MACHINING
LEVEL – I



CURRICULUM

Based on December, 2021 (V- III) 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 Machining Level I**.** The curriculum development process has been actively supported and facilitated by **Ministry of Labor and Skills.**

TVET-Program Design

1.1. TVET-Program Title: Machining Level - I

1.2. 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 as a **machinist** with competencies elaborated in the respective OS. Graduates of the program will have the required qualification to work in the **Industry** sector in the field of Machining.

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 Test and Identify Properties of Metals, Perform Bench Work, Draw and Interpret drawing, Perform Hand Forging ,Cut and Join Sheet Metal ,Perform General Workshop Machinery, Apply Basic Electrical Practices, Perform flame Cutting and welding ,in accordance with the performance criteria and evidence guide described in the OS.

1.3. TVET-Program Training Outcomes

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

IND MAC1 01 1221	**Draw and Interpret drawing**
IND MAC1 02 1221	**Test and Identify Properties of Metals**
IND MAC1 03 1221	**Perform Bench Work**
IND MAC1 04 1221	**Cut and Join Sheet Metal**
IND MAC1 05 1221	**Perform General Workshop Machinery**
IND MAC1 06 1221	**Perform Hand Forging**
IND MAC1 07 1221	**Perform flame Cutting and welding**
IND MAC1 08 1221	**Apply Basic Electrical Practices**

1.4. Duration of the TVET-Program

The Program will have duration of **600 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.

S.No	Unit Competency	TVET Institution Training		Cooperative Training	Total Hours	Remarks
		Theory	Practical			
1.	Draw and Interpret drawing	30	50	20	100	
2.	Test and Identify Properties of Metals	18	30	12	60	
3.	Perform Bench Work	36	60	24	120	
4.	Cut and Join Sheet Metal	24	40	16	80	
5.	Perform General Workshop Machinery	24	40	16	80	
6.	Perform Hand Forging	18	30	12	60	
7.	Perform flame Cutting and welding	15	25	10	50	
8.	Apply Basic Electrical Practices	15	25	10	50	
Total Hours					**600 Hours**	

1.5. 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 I.**

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.

1.6. 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)
IND MAC1 01 1221 Draw and Interpret drawing	IND MAC1 M01 02 22 Drawing and Interpreting drawings	• Prepare for drawing • Draw simple drawing • Construct multi-view • Prepare freehand sketch • Interpret details from sketches and drawings	**100 hr.**
IND MAC1 02 1221 Test and Identify Properties of Metals	IND MAC1 M 02 0322 Testing and Identifying Properties of Metals	• Classify common ferrous and non-ferrous metals • Test basic applications and methods for manufacturing • Perform basic common metal tests • Define common heat treatment outcomes and applications	**60 hr.**
		• Apply work values/ethics • Plan and prepare work piece • Use a range of graduated devices to measure/determine	**120hr**

			dimensions or variables • Perform hand tool operations • Perform basic drill, ream, hone and scraper operations • Perform Off-hand grind cutting tools • Quality assures finished component	
IND MAC1 04 1221	Cut and Join Sheet Metal	IND MAC1 M 04 0322	Cutting and Joining Sheet Metal	• Analyze work task • Plan and prepare work • Develop patterns as required • Cut and join sheet metal • Quality assure work and clean up	**80hr**
IND MAC1 05 1221	Perform General Workshop Machinery	IND MAC1 M 05 0322	Performing General Workshop Machineries	• Determine and plan job requirements • Set-up machine • Perform machine operations • Quality assures finished component	**80hr**
IND MAC1 06 1221	Perform Hand Forging	IND MAC1 M 06 0322	Performing Hand	• Analyze and plan hand forging work	**60hr**

			Forging	• Perform hand forging techniques • Quality assure work	
IND MAC1 07 1221	Perform flame Cutting and welding	IND MAC1 M 07 0322	Performing flame Cutting and welding	• Plan and select cutting and welding work • Set up oxyacetylene cutting outfit and welding • Perform Cut materials and welding • Assure quality and clean up	**50hr**
IND MAC1 08 1221	Apply Basic Electrical Practices	IND MAC1 M 08 0322	Applying Basic Electrical Practices	• Prepare for work • Conduct minor handling and maintenance • Notify the completion of quality work	**50hr**

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

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 **B Level** and above who have satisfactory practical experiences or equivalent qualifications.

LEARNING MODULE 01
TVET-PROGRAMME TITLE: **Machining Level I**
MODULE TITLE : **Drawings and Interpreting Drawings**
MODULE CODE : **IND MAC1 M01 0322**
NOMINAL DURATION : **100 Hours**
MODULE DESCRIPTION: This Modules deals with the skills, knowledge and attitude required to effectively draw and interpret simple layout drawings and sketches, and applies to individuals working in the manufacturing industry.

LEARNING OUTCOMES

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

LO1. Prepare for drawing

LO2. Draw simple drawing

LO3. Construct multi-view

LO4. Prepare freehand sketch

LO5. Interpret details from sketches and drawings

MODULE CONTENTS:

LO1. Prepare for drawing

1.1.Identifying and selecting drawing instruments.

1.2.Identifying alphabet of lines

1.3.Performing Measurements using appropriate scales

1.4.Constructing lettering.

LO2. Draw simple drawing

2.1 Illustrating a series of geometric shapes.

2.2 Neat and clearing of smudges from the finished drawing**.**

Lo3. Construct multi- view

3.1 Illustrating three views drawing. of specified object.

3.2 Constructing multi-view drawing correctly.

3.3 Constructing view orientation.

3.4 Developing pictorial (3D) drawings

LO4. Prepare freehand sketch

4.1 Sketch correctly appropriate views.

4.2 Showing the necessary dimensions using instruction on drawing

LO5. Interpret details from sketches and drawings

5.1 Identifying Components, assemblies or objects.

5.2 Recognizing Commonly used symbols and abbreviations

5.3 Identifying and following dimensions and instructions

5.4 Identifying material requirements

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	✞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

		❖ Summarize main points		
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 ❖ 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 equipment / machines ✞ Assign peer trainees to assist ✞ Conduct close follow up ❖ provide 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	❖ Introduce the trainees with their peers

			❖ Inform the group members to speak loudly	
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	✞Use sign language interpreter ✞Brief on the instruction of the	✞Provide activity based assessment ✞Brief on the instruction of the	❖ Provide activity based assessment

	text		exam	
	❖ Time extension	✞Provide activity-based/ practical assessment method ✞Time extension	✞ Use loud voice ✞ Time extension	✞Conduct close follow up ✞Time extension

ASSESSMENT CRITERIA:

LO.1 Prepare for drawing

- Drawing instruments and supplies are correctly identified and selected.
- Alphabet of lines is identified and applied with all lines distinct, easily read and of the appropriate line weight and type.
- Measurements are performed using appropriate scales.
- Lettering is constructed distinctly and is easily read

LO.2 Draw simple drawing

- The completed drawing illustrates a series of geometric shapes and activities.
- The finished drawing is neat and clear of smudges.

LO.3 Construct multi-view

- The drawing illustrates three views of specified object with correct line representation.
- The finished multi-view drawing is constructed correctly.
- The drawing has a correct view orientation (isometric).
- The complete pictorial (3D) drawing is correctly developed with hidden features.

LO.4 Prepare freehand sketch

- Sketch correctly drawn with appropriate views where applicable.
- Necessary dimensions are shown and instructions and/or information conveyed by appropriate use of notes.

LO.5 Interpret details from sketches and drawings

- Components, assemblies or objects correctly identified.
- Commonly used symbols and abbreviations are recognized.
- Dimensions and instructions are identified and followed as required.
- Material requirements are correctly identified as required.

Annex: Resource Requirements

IND MAC1 M01 0322 Drawings and Interprating Drawings				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	TTTLM prepared by Trainer	25	1:1
2.	Reference Books	Machine drawing 3rd edition by P.Kannaiah,K.Venkata Reddy Machine Drawing Gills	5	1:5
B.	**Learning Facilities & Infrastructure**			
1.	Drawing room	Standard	1	1:1
2.	Clinic	Standard	1	1:1
C.	**Consumable Materials**			
1.	Paper	A4 & A3	5 pack	1:5
2.	White board marker	Standard	1 pack	1:25
3.	Pencil (Fixer)	Standard	25	1:1
4.	Eraser	Standard	25	1:1
5.	Masking tape	Standard	5	1:5
D.	**Tools and Equipment**			
1.	White board	Standard	1	1:25
2.	Drawing Board (Table)	Standard	25	1:1
3.	Pencil sharpener	Standard	5	1:5
4.	Protractor	Standard	25	1:1
5.	Compass	Standard	25	1:1
6.	Rulers	Standard	25	1:1
7.	T-square	Standard	25	1:1
8.	Set square	45^0 x90^0	25	1:1
9.	Set square	30^0 x60^0	25	1:1
10.	Scale	Standard	25	1:1
11.	LCD	Standard	1	1

LEARNING MODULE 02
TVET-PROGRAMME TITLE: **Machining Level I**
MODULE TITLE **Testing and Identifying Properties of Metals**
MODULE CODE: **IND MAC1 M02 0322**
NOMINAL DURATION **:- 60 Hours**
MODULE DESCRIPTION: This module covers the basic skills, knowledge and attitude required to classify the characteristics of different ferrous and non-ferrous metals, applications, and common treatments and testing procedures in metal engineering manufacturing.
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Classify common ferrous and non-ferrous metals **LO2.** Test basic applications and methods for manufacturing **LO3** Perform basic common metal tests Lo4 Prepare freehand sketch **LO4.** Define common heat treatment outcomes and applications
MODULE CONTENTS: **LO1. Classify common ferrous and non-ferrous metals** 1.1 Classifying ferrous and non-ferrous metals and alloys 1.2 Identifying metal properties **LO2 .Test basic applications and methods for manufacturing** 2.1. Selecting correct cutting tools 2.2. Testing basics on cast ability, weld-ability, forge-ability and corrosion resistance 2.3. Processing engineering materials for rolling, forging, extrusion, drawing 2.4. Experiencing methods of manufacturing in hot working, cold working and thermal processes. **LO3.Perform basic common metal test** 3.1 Selecting, Preparing and carrying out basic metal tests 3.1.1 Tensile strength 3.1.2 Hardness 3.1.3 Shear stress 3.1.4 Impact resistance

3.1.5 Spark and bend tests

3.2 Recording and comparing basic material test results

LO4 Define common heat treatment outcomes and applications

4.1 Identifying the most common heat treatment processes

4.2. Explaining changes in metal property

4.3. Explaining the reasons for heat treatment

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	✞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

		❖ Summarize main points		
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 ❖ 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 equipment / machines ✞ Assign peer trainees to assist ✞ Conduct close follow up ❖ provide 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	❖ Introduce the trainees with their peers

			❖ Inform the group members to speak loudly	
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	✞Use sign language interpreter ✞Brief on the instruction of the	✞Provide activity based assessment ✞Brief on the instruction of the exam	❖ Provide activity based assessment

	❖ Time extension	✞Provide activity-based/ practical assessment method ✞Time extension	✞ Use loud voice ✞ Time extension	✞Conduct close follow up ✞Time extension

ASSESSMENT CRITERIA:

LO.1 Classify common ferrous and non-ferrous metals

- Distinctions between ferrous and non-ferrous metals and alloys are classified in terms of color codes, strength, density, corrosion resistance, electrical conductivity and magnetic properties.
- Distinctions between ferrous and non-ferrous metals and alloys are classified in terms of color codes, strength, density, corrosion resistance, electrical conductivity and magnetic properties.

LO.2 Test basic applications and methods for manufacturing

- Correct cutting tools are selected for the machinability
- Basics on cast-ability, weld-ability, forge-ability and corrosion resistance are tested
- Basic methods are carried out of processing engineering materials for rolling, forging, extrusion, drawing and spinning
- Methods of manufacturing in hot working, cold working and thermal processes are experienced.

LO.3 Perform basic common metal tests

- Basic metal tests of tensile, hardness, shear, impact, spark and bend tests are selected, prepared and carried out
- Basic material test results are recorded and compared

LO.4 Define common heat treatment outcomes and applications

- The most common heat treatment processes used are identified
- The changes in metal properties caused by heating are explained
- The reasons for heat treatment use are explained

Annex: Resource Requirements

IND MAC1 M02 0322 Testing and Identifying Properties of Metals				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	TTLM prepared by the trainer	25	1;1
2	Reference Books	- The motive series Macmillan text for industrial vocation & technical education metal work technology - Any book related to material testing	5	1:5
3.	Journals/Publication/Magazines			
B.	**Learning Facilities & Infrastructure**			
1.	Classroom	5m*10m	1	1:25
2.	LAB	Std	1	1:25
3.	Work shop	standard	1	1:25
4	Library	standard	1	1;25
5	white board	standard	1	1:25
C.	**Consumable Materials**			
1.	Paper	A4	25	1;1
2.	Mild steel road	Φ6mm,Φ8mm, Φ10mm, Φ12mm,	1Pcs each	1;25
3.	Mild steel plate	6000mmx30mmx5mm	1Pcs each	1;1
D.	**Tools and Equipment's**			
1.	Hardness tester	Rockwell, Brinell, etc.	2	1;12
2.	Spark testing-grinder	standard	2	1;12
3.	Tensile tester	standard	2	1;12
4.	Impact testing equipment	standard	2	1;12

LEARNING MODULE 03
TVET-PROGRAMME TITLE: **Machining Level I**
MODULE TITLE : **Performing Bench Work**
MODULE CODE : **IND MAC1 M 03 0322**
NOMINAL DURATION : **120 Hours**
MODULE DESCRIPTION : This module covers the basic skills, knowledge and attitude required to determine work requirements, perform basic bench work operations check the components for conformance to specifications.

LEARNING OUTCOMES

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

LO1. Apply work values/ethics

LO2. Plan and prepare work piece

LO3. Use a range of graduated devices to measure/determine dimensions or variables

LO4. Perform hand tool operations

LO5 Perform basic drill, ream, hone and scraper operations

LO6 Perform Off-hand grind cutting tools

LO7 Quality assure finished component

MODULE CONTENTS:

LO1. Apply work values/ethics

1.1.Classifying and reaffirming work values/ethics/concepts

1.1.1. Sense of responsibility

1.1.2. Competence

1.1.3. Team work

1.1.4. Commitment/ Dedication

1.2.Undertaking work practices with industry work ethical standards, organizational policy and guidelines

1.2.1 5S (Discipline and Ongoing improvement)

1.2.2. Innovativeness/Creativity

1.2.3. Quality of work

1.3.Conducting personal behavior and relationships with co-workers and/or clients.

1.4.Using company resources.

1.4.1. Consumable materials

1.4.2. Equipment/Machineries

1.4.3.Human power

1.4.4. Time and Financial resources

LO2. Plan and prepare work piece

2.1. Planning work activities sequentially.

2.2. Selecting materials.

2.2.1. Ferrous

2.2.2. Non Ferrous

2.3 Laying out and marking dimensions/features

LO3. Use a range of graduated devices to measure/determine dimensions or variables

3.1. Selecting appropriate device or equipment to achieve required outcome.

3.2. Using correct and appropriate measuring technique.

3.3. Measuring accurately to finest graduation of instrument..

LO4. Perform hand tool operations

4.1. Clamping work pieces in work holding devices.

4.2. Selecting and using hand tools according to task and safety regulations.

4.3. Cutting, Chipping, filed or scraping work pieces within tolerances.

4.4. Cutting threads

4.4.1. Internal threads

4.4.2. External threads

4.5. Performing bench work operations

LO5. Perform basic drill, ream, hone and scraper operations

5.1. Drilling, Reaming and Honing boreholes according to guidance.

5.2. Performing all operations using personal protective devices.

5.3. Selecting scrapers according to requirements of operation.

LO6. Perform Off-hand grind cutting tools

6.1. Honing cut edges free of burrs.

6.2. Sharpening cutter to conform to specifications.

6.3. Grounding cutters using appropriate cooling agents.

6.4. Performing cutting tool grinding using personal protective devices.

LO7. Quality assure finished component

7.1. Checking component for conformance.

7.2. Using appropriate techniques, measuring tools and equipment.

7.2.1. Steel rule

7.2.2. Vernier caliper

7.2.3. Micro meter

7.2.4. Straight edge

7.2.5. Gages

7.3 Handling deviations appropriately.

7.4 Caring routine maintenance and adjustments out.

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	✞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
		❖ Summarize main points		

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 ❖ 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 equipment / machines ✞ Assign peer trainees to assist ✞ Conduct close follow up ❖ provide 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	❖ Introduce the trainees with their peers

			❖ Inform the group members to speak loudly	
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	✞Use sign language interpreter ✞Brief on the instruction of the	✞Provide activity based assessment ✞Brief on the instruction of the exam	❖ Provide activity based assessment
	❖ Time extension	✞Provide activity-based/ practical assessment method ✞Time extension	✞ Use loud voice ✞ Time extension	✞Conduct close follow up ✞Time extension

ASSESSMENT CRITERIA:

LO1. Apply work values/ethics

- Work values/ethics/concepts are classified and reaffirmed in accordance with the transparent company ethical standards, policies and guidelines.
- Work practices are undertaken in compliance with industry work ethical standards, organizational policy and guidelines
- Personal behavior and relationships with co-workers and/or clients are conducted in accordance with ethical standards, policy and guidelines.
- Company resources are used in accordance with transparent company ethical standard, policies and guidelines.

LO.2. Plan and prepare work piece

- Work activities are sequentially planned based on the required tasks and the applied safety regulations
- Materials are selected according to specifications of the drawing.
- Dimensions/features are lay out and marked in accordance with drawing specifications using bench work tools and equipment.

LO3. Use a range of graduated devices

- Select appropriate device or equipment to achieve required outcome.
- Use correct and appropriate measuring technique.
- Measure accurately to finest graduation of instrument. As appropriate to field or area.

LO4. Perform hand tool operations

- Work pieces are clamped in work holding devices to avoid damage and accidents.
- Hand tools are select and used according to task and safety regulations
- Work pieces are cut, chipped, filed or scrape within tolerances specified in the drawing.
- Threads are cut according to standard procedures
- Bench workk operations are performed applying safety procedures and using personal protective devices

LO5. Perform basic drill, ream, hone and scraper operations

- Boreholes are drilled, reamed and honed to drawing specification and according to guidance.
- All operations are performed applying safety procedures and using personal protective devices.
- Scrapers are select according to requirements of operation. **LO6** Perform Off-hand grind cutting tools

LO6.Perform Off-hand grind cutting tools

- Cut edges are honed and free of burrs.
- Cutter is sharpened to conform to specifications.
- Cutters are ground using appropriate cooling agents.
- Cutting tool grinding is performed applying safety procedures and using personal protective devices.

LO7 Quality assure finished component

- Component is checked for conformance to specifications and predetermined finish in accordance with given standards.
- Appropriate techniques, measuring tools and equipment are used in checking conformance.
- .Deviations is handled appropriately in accordance with organization procedures and standard.
- .Routine maintenance and adjustments are carried out based on machine inspection plan

Annex: Resource Requirements

IND MAC1 M03 0322 Performing Bench work				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	TTTLM prepared by Trainer	25	1:1
2.	Reference Books	Modern machining technology operation apractical guide eddited by j paulo david	5	1:5
B.	**Learning Facilities & Infrastructure**			
1.	Drawing room	Standard	1	1:25
2	Clinic	Standard	1	1:25
C.	**Consumable Materials**			
1.	Copy paper	A4 size	25 rim	1:1
2.	White board marker	Standard	1 pack	1:25
3.	Pencil (Fixer)	Standard	25	1:1
4.	Eraser	Standard	25	1:1
5.	Masking tape	Standard	5	1:5
D.	**Tools and Equipment**			
1.	White board	Standard	1	1:25
2.	Electric grinder	Portable, bench type and Pedestal grinder	5	1:5
3.	Scriber	Standard as required	25	1:1
4.	Hacksaw with blade	Adjustable and fixed frame with 200mm and 300mm length blades	100	4:1
5.	Chisels	Flat ,round, half –round and diamond chisels	25	1:1
6.	Hand tap and die	Standard	5 sets	1:5
7.	Files	Round ,half round, flat ,triangular, square and knife	50 each	2:5
8.	Reamer	standard	5set	1:5
9.	Steel rule	30mm,50mm,60mm and 100mm	25each	1:1
10.	Meter tape/Tape rule	3m and 5m	50each	1:1
11.	LCD	Standard	1	1:25

12	Vernier caliper	0.1mm, 0.5mm and 0.2mm accuracy	5 each	1:5
15	Micrometers	0-25mm,25-50mm,50-75mm,etc.	1 each	1:5
14	Laying out tools	Try square, calipers, dividers, punches, surface plate etc.	25each	1:5
15	Hammer	Ball pin, cross pin, setting hammers	50	
16	Bench vice	Standard	5	1:5
17	Personal protective equipment	Safety Shoes, gloves, apron, goggle, overall	25each	1:1
18	Clamps	Standard/c-clamp, parallel clamp/	5 each	1:5

LEARNING MODULE 04
TVET-PROGRAMME TITLE: **Machining Level I**
MODULE TITLE : **Cutting and Joining Sheets Métal**
MODULE CODE : **IND MAC1 M04 0322**
NOMINAL DURATION : **80 Hours**
This Modules deals with the knowledge, skills and attitudes in applying cutting and joining sheet metal using variety of techniques, and tools and equipment.
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Analyze work task **LO2.** Plan and prepare work **LO3**. Develop patterns as required **LO4.** Cut and join sheet metal **LO5.** Quality assure work and clean up
MODULE CONTENTS: **LO1. Analyze work task** 1.1. Analyzing task according to applied requirements. 1.2. Identifying and adhering quality assurance. 1.3. Adhering OHS requirements associated with cutting and joining sheet metal. **LO2. Plan and prepare work** 2.1. Planning and sequencing tasks. 2.2. Selecting and checking tools, equipment and materials, 2.3. Preparing work area. 2.4. Checking Sealants, fixing and sheet metal materials for compatibility. **LO3. Develop patterns as required** 3.1. Applying parallel line, radial line and triangulation development methods 3.2. Determining and transferring allowances for fabrication and assembly. **LO4. Cut and join sheet metal** 4.1. Marking out Sheet metal. 4.2. Measuring and Cutting Sheet metal to pattern. 4.3. Preparing and cleaning Surface from contaminants. 4.4. Joining Sheet metal by avoiding damage to all surrounding surfaces

LO5. Quality assure work and clean up

5.1. Measuring aligned, joined and sealed components.

5.2. Cleaning, checking, maintaining and storing work area, tools and equipment.

5.3. Completing workplace documentation.

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	✞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

		❖ Summarize main points		
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 ❖ 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 equipment / machines ✞ Assign peer trainees to assist ✞ Conduct close follow up ❖ provide 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	❖ Introduce the trainees with their peers

			❖ Inform the group members to speak loudly	
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	✞Use sign language interpreter ✞Brief on the instruction of the	✞Provide activity based assessment ✞Brief on the instruction of the exam	❖ Provide activity based assessment

	❖ Time extension	✞Provide activity-based/ practical assessment method ✞Time extension	✞ Use loud voice ✞ Time extension	✞Conduct close follow up ✞Time extension

ASSESSMENT CRITERIA:

LO.1 Analyze work task

- Task is analyzed according to applied requirements and expertise needed
- Quality assurance requirements are identified and adhered based on task specifications
- OHS requirements associated with cutting and joining sheet metal, and the workplace environment, are adhered to throughout the work

LO.2 Plan and prepare work

- Tasks are planned and sequenced in conjunction with others involved or affected by the work
- Tools, equipment and materials, including personal safety equipment, are selected and checked for serviceability and compliance with plans/specifications
- Work area is prepared to support the efficient cutting and joining of sheet metal
- Sealants, fixing and sheet metal materials are checked for compatibility and appropriateness for the job

LO.3 Develop patterns as required

- Parallel line, radial line and triangulation development methods are chosen and applied.
- Allowances for fabrication and assembly are correctly determined and transferred.

LO.4 Cut and join sheet metal

- Sheet metal is marked out in accordance with plans/specifications
- Sheet metal is cut to pattern and measured using appropriate cutting tools and according to specifications
- Surface is prepared and cleaned of grease and other contaminants
- Sheet metal is joined to comply with plans/specifications, avoiding damage to all surrounding surfaces.

LO.5 Quality assure work

- Aligned, joined and sealed components are visually inspected and measured according to specifications
- Work area, tools and equipment are cleaned, checked, maintained and stored in accordance with regulations and procedures
- Documentation is completed in accordance with workplace requirements

Annex: Resource Requirements

IND MAC1 M04 0322 Cutting and Joining Sheets Métal				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	TTTLM prepared by Trainer	25	1:1
2.	Reference Books	Modern machining technology operation a practical guide edited by j Paulo David	5	1:5
B.	**Learning Facilities & Infrastructure**			
1.	Lecture room / work shop	Standard	1	1:25
2.	Library,	With sufficient books	1	1:25
C.	**Consumable Materials**			
1.	Copy paper	A4 and A3 size	2 pack	2:25
2.	Stainless sheet	1000 x2000mm	1Pcs	1:25
3.	Galvanized sheet	1000 x2000mm	1Pcs	1:25
4.	Mechanical pencils	1000 x2000mm	1Pcs	1:25
5.	Aluminum sheet	1000 x2000mm	1Pcs	1:25
6.	Brush for adhesive applying	Standard as required	5Pcs	1:5
D.	**Tools and equipment**			
1.	Tape rule	3 meter & 5 meter	5pcs	1:5
2.	Hand shear	Standard as required	25 pcs	1:5
3.	Steel rule	500,& 1000 (mm)	5pcs	1:5
4.	Scriber	Standard as required	25 pcs	1:1
5.	Snip	Standard as required	25 pcs	1:1
6.	Ball pin Hammer	Standard as required	25 pcs	1:1
7.	Mallet Hammer	Rubber and plastic	25 pcs	1:1
8.	Stake and stake holder	Standard as required	5pcs	1:5
9.	Chisel	Standard as required	25 pcs	1:1
10.	Hand Groove	Standard as required	5pcs	1:5
11.	Hand Seaming	Standard as required	5pcs	1:5

12.	Rivet set	Standard as required	5pcs	1:5
13.	Punch	Standard as required	5pcs	1:5
14.	Personal protective equipment	Standard as required	25 pcs	1:1
15.	Iron scissors	Standard as required	25 pcs	1:1

LEARNING MODULE 05
TVET-PROGRAMME TITLE: **Machining Level I**
MODULE TITLE : **Performing General Workshop Machining**
MODULE CODE : **IND MAC1 M05 0322**
NOMINAL DURATION: **80 Hours**
MODULE DESCRIPTION: This Module covers the knowledge, skills and attitudes required in using workshop machines.

LEARNING OUTCOMES

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

LO1. Determine and plan job requirements

LO2. Set-up machine

LO3. Perform machine operations

LO4. Quality assure finished component

MODULE CONTENTS:

LO1. Determine and plan job requirements

1.1. Analyzing and selecting Work requirements

1.2. Selecting Appropriate machine and tools

1.2.2 Drilling Machine

2.1 Lathe Machine

1.2.3 Milling Machine

1.3. Determining sequence of operations

LO2. Set-up machine

2.1 Inspecting and sharpening tools

2.2 Mounting and positioning tools

2.3 Setting and adjusting guards and accessories

2.4 Calculating cutting speeds, RPM, feeds and depth of cuts

2.5 Performing setup operations

LO3.Perform machine operations

3.1 Mounting materials to be machined and secured using clamping devices.

3.2 Operating machine correctly

3.3 Setting machining parameters for job requirements and maximum tool life.

3.3.1 Speeds
3.3.2 Feeds
3.3.3 Depth

3.4 Performing operations applying safety procedures.

LO4. Quality assure finished component

4.1. Checking Components for conformance to specifications

4.2. Using appropriate measuring tools and equipment

4.3. Handling deviations

4.4. Carrying out routine maintenance and adjustments

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	✞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

		❖ Summarize main points		
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 ❖ 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 equipment / machines ✞ Assign peer trainees to assist ✞ Conduct close follow up ❖ provide 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	❖ Introduce the trainees with their peers

			❖ Inform the group members to speak loudly	
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	✞Use sign language interpreter ✞Brief on the instruction of the	✞Provide activity based assessment ✞Brief on the instruction of the exam	❖ Provide activity based assessment

	❖ Time extension	✞Provide activity-based/ practical assessment method ✞Time extension	✞ Use loud voice ✞ Time extension	✞Conduct close follow up ✞Time extension

ASSESSMENT CRITERIA:

LO.1 Determine and plan job requirements

- Work requirements are analyzed and selected from work instructions and drawings/diagrams
- Appropriate machine and tools are selected based on work requirements
- Sequence of operations is determined for maximum efficiency and to meet work requirements and specifications.

LO.2 Set-up machine

- Tools are inspected and if necessary sharpened according to the work requirements
- Tools are mounted and positioned within machine specifications
- Guards and accessories are set and adjusted as required
- Speeds and feeds are calculated using appropriate mathematical techniques and reference material.
- Setup operations are performed following correct/standard procedures and applying safety measures

LO.3 Perform machine operations

- Materials to be machined is mounted and secured using clamping devices appropriate to the work requirements
- Machine is operated correctly to suit work and material requirements.
- Machining parameters are set for job requirements and maximum tool life.
- Operations are performed applying safety procedures and using personal protective devices.

LO.4 Quality assure finished component

- Component is checked for conformance to specifications and predetermined finish in accordance with given standards.
- Appropriate techniques, measuring tools and equipment are used in checking conformance.
- Deviations are handled appropriately in accordance with organization procedures and standard.
- Routine maintenance and adjustments are carried out based on machine inspection plan
- Material requirements are correctly identified as required.

Annex: Resource Requirements

IND MAC1 M05 0322 Performing general workshop machinery				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	TTTLM prepared by Trainer	1	1:25
2.	Reference Books	1. B. H. Amstead, P. Ostwald, M.L.Begaman, Manufacturing Processes,(8 Edition)	5	1:5
B.	**Learning Facilities & Infrastructure**			
1.	Class room	Standard	1	1:25
2.	Clinic	Standard	1	1:25
3	Workshop	Standard	1	1:25
4	Library	Standard	1	1:25
C.	**Consumable Materials**	Standard	25	1:1
1.	Paper	A4 & A3	5 pack	1:5
2.	White board marker	Standard	1 pack	---
3.	Aluminum Ingot	Ø 30-100x500mm	1 each	25
4.	Mild steel Round bar	Ø20-60x6000mm	1 each	25
D.	**Tools and Equipment**			
1.	Lathe tools, Milling cutters, drill, reamers	Standard	Each set 5	5:25
2.	Drill Machine	Standard	5	5:25
3.	Lathe & Milling machines different type	Standard	5	5:25
4.	Accessories (Chucks, ,Boring bar, Clamps, Vises, Angle Clamping	Standard	Each set	5:25

	devices, Chucks, vices, clamps) etc.			
5	Personal protective equipment's	Standard	25	1:1
6.	Meter tape	3 meter & 5 meter	25	1:1
7.	Steel rule	30,50,60 and 100mm	25	1:1
8.	Try square	45^0 x90^0	25	1:1
9.	Steel rule	30^0 x60^0	25	1:1
10.	Vernier caliper	0.02,0.05 and 0.1mm	5	5:25
11.	Micrometer	0-25, 25-50, 50-75 and 75-100mm	5	5:25

LEARNING MODULE 06
TVET-PROGRAMME TITLE: **Machining Level I**
MODULE TITLE: **Performing Hand Forging**
MODULE CODE: **IND MAC1 M06 0322**
NOMINAL DURATION: **60 Hours**
MODULE DESCRIPTION: This module covers the basic skills, knowledge and attitude required using hand tools and formers, applying hand forging techniques and operating heat treatment equipment.

LEARNING OUTCOMES

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

LO1. Analyze and plan hand forging work

LO2 Perform hand forging techniques

LO3 Quality assure work

MODULE CONTENTS:

LO1. Analyze and plan hand forging work

1.1 Interpreting drawing for swaging, bending, upsetting, spreading, punching and drifting

1.2. Selecting hand tools and formers for required forging techniques.

1.3 Applying forging temperatures and heat specifications to for various materials requirement

1.4. Drafting work plan according to specifications

LO2. Perform hand forging techniques

2.1. Setting up and operating heating equipment correctly.

2.2.Applying and carrying out appropriate forging techniques

2.3.Making allowance for materials shrinkage and oxidization

2.8.1 Drawing

2.8.2 Swaging

2.8.3 Bending

2.8.4 Upsetting

2.8.5 Spreading

2.8.6 Punching

2.8.7 Drifting

LO3. Quality assure work

2.4 Operating equipment that minimizes oxidization.

3.2.Ccontrolling heat to specified areas as per instruction

3.3.Measuring form and shape by applying standard devices

3.4.Following Occupational Health and Safety (OHS) measures and procedure

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	✞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

		❖ Summarize main points		
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 ❖ 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 equipment / machines ✞ Assign peer trainees to assist ✞ Conduct close follow up ❖ provide 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	❖ Introduce the trainees with their peers

			❖ Inform the group members to speak loudly	
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	✞Use sign language interpreter ✞Brief on the instruction of the	✞Provide activity based assessment ✞Brief on the instruction of the exam	❖ Provide activity based assessment

	❖ Time extension	✞Provide activity-based/ practical assessment method ✞Time extension	✞ Use loud voice ✞ Time extension	✞Conduct close follow up ✞Time extension

ASSESSMENT CRITERIA:

LO.1. Analyze and plan hand forging work

- Drawing is interpreted for swaging, bending, upsetting, spreading, punching and drifting techniques in compliance with specification.
- Hand tools and formers are selected for required forging techniques.
- Forging temperatures and heat specifications are applied to for various materials requirement
- Work plan is drafted according to specifications

LO.2 Perform hand forging techniques

- Heating equipment is set up and operated correctly.
- Appropriate forging techniques are applied and carried out in accordance with safety procedures
- Allowance is made for materials shrinkage and oxidization.

LO.3 Quality assure work

- Equipment is operated in a manner that minimizes oxidization in accordance with operational procedures
- Heat is controlled to specified areas as per instruction
- Form and shape are measured by applying standard devices
- Occupational Health and Safety (OHS) measures and procedures are followed throughout the process.

Annex: Resource Requirements

IND MAC1 M06 0322 Performing Hand Forging				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	TTTLM prepared by the trainer	25	1:1
3.	Reference book	Moltrecht, Karl Hans: Machine Shop Practice, 2n ed. New York: Industrial Press, 1981, Volume 1, p. 403.	1	1:25
B.	**Learning Facilities & Infrastructure**			
1.	Drawing Room	Standard	1	1:25
2.	Clinic	Standard	1	1:25
C.	**Consumable Materials**			
1	Copy paper Drawing paper	A_4, A_3,	5packs each	1:5
2	Low to medium carbon and alloy steel	Standard as required	5	1:5
4	Charcoal	200 kg	1 Pcs	1:25
5	kerosene	Standard	5L	1:5
6	White Board Marker	Standard	1 pack	
D	**Tools and Equipment**			
1	Flatters, set hammers, swages hot/cold sets	Standard	5 each	1:5
2	White Board	Standard	1	1:25
3	ball peen hammer, measuring tools,	Standard	25	1:1
5	Personal protective equipment's	Standard	25	1:1
6	Tong	Standard	25	1:1
7	Anvil	Standard	5	1:5
8	Forging Oven	Manual or Electrical	1	1:25
10	LCD Projector	Standard	1	1:25

LEARNING MODULE 07
TVET-PROGRAMME TITLE: **Machining Level I**
MODULE TITLE: **Performing flame Cutting and welding.**
MODULE CODE: **IND MAC1 M 07 0322**
NOMINAL DURATION : **50 Hours**
MODULE DESCRIPTION: This module covers the skills, knowledge and attitudes required in preparing the materials and carrying out flame Cutting and welding
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Plan and select cutting and welding work **LO2.** Set up oxyacetylene cutting outfit and welding **LO3**. Perform Cut materials and welding **LO4.** Assure quality and clean up
MODULE CONTENTS: **LO1. Plan and select cutting and welding work** 1.1 Identifying cutting and welding requirements. 1.2 Selecting and preparing Cutting welding equipment and consumables 1.3 Preparing material to achieve the required cutting and welding specifications. **LO2.Set up oxyacetylene cutting outfit and welding** 2.1 Interpreting instructions, symbols, specifications including bead size, bead placement, and reinforcement 2.2 Assembling and setting up cutting equipment 2.3 Setting up Welding currency. 2.4 Selecting suitable Electrodes **LO3. Perform Cut materials and welding** 3.1 Cutting Materials in all positions 3.2 Inspecting and releasing Cutting components

3.3 Cleaning and preparing materials based on procedures

3.4 Welding materials to job requirements.

3.5 Cleaning Welding seams

3.6 Following and applying OHS cutting procedures.

LO4 Assure quality and clean up

4.1 Cleaning Welding seams and inspecting.

4.2 Measuring Joins according to specifications

4.3 Cleaning and maintaining welding equipment and working area after welding activity

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	✞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

		❖ Summarize main points		
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 ❖ 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 equipment / machines ✞ Assign peer trainees to assist ✞ Conduct close follow up ❖ provide 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	❖ Introduce the trainees with their peers

			❖ Inform the group members to speak loudly	
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	✞Use sign language interpreter ✞Brief on the instruction of the	✞Provide activity based assessment ✞Brief on the instruction of the exam	❖ Provide activity based assessment

	❖ Time extension	✞Provide activity-based/ practical assessment method ✞Time extension	✞ Use loud voice ✞ Time extension	✞Conduct close follow up ✞Time extension

ASSESSMENT CRITERIA:

LO.1 Plan and select cutting and welding work

- Cutting and Welding requirements are identified from work instructions and drawing
- Cutting and welding equipment and consumables are selected and prepared according to job requirements
- Materials are prepared to achieve required cutting and welding specification.

LO.2 Set up oxyacetylene cutting outfit and welding

- Instructions, symbols, specifications including bead size, bead placement, reinforcement etc. are interpreted correctly in accordance with cutting procedure sheet, if available, and standard operating procedures.
- Cutting equipment including cylinders, regulators, hoses, torches and tips are assembled and set up safely in accordance with standard operating procedures.
- Welding currency is set up correctly according to standard
- Electrodes are selected to suit application and standard settings

LO.3 Perform Cut materials and welding Cutting procedures are followed according to regulations

- Materials are cut in all positions according to specifications
- Cut components are quality inspected and released due to procedures
- Materials are cleaned and prepared based on procedures
- Materials are welded to job requirements and instructions
- Welding seams are cleaned in accordance with operating procedures
- OHS measures are followed and applied throughout cutting and arc welding activities\

LO.4 Assure quality and clean up

- Welding seams are cleaned and inspected in accordance with operating procedures
- Joins are measured according to specification

- Welding equipment and work area are cleaned and maintained after welding activity

Annex: Resource Requirements

IND MAC1 M07 0322 Performing flame Cutting and welding.				
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.	Text books	any book related to oxy-acetylene cutting and welding	5	1;5
3	Reference Books	The motive series Macmillan text for industrial vocation &technical education metal work technology any book related to oxy-acetylene cutting	5	1;5
B.	**Learning Facilities & Infrastructure**			
1.	Class room	5m*10m	1	1:25
2.	library	standard	1	1;25
3.	clinic	standard	1	1;25
4	workshop	standard	1	1;25
5	white board	standard	1	1;25
C.	**Consumable Materials**			
1	Paper	A4 size	5pac	1:1

2	Steel plate	2000x1000x(4-12)mm thick	5 Pcs each	1:5
3	Steel pipe	Ø 50-60x3mm thick	5 Pcs each	1:5
4	Round bar	Ø 20-40x6000mm	5 Pcs each	1:5
5	Oxygen and Acetylene Cylinder With Gas	With all accessories , regulator,	5	1:5
D.	**Tools and Equipment's**			
1.	Meter tape/ Tape rule	3 m,5m	25 each	1:1
2.	Hammer	Chipping	5	1;5
3.	Tip cleaner	Different size	5 set	1:5
4.	Personal protective equipment	Goggle, helmet, Lather apron, safety shoe, glove, over all etc.	25	1:1

LEARNING MODULE 08
TVET-PROGRAMME TITLE: **Machining Level I**
MODULE TITLE : **Applying Basic Electrical Practices**
MODULE CODE : **IND MAC1 M08 0322**
NOMINAL DURATION: **50 Hours**
MODULE DESCRIPTION : This Modules covers skills, knowledge and attitudes required to apply minor/basic handling and maintenance practices associated with a range of electrical equipment at the metal engineering workplace
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Prepare for work **LO2.** Conduct minor handling and maintenance **LO3**. Notify the completion of quality work
MODULE CONTENTS: **LO1. Prepare for work** 1.1. Identifying basic electrical Work requirements 1.2. Identifying, applying and monitoring OHS standards 1.3. Selecting resources (material and equipment) 1.4. Identifying and interpreting relevant plans, drawings and texts 1.5. Setting up detail Work plan 1.6. Identifying and preventing Potential hazards 1.7. Selecting control measures 1.8. Preparing Work area 1.9. Resolving Co-ordination requirements with others involved **LO2. Conduct minor handling and maintenance** 2.1 Confirming required isolations with enterprise requirements 2.2 Conducting minor maintenance 2.3 Maintenance procedures and associated manufacturer requirements

2.4 Handling and maintenance of electrical machinery and equipment

2.5 Undertaking minor adjustment

2.6 Reporting faults

LO3.Notify the completion of quality work

3.1 Completing work and notifying to responsible person

3.1.1 Plant and maintenance records

3.1.2 Job cards

3.1.3 Check sheets

3.1.4 Reporting and/or documenting equipment defects

3.2 . Making final checks with supervisor

3.3 . Clearing, restoring and securing work area

3.4 .Maintaining and storing plant, tools and equipment

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	✞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

		❖ Summarize main points		
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 ❖ 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 equipment / machines ✞ Assign peer trainees to assist ✞ Conduct close follow up ❖ provide 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	❖ Introduce the trainees with their peers

			❖ Inform the group members to speak loudly	
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	✞Use sign language interpreter ✞Brief on the instruction of the	✞Provide activity based assessment ✞Brief on the instruction of the exam	❖ Provide activity based assessment
	❖ Time extension	✞Provide activity-based/ practical assessment method ✞Time extension	✞ Use loud voice ✞ Time extension	✞Conduct close follow up ✞Time extension

ASSESSMENT CRITERIA:

LO.1 Prepare for work

- Work requirements are identified from relevant work orders or equivalent
- Occupational Health and Safety standards, statutory requirements, relevant Ethiopian standards, codes of practice, manufacturers' specifications, environmental regulations and enterprise procedures are identified, applied and monitored according to regulations throughout the work process
- Resources (material and equipment) required to perform the tasks are selected for compliance with the work specifications
- Relevant plans, drawings and texts are identified and interpreted in accordance with the work plan
- Work plan is set-up in detail according to regulations
- Potential hazards are identified and prevention and/or control measures are selected in accordance with regulations
- Work area is prepared in accordance with work requirements and site specifications
- Co-ordination requirements, including requests for isolations where appropriate, are resolved with others involved, affected or required by the work according to regulations

LO.2 Conduct minor handling and maintenance

- Required isolations are confirmed where appropriate in accordance with enterprise requirements
- Minor maintenance is conducted in accordance with the work plan and site requirements
- Minor adjustments are undertaken in accordance with prescribed procedures and schedules and site requirements
- Faults are reported to the relevant and responsible parties in accordance with

site/enterprise procedures

LO.3 Notify the completion of quality work

- Work is completed and responsible personnel notified in accordance with site/enterprise requirements and regulations
- Final checks with supervisor are made to ensure the work conforms with instructions and regulation
- Work area is cleared of waste, cleaned, restored and secured in accordance with site/enterprise regulations
- Plant, tools and equipment are maintained and stored in accordance with site/enterprise procedures.

Annex: Resource Requirement

IND MAC1 M08 1221 Applying Basic Electrical Practices				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	TTTLM prepared by Trainer	1	1:25
2.	Reference Books	- The motive series Macmillan text for industrial vocation &technical education metal work technology - Any book related to electrical wiring	1	1:25
B.	**Learning Facilities & Infrastructure**			
	Class room	Standard	1	1:25
	Clinic	Standard	1	1:25
	Workshop	Standard	1	1:25
	Library	Standard	1	1:25
C.	**Consumable Materials**			

1.	Paper	A4 & A3	5 pack	1:5
2.	White board marker	Standard	1 pack	---
3.	Different Electrical tools	Standard	5	5:25
4. .	Connectors	Standard	25	25
5.	Electrical wire Cable	Standard	Each 1 m	1:25
6.	Switch	Single phase	25	1:1
7.	Switch	Three phase	25	1:1
8.	Breaker	10A	25	1:1
9.	Breaker	16A	25	1:1
10.	Breaker	20A	25	1:1
11.	Breaker	30A	25	1:1
12.	Wall socket	STD	25	1:1
13.	Plug	STD	25	1:1
14.	Electrical tape	STD	25	1:1
15.	Junction box	STD	25	1:1
D	***.Tools and Equipment***			
1.	Control wiring, machinery	Standard	Each set 5	5:25
2.	Switchboards and other electrical apparatus	Standard	5	5:25
3.	Clamping tools & crimping	Standard	Each 5	5:25
4.	pin connection, soldered joints, plugs, sockets	Standard	Each set	5:25
5.	Personal protective equipment's	Standard	25	1:1
6.	Cleaning agents,	Standard	25	1:1
7.	Contact cleaners,	Standard	25	1:1
8.	Emery paper	Roll	2	1:12
9.	Filters	Standard	25	1:1
10.	Battery cells	3volt	50	2:1

Acknowledgement

The **Ministry of Labor and Skills and Federal TVET Institute (FTI)** wishes to thank and appreciation for the trainers who donated their effort and time to develop this outcome based curriculum for the TVET program machining Level I. We also thank all regional TVET College, management institute at bishoftu programmers for active facilitation of their trainers for the development of this curriculum.

The trainers who developed the curriculum

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