric blower	220V/50Hz, 400watt	5pcs	1:5
11	Logic analyzer	Standard	5pcs	1:5
13	Logic clip,	Standard	5pcs	1:5
14	Logic probe,	TTL: > 2.3V ±0.02V, CMOS: > 70% Vcc ± 10% ,TTL: < 0.08V ±0.02V	5pcs	1:5
15	Logic current tracer,	Single phase ,220v AC	5pcs	1:5
16	Logic pulsar,	Plus rate (0.5 -400)Hz	5pcs	1:5
17	IC remover,	Sponge	5pcs	1:5
18	High voltage probe	Single phase ,220v AC	5pcs	1:5
19	Hand drilling machine electrical	Makita 220 volt	5pcs	1:5
20	Oscilloscope	Bandwidth (-3dB) DC-20MHz, X5MAG:10MHz • Sensitivity 5mV/DIV-5V/DIV+/-3%. 10 Calibrated Steps, X5MAG:1mV/DIV-1V/DIV • Display Mode CH1, CH2, DUAL (ALT/CHOP), ADD • Rise Time 17.5ns • Input Impedance 1 Mohm//25PF • Input Coupling AC, DC, GND • Max. Input Volt 400V DC + Peak AC **HORIZONTAL AXIS** • Main Time Base 0.1uS/DIV-2S/DIV, 23 Calibrated Steps, X 10MAG: 10nS/DIV-200mS/DIV • Delay Time Base 7025A(N/A), 7026A(YES) • Delay Display Main, Mix, Delay **TRIGGER**	5pcs	1:5

		• Mode AUTO, NORM, TV-V, TV-H • Source CH1, CH2, ALT, LINE, EXT • Sensitivity INT: 0.5DIV, EXT:0.5V • Polarity +, - • Level Adjustable • Hold Off YES **X-Y** • Mode CH1:X, CH2:Y • Sensitivity 5mV/DIV-5V/DIV • Bandwidth (-3dB) DC-1MHz • Phase Difference 3 degree at 50KHz • Z AXISZ Modulation 7025A(N/A), 7026A(YES) **CRT** • Cursor Readout N/A • Screen 6-inch Rectangular, Internal Graticule with % Scale • Effective Area 8 X 10cm • Acceleration Voltage 2.1KV • Illumination 7025A(N/A), 7026A(YES) **GENERAL** • CH2 Output 7025A(N/A), 7026A(YES) • Component Test 7025A(N/A), 7026A(YES) • Beam Find 7025A(N/A), 7026A(YES) • Calibrator Square wave, 1KHz+/-10%, 2Vp-p+/-3% • Trace Rotation Electrical, front panel adjustable • Dimension & Net/Gross Weight 324(W) x 132(H) x 398(H) mm & 7.8kg/12kg • Power 115V/230V+/-10%, 50/60Hz		
21	Programmable Logic Controller	12 In/8 Out- DL 2110AH (12 digital inputs and 8 relay outputs)	5pcs	1:5
22	Speaker	Column speaker 25 W	5 pcs	1 :5

Electro technology



ACKNOWLEDGEMENT

The **Ministry of Labor and Skills** wishes to thank and appreciation for the trainers who donated their effort and time to develop this outcome based curriculum for the TVET program **Electrical/ Electronic Equipment Servicing.** We also thank coordinators, Industry experts, regional TVET experts and curriculum developers.

The trainers who developed the curriculum

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Group coordinator

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