MACHINING
LEVEL – V



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 V

The curriculum development process has been actively supported and facilitated by **Ministry of Labor and Skills and Federal TVET Institute (FTI)..**

TVET-Program Design

1.1. TVET-Program Title: Machining Level V

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 Develop Proactive Maintenance Strategy, Develop and Document Technical Specifications and Procedures, Manage Technical Processes, Analyze and Perform Control Requirements Solutions, Manage the Installation and Commissioning of Equipment and Systems,Maintain and overhaul mechanical equipment, Manage a Value Chain, 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 MAC5 01 1221 Develop Proactive Maintenance Strategy
IND MAC5 02 1221 Develop and Document Technical Specifications and Procedures
IND MAC5 03 1221 Manage Technical Processes
IND MAC5 04 1221 Analyze and Perform Control Requirements Solutions
IND MAC5 05 1221 Manage the Installation and Commissioning of Equipment and Systems
IND MAC5 06 1221 Maintain and overhaul mechanical equipment
IND MAC5 07 1221 Manage a Value Chain

1.4. Duration of the TVET-Program

The Program will have duration of **470 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.	Develop Proactive Maintenance Strategy	18	30	12	60	
2.	Develop and Document Technical Specifications and Procedures	15	25	10	50	
3.	Manage Technical Processes	15	25	10	50	
4.	Analyze and Perform Control Requirements Solutions	21	35	14	70	
5.	Manage the Installation and Commissioning of Equipment and Systems	24	40	16	80	
6.	Maintain and overhaul mechanical equipment	24	40	16	80	
7.	Manage a Value Chain	24	40	16	80	
Total Hours					**470 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 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.

1.6. 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 MAC5 01 1221 Develop Proactive Maintenance Strategy	IND MAC5 M01 0322 Developing Proactive Maintenance Strategy	• Determine appropriate analytical techniques • Develop reliability strategies • Implement strategies • Monitor the implementation of strategy	**60 hr.**
. IND MAC5 02 1221 Develop and Document Technical Specifications and Procedures	IND MAC5 M02 0322 Developing and Document Technical Specifications and Procedures	• Identify requirements • Prepare specifications • Prepare technical procedures	**50hr**

IND MAC5 03 1221	Manage Technical Processes	IND MAC5 M03 0322	Managing Technical Processes	• Coordinate resource use • Manage the process • Facilitate process problem resolution • Monitor process improvements and variations	**50 hr.**
IND MAC5 04 1221	Analyze and Perform Control Requirements Solutions	IND MAC5 M04 0322	Analyze and Perform Control Requirements Solutions	• Determine system requirements • Analyze control requirements • Select control system components • Solve control requirements • Verify component selection	**70hr**
IND MAC5 05 1221	Manage the Installation and Commissioning of Equipment and Systems	IND MAC5 M05 0322	Managing the Installation and Commissioning of Equipment and Systems	• Prepare work plan and specification document • Coordinate and monitor contract arrangements • Manage schedules and budgets	**80 hr.**

				• Administer legal, environmental and OHS requirements • Assess and report on work completion • Maintain records	
IND MAC5 06 1221	Maintain and overhaul mechanical equipment	IND MAC5 M06 0322	Maintaining and overhaul mechanical equipment	• Diagnose and locate faults • Repair or overhaul mechanical system • Fit and adjust • mechanical equipment	**80hr.**
IND MAC5 07 1221	Manage a Value Chain	IND MAC5 M07 0322	Managing a Value Chain	• Evaluate value chain • Liaise regularly with chain members • Monitor value added at each step • Continue to reduce waste	**80 hr.**

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

LEARNING MODULE 01
TVET-PROGRAMME TITLE: **Machining Level V**
MODULE TITLE: **Developing Proactive Maintenance Strategy**
MODULE CODE: **IND MAC5 M01 0322**
NOMINAL DURATION:**60 Hours**
MODULE DESCRIPTION: This module of competency covers the skills, knowledge and attitudes required to develop and implement a proactive maintenance strategy for an organization. The unit recognizes that there are a number of predictive or proactive maintenance strategies, such as Total Productive Maintenance (TPM) and Reliability Centered Maintenance (RCM).
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Determine appropriate analytical techniques **LO 2.** Develop reliability strategies **LO 3.** Implement strategies **LO 4.** Monitor the implementation of strategy

MODULE CONTENTS:

LO1. Determine appropriate analytical techniques

1.1. Liaising key stakeholders.

1.2. Examining current maintenance situation.

1.3. Comparing possible strategies, techniques and tools.

1.4. Selecting possible strategies, techniques and tools.

1.5. Confirming Selects strategies, techniques and tools.

LO 2. Develop reliability strategies.

2.1 Selecting Preferring maintenance strategy

2.2 Adapting and examining strategies to organization needs and priorities.

2.3 Examining and adapting Implementing techniques and tools strategies.

2.4 Developing implementation plan to Key stakeholders.

2.5 Identifying key information and performance indicators.

LO 3. Implement strategies

3.1 Identifying data collection.

3.2 Identifying hardware and other resources.

3.3 Analysing implications of condition monitoring data.

3.4 Identifying skill needs required in consultation with key stakeholders

3.5 Ensuring all resources/training.

LO 4.Monitor the implementation of strategy

4.1 Comparing information/performance indicators.

4.2 liaising key stakeholders.

4.3. Identifying areas requiring adjustment.

4.4 Making required 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. Confirm client or designer detail drafting briefs

- Key stakeholders are liaised with to determine objectives of maintenance strategy
- Current maintenance situation is examined to determine major areas requiring improvement
- Possible strategies, techniques and tools are compared against organization needs
- Possible strategies, techniques and tools are selected
- Selected strategies, techniques and tools are confirmed with key stakeholders

LO.2 Develop reliability strategies

- Preferred maintenance strategy is selected
- Strategy is examined and adapted to organization needs and priorities
- Techniques and tools required to implement strategy are examined and adapted
- Key stakeholders are liaised with to develop an implementation plan
- Key information and performance indicators required are identified

LO.3. Implement strategies

- Data collection required is identified
- Hardware and other resources required are identified
- The implications of condition monitoring data are analyzed
- Skill needs required are identified in consultation with key stakeholders
- All resources/training are ensured to implement strategy available

LO4. Monitor the implementation of strategy.

- Information/performance indicators are compared with desired levels
- Key stakeholders are liaised with regarding strategy issues
- Areas requiring adjustment are identified
- Required adjustments are made Detail draft persons with feedback on project outcomes are provided

Annex: Resource Requirements

IND MAC5 M 01 0322 Developing Proactive Maintenance Strategy				
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	- Any books related to the develop protective maintence strategy	5	1:5
B.	**Learning Facilities & Infrastructure**			
1.	Class room	$1.2m^2$	25	1
2.	lecture room	standard		
3.	clinic	standard		
C.	**Consumable Materials**			
1.	paper	A4andA3	5pack	1;5
2.	White board marker	standard	1pack	1:25
D.	**Tools and Equipment's**			
1.	White board	standard	1	**1;25**
2.	LCD	stander	1	1;25

LEARNING MODULE 02
TVET-PROGRAMME TITLE: **Machining Level V**
MODULE TITLE : **Develop and Document Technical Specifications and Procedures**
MODULE CODE : **INDMAC5 M02 0322**
NOMINAL DURATION : **50 Hours**
MODULE DESCRPITION : This module covers the competence skills, knowledge and attitudes to analyze requirement and to develop and document technical specifications and procedures providing concise and unambiguous direction and guidance for workplace activities

LEARNING OUTCOMES

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

LO1. Identify requirements

LO2. Prepare specifications

LO3. Prepare technical procedure

MODULE CONTENTS:

LO1. Identify requirements

1.1. Identifying information requiring for technical specifications.

1.2. Establishing specifications and procedures formats.

1.3. Identified requirements information entry, storage, output and quality of document production.

1.4. Making specifications and procedures document design.

1.5. Nominating range of functions.

LO2. Prepare specifications

2.1 Collecting technical information.

2.2 Identifying and using authoritative sources and references.

2.3 Ensuring specifications written in a format.

2.4 Clearing and understanding Specifications.

2.5 Making specification, documentation.

2.6 Using Specification, documentation personal protective devices.

LO3. Prepare technical procedure

3.1 Identifying, analyzing and documenting activities and tasks.

3.2 Sequencings' activities and tasks.

3.3 Documenting procedures.

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. Identify requirements

- Information required for technical specifications and procedures is identified and assembled
- Specifications and procedures requirements and formats are established and confirmed, where necessary
- Requirements for information entry, storage, output and quality of document production are identified in accordance with enterprise procedures
- Specifications and procedures document design are made appropriate for efficient entry of information and satisfy appearance and presentation requirements for the purpose of the document
- Range of functions incorporated in the document design are made to reflect the nominated requirements

LO.2. Prepare specifications

- Technical information is collected for use in the specification; tested and validated or confirmed before use
- Authoritative sources and references are identified and used in the preparation and presentation of the specification
- Specifications are written in a format to ensure requirements can be met
- Specifications are written in a manner that is clear and understood in the workplace
- Specification documentation is made to satisfy enterprise and industry standards
- Specification documentation is using personal protective devices due to OHS regulations

LO3. Prepare technical procedures

- Activities and tasks are identified, analyzed and documented
- Activities and tasks are sequenced and logically grouped
- Procedures are documented to enterprise and industry standards

Annex: Resource Requirements

INDMAC5 M02 0322 Develop and Document Technical Specifications and Procedures				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	TTTLM prepared by the trainer	25	15
2.	Reference Books	- Any books related to the Develop and Document Technical Specifications and Procedures	15	1:5
B.	**Learning Facilities & Infrastructure**			
1.	Class room	$1.2m^2$	1	1:25
2.	lecture room	standard	1	1:25
3.	clinic	standard	1	1:25
C.	**Consumable Materials**			
3.	paper	A4andA3	5pac	1;5
4.	White board marker	standard	1pac	--
D.	**Tools and Equipment's**			
3.	White board	standard	1	**1;25**
4.	LCD	stander	1	1;25

LEARNING MODULE 03
TVET-PROGRAMME TITLE: **Machining Level V**

MODULE TITLE : **Managing Technical Processes**

MODULE CODE : **IND MAC5 M03 0322**

NOMINAL DURATION : **50Hours**

MODULE DESCRPITION : This Modules deals with the knowledge, skills and attitudes required to manage technical processes in the preparation of resource, monitoring production stages and measuring specified process parameters.

LEARNING OUTCOMES

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

LO1 Coordinate resource use

LO2 Manage the process

LO3 Facilitate process problem resolution

LO4 Monitor process improvements and variations

MODULE CONTENTS:

LO1 Coordinate resource use

1.1. Interpreting ***technical process.***

1.1.1 Design
1.1.2 Develop and analyze the system,
1.1.3 Integration,
1.1.4 Test,
1.1.5 Production,
1.1.6 Deployment,
1.1.7 Support,
1.1.8 Operation and disposal.

1.2. Confirming schedules and technical resources.

1.3. Clarifying process and occupational health and safety (OHS).

1.3.1 Manual handling techniques
1.3.2 Standard operating procedures
1.3.3 Personal protective equipment
1.3.4 Safe materials handling
1.3.5 Taking of rest breaks
1.3.6 Ergonomic arrangement of workplaces
1.3.7 Following marked walkways
1.3.8 Safe storage of equipment
1.3.9 Housekeeping
1.3.10 Reporting accidents and incidents

LO2 Manage the process.

2.1. Allocating roles and responsibilities.

2.2. Monitoring and providing guidance for technical process,

2.3. Monitoring process parameters.

2.3.1 Speed

2.3.2 Efficiency

2.3.3 Machine utilization

2.3.4 Production

2.3.5 Production capacity of machines

2.3.6 Temperature

2.4. Monitoring safety associated with the process including chemical handling

LO3 Facilitate process problem resolution

3.1. Identifying methods to solve process problems.

3.2. Using of knowledge process improvement and technical systems.

3.3. Recommending and documenting preferred option to resolve problem

3.4. Facilitating the implementation of the recommended problem resolution option

LO4 Monitor process improvements and variations

4.1. Monitoring improvements and variations.

4.2. Collating and analyzing data.

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 Coordinate resource use.

- Technical process requirements are interpreted in terms of resources and procedures
- Schedules and technical resources are confirmed with relevant personnel
- Process and Occupational Health and Safety (OHS) requirements are clarified, where necessary

LO2 Manage the process

- Roles and responsibilities are allocated, as required
- Technical process is monitored and guidance provided, where required
- Process parameters are monitored to ensure conformance to requirements
- Safety associated with the process including chemical handling is monitored

LO3 Facilitate process problem resolution

- Methods to solve process problems are identified through facilitation of meetings or discussions
- Knowledge of process improvement and technical systems are used to assist in the systematic identification and resolution of process problems
- Preferred option is recommended and documented to resolve the problem
- Implementation of the recommended problem resolution option is facilitated

LO4 Monitor process improvements and variations

- Improvements and variations to process are monitored to ensure outcome meets specifications, production schedule and workplace requirements
- Data is collated and analyzed to evaluate the effectiveness of process improvements or variations

Annex: Resource Requirements

IND MAC5 M03 0322 Managing Technical Processes				
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		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.	White board Marker	Standard	pack	1:10
2.	Paper	A_4,A3 size	5 rim	1:5
D.	**Tools and Equipment**			
1	White board	**STD**	1	1:5
2	LCD Projector	**STD**	1	1:5

LEARNING MODULE 04
TVET-PROGRAMME TITLE: **Machining Level V**
MODULE TITLE: **Analyzing and Performing Control Requirements Solutions**
MODULE CODE: **IND MAC5 M04 0322**
NOMINAL DURATION: **50 Hours**
MODULE DESCRIPTION: This module covers the knowledge, skills, and attitudes required for solution and operation of important requirements by controller.

LEARNING OUTCOMES

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

LO1. Determine system requirements

LO2. Analyze control requirements

LO3. Select control system components

LO4. Solve control requirements

LO5. Verify component selection

MODULE CONTENTS:

LO1. Determine system requirements

1.1 Obtaining, understanding and clarifying instructions.

1.2 Interpreting available drawings.

LO2. Analyze control requirements

1.1 Analyzing requirements.

1.2 Detecting basic parts of hydraulic, pneumatic and electric control system..

1.3 Using electro-pneumatic/hydraulic control systems.

LO3. Select control system component

3.1. Detecting suitable components and alternatives.

3.2. Selecting Components for hydraulic, pneumatic and electric circuits

3.3. Modifying functions of the control.

LO4. Solve control requirements

4.1 Using hardware programmed logic controller and PLC.

4.2 Integrating Solutions.

LO5. Verify component selection

5.1 Setting- up and operating circuits.

5.2 Analyzing operation and verifying outcomes.

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 system requirements

- Instructions regarding system requirements are obtained, understood and clarified as necessary.
- Available drawings are interpreted correctly using standard symbols

LO.2 Analyze control requirements

- Requirements are analyzed based on demand
- Basic parts of hydraulic, pneumatic and electric control system are detected.
- Electro-pneumatic/hydraulic control systems are used as development of traditional ones.

LO.3 Select control system components

- Suitable components and alternatives are detected with different systems developed.
- Components are selected for hydraulic, pneumatic and electric circuits
- Functions of the control systems are modified according to the requirements and safety procedures.

LO4. Solve control requirements

- Hardware programmed logic controller and PLC are used for solutions
- Solutions are integrated into the working process

LO5. Verify component selection

- . Circuits are set- up and operated on laboratory benches.
- Operation is analyzed and outcomes are verified against system requirements..

Annex: Resource Requirements

IND MAC5 04 0322 Analyzing and Performing Control Requirements Solutions				
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	- construction process planning and management 1st Edition- Elsevier	1	1:25
3.	Reference Books	- `project planning scheduling and control –student Guide (Georgia)	1	1:25
B.	**Learning Facilities & Infrastructure**			
1.	Lecture Room	5m x 8m	1	1:25
2.	Clinic	Standard	1	1:25
C.	**Consumable Materials**			
1	Copy paper drawing paper	A4 size	5 rim	1:5
D	**Tools and Equipment**			
1	White Board	1m x 1.5m	1	1:25
2	LCD	Standard	1	1:25

LEARNING MODULE 05
TVET-PROGRAMME TITLE: **Machining Level V**
MODULE TITLE : **Managing the Installation and Commissioning of Equipment and Systems**
MODULE CODE : **INDMAC5 M05 0322**
NOMINAL DURATION : **80 Hours**
MODULE DESCRIPTION: This module covers the skills, knowledge and attitudes required to manage the installation and commissioning of equipment and systems.

LEARNING OUTCOMES

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

LO1. Prepare work plan and specification document

LO2. Coordinate and monitor contract arrangements

LO3. Manage schedules and budgets

LO4. Administer legal, environmental and OHS requirements

LO5. Assess and report on work completion

LO6. Maintain records

MODULE CONTENTS:

LO1. Prepare work plan and specification document

1.1 Identifying and confirming items.

1.2 Drowning up work plan for installation and commissioning of *equipment and systems.*

1.2.1. Microprocessor or computer control

1.2.2. Production and facility equipment used within the enterprise

1.3. Preparing specification document.

LO2. Coordinate and monitor contract arrangements

2.1 Coordinating contract arrangements for the installation and commissioning.

2.2 Monitoring contract arrangements.

LO3. Manage schedules and budgets

3.1. Gathering information.

3.2. Monitoring deviation from performance targets.

3.3. Assessing and scheduling budgeting processes.

LO4. Administer legal, environmental and OHS requirements

4.1 Defining legal, environmental and OHS requirements

4.2. Assessing monitoring of the process.

LO5. Assess and report on work completion

5.1 Confirming completed work.

5.2 Preparing report on work completed.

LO6. Maintain records

6.1. Maintaining records of installation and commissioning activities.

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	❖ Use sign language interpreter ❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	

	and submit the assignment in soft or hard copy			
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. Prepare work plan and specification document

- Items to be included in work plan and specification document are identified and confirmed
- Work plan for installation and commissioning of ***equipment and systems*** is drawn up, including management and reporting procedures
- Specification document is prepared according to workplace and/or manufacturer procedures

LO.2. Coordinate and monitor contract arrangements

- Contract arrangements for the installation and commissioning of equipment/systems, including all legal, insurance and safety requirements, are coordinated in accordance with workplace and/or legislative procedures
- Contract arrangements are monitored to ensure compliance with requirements and variations dealt with according to agreed strategy

LO3. Manage schedules and budgets

- Information is gathered to establish adherence to schedule and budget forecasts
- Deviation from performance targets is monitored and corrective action taken, if and where necessary
- Scheduling and budgeting processes are assessed to determine whether variations or alternative plans are indicated

LO4. Administer legal, environmental and OHS requirements

- Legal, environmental and OHS requirements related to installation and commissioning of equipment/systems are defined
- Monitoring of the process is assessed to ensure compliance

LO5. Assess and report on work completion

- Completed work is assessed to confirm all specifications have been incorporated
- Report on work completed is prepared in accordance with ***workplace practices***

LO6. Maintain records

- Records are maintained of installation and commissioning activities in accordance with workplace practice

Annex: Resource Requirements

INDMAC5 M05 0322 Managing the Installation and Commissioning of Equipment and Systems				
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	- Narsimhan, S.L., McLeavey, D.W.&Billigtion. P.J., Productio planning and Inventory Control, Prentice Hall of India- New Delhi. 2nd edition 1995 - Buffa, E.S. and Sarin, R., Modern production and operations management, 8th editon, John Wiley.	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.	White board Marker	STD	pack	1:10
2.		STD		
D.	**Tools and Equipment**			
1	White board	**Pcs**	1	1:5
2	LCD	STD	1	1:25

LEARNING MODULE 06
TVET-PROGRAMME TITLE: **Machining Level V**
MODULE TITLE : **Maintaining and overhaul Mechanics Equipment**
MODULE CODE : **IND MAC5 M06 0322**
NOMINAL DURATION : .**80 Hours**
MODULE DESCRIPTION: This Modules deals the knowledge, skills and attitudes diagnosing, locating faults, repairing, Overhauling, fitting and adjusting mechanical systems and equipment. This unit integrates the application of prerequisite diagnostic, maintenance and overhaul competencies.
LEARNING OUTCOMES At the end of the module the trainee will be able to: **L01**: Perform preventative maintenance tasks and adjustments **L02**: Diagnose and locate faults **L03**: Repair or overhaul mechanical system **L04**: Fit and adjust mechanical equipment
MODULE CONTENTS: **L01: Perform preventative maintenance tasks and adjustments** 1.1 Determining preventative maintenance schedule. 1.2 Using appropriate maintenance principles and performing routine maintenance. 1.3 Checking mechanical equipment, components, and sub-assemblies. 1.4 Making adjustments to equipment or components. **L02: Diagnose and locate faults** 2.1. Determining equipment component function. 2.2. Checking, reviewing maintenance reports and diagnosing faults. 2.3. Carrying out consultation with operators. 2.4. Selecting and applying appropriate, test equipment. 2.5. Diagnosing and localizing fault condition. 2.6. Evaluating faulty condition and taking appropriate corrective action. 2.7. Documenting faults. **L03: Repair or overhaul mechanical system** 3.1. Isolating machine or equipment safely. 3.2. Removing faulty equipment, component or sub-assembly. 3.3. Selecting replaceable items

3.4. Selecting and preparing correct repair procedure, tools and equipment for use

3.5. Repairing or overhauling appropriate engineering principles designate procedures, correct tools/equipment.

3.6. Checking Components with precision instruments.

L04: Fit and adjust mechanical equipment

4.1. Adhering all electrical, safety and site requirements.

4.2. Completing maintenance report.

4.3. Determining fitting requirements and carrying out sequential assembly planning.

4.4. Applying sound fitting principles and techniques.

4.5. Selecting and using acceptable maintenance practices, correct gland packing, jointing and gasket material.

4.6. Determining correct lubrication requirement.

4.7. Using appropriate wedges and leveling devices.

4.8. Performing correct alignment and balancing functions.

4.9. Performing final adjustments on mechanical equipment.

4.10. Testing mechanical equipment for accuracy and correct operation.

4.11. Obtaining appropriate work and safety clearances.

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:

L01: Perform preventative maintenance tasks and adjustments

- Preventative maintenance schedule is read and task requirements are determined.
- Appropriate maintenance principles and techniques are used and routine maintenance tasks are performed on mechanical equipment, components or sub-assemblies using correct tools, equipment and procedures.
- Mechanical equipment, components, sub-assemblies are checked visually and with test equipment, using prescribed procedures and safety requirements to ensure correct function or determine malfunction.
- Adjustments are made to equipment or components to ensure specifications are met using acceptable fitting techniques and Procedures, observing all safety requirements.

L02: Diagnose and locate faults

- Equipment component function is determined by reference to engineering drawings, technical manuals and or consultation with appropriate personnel.
- Maintenance reports are checked, reviewed and faults are diagnosed.
- Consultation with operators and other relevant plant Personnel are carried out to assist in locating faults.
- Where appropriate, test equipment is selected and applied in accordance with defined requirements and procedures to assist fault location.
- Fault condition is diagnosed and localized at component level using appropriate test equipment and procedures.
- Faulty condition is evaluated and appropriate corrective action is taken.
- Faults are documented to standard operating procedures.

L03: Repair or overhaul mechanical system

- Machine or equipment is isolated safely or checked for isolation.
- Faulty equipment, component or sub-assembly is removed from system using appropriate engineering principles, tools, equipment and procedures.
- Replaceable items are selected from manufacturers catalogues and obtained by appropriate means.
- Correct repair procedure, tools and equipment are selected and prepared for use on serviceable items.
- Using appropriate engineering principles designate procedures, correct tools/equipment and workshop practices, serviceable items are repaired or

overhauled to manufacturers or site specifications.

- Components are checked with precision instruments to ensure conformance to specifications were applicable.

L04: Fit and adjust mechanical equipment

- All electrical, safety and site requirements are adhered to throughout the maintenance cycle.
- Maintenance report is completed to standard operating procedures and conveyed to designated personnel.
- Fitting requirements are determined and sequential assembly planning is carried out where applicable.
- Sound fitting principles and techniques are applied in the preparation and assembly of component parts using fastening equipment and methods which ensure conformance to specifications, operational performance, quality and safety.
- Using acceptable maintenance practices, correct gland packing, jointing and gasket materials are selected and applied correctly in conformance to specifications and operational requirements.
- Correct lubrication requirements are determined by appropriate means and attended to where applicable using mechanical or manual applications.
- Appropriate wedges and leveling devices are used to level mechanical equipment as appropriate.
- Correct alignment and balancing functions are performed where appropriate.
- Final adjustments are performed on mechanical equipment to align to operational specifications using acceptable engineering principles, fitting techniques and procedures
- Mechanical equipment is tested for accuracy and correct operation where applicable, and returned to service to specifications using acceptable procedures.
- Appropriate work and safety clearances are obtained throughout maintenance cycle.

Annex: Resource Requirements

IND MAC5 M06 0322 Maintaining and overhaul Mechanics Equipment				
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	Mc Graw-Hill Maintainace engineering hand books 6th edition.	5	1:5
3	Text Book	Any Book related to the subject		
1.	Lecture room / work shop	Standard	1	1:25
2.	Library	With sufficient books	1	1:25
C.	**Consumable Materials**			
1.	White board Marker		pack	1:10
D.	**Tools and Equipment**			
1	White board	**Pcs**	1	1:5
2	LCD	STD	1	1:25

LEARNING MODULE 07
TVET-PROGRAMME TITLE: **Machining Level V**
MODULE TITLE : **Managing a Value Chain**
MODULE CODE : **IND MAC5 M07 0322**
NOMINAL DURATION : .**80 Hours**
MODULE DESCRPITON : This Modules deals with the knowledge, skills and attitudes needed to manage a value chain, a supply chain or a demand chain, including the close liaison with suppliers and customers and even the managing of the supply/demand chain of smaller suppliers/customers (if they wish it).
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Evaluate value chain **LO2.** Liaise regularly with chain members **LO3.** Monitor value added at each step **LO4.** Continue to reduce waste
MODULE CONTENTS: **LO1. Evaluate value chain.** 1.1.Identifying all members in the value chain for product. 1.1.1. The entire supply system, 1.1.2. Any truly competitive' system. 1.2.Identifying value added by each member of the chain. 2.2.1. Technical benefits/features 2.2.2. Location benefits/features 2.2.3. Aesthetic benefits/features 2.2.4. Information benefits/features 1.3.Identifying acute and chronic issues. 1.4.Developing list of priority items for improvement. **LO2. Liaise regularly with chain members.** 2.1. Establishing and maintained regular liaison. 2.2. Identifying Current and forecast issues. 2.3. Helping members to work with them. 2.4. Building trust and confidence in the relationship.

2.5. Developing list of priority items for improvement.

2.6. Improvement of benefits/features are negotiated with all chain members

LO3. Monitor value added at each step.

3.1.Identifying changes in the value added.

3.2.Identifying areas where changes to value added required.

3.3.Developing list of priority items for improvement.

3.4.Bring about improvements working with chain member.

LO4. Continue to reduce waste.

4.1.Identifying Waste in value chain.

4.2.Reduce waste Working with chain members continually.

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	❖ 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

		❖ Present the lecture in video format ❖ 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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the integration of trainees with group members	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with	❖ Introduce the trainees with their peers

	❖ Brief the thematic issues of the work	❖ Conduct close follow up ❖ Introduce the trainees with other group member	other group member ❖ 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. Evaluate value chain

- All members in the value chain are identified for product/s in area of responsibility
- Value added by each member of the chain is identified
- Acute and chronic issues which impact on the value chain are identified
- List of priority items for improvement is developed

LO2. Liaise regularly with chain members

- Regular liaison with all chain members is established and maintained
- Current and forecast issues with each member are identified
- Work with members to help them address their issues
- Trust and confidence in the relationship is built
- List of priority items for improvement is developed
- Improvement of benefits/features are negotiated with all chain members

LO3. Monitor value added at each step

- Changes in value added are identified by each chain member
- Areas where changes to value added are required are identified
- List of priority items for improvement is developed
- Work with chain member to bring about improvements to value added

LO4. Continue to reduce waste

- Waste in value chain is identified
- Work with chain members to continually reduce waste

Annex: Resource Requirements

IND MAC5 M07 0322 Managing a Value Chain				
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		5	1:5
B.	**Learning Facilities & Infrastructure**			
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4.	Library	With sufficient books	1	1:25
C.	**Consumable Materials**			
2.	White board Marker		pack	1:10
3.				
D.	**Tools and Equipment**			
1	White board	**Pcs**	1	1:5
2	LCD	STD	1	1:25

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 VI. 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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