Irrigation and Drainage

Level II

TVET Curriculum Version-I

Based on March, 2022, Version- I Occupational standard

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Addis Ababa, Ethiopia

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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 **Irrigation and Drainage Level** II**.**

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

1. TVET-Program Design

1.1 TVET-Program Title: Irrigation and Drainage level-II

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 **Irrigation and Drainage Worker** with competencies elaborated in the respective OS. Graduates of the program will have the required qualification to work in the **Agricultural sector** in the field of **Irrigation and Drainage.**

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 Identify and Select Irrigation Methods, Apply Basics of Estimating Crop Water Requirements, Lay Micro Irrigation Systems, Operate and maintain basic Surface Irrigation System, Prepare Technical Drawings and Specifications, Perform Irrigated crops and Pasture Production, Construct Irrigation and Drainage Structures, Operate and Maintain Irrigation Pumps, Apply Basic Techniques of Water, Harvesting Structures and Apply Erosion and Sediment Control Activities in accordance with the performance criteria and evidence guide described in the OS.

1.3 Training Program Structure for Level-II

Unit of competence		Sequences of Learning modules		Module Units	Nominal Duration (In Hours)
		Module Code	Module Name /**Title** –		
AGR IRD2 01 0322	Identify and Select Irrigation Methods	**AGR IRD2 M01 0522**	Irrigation Methods Selection	• Indigenous irrigation methods • Irrigation Method	36 hr.
AGR IRD2 03 0322	Apply Basics of Estimating Crop Water Requirements	**AGR IRD2 M02 0522**	Estimate Crop Water Requirement	• Data Collection • Crop water requirement Calculation	30 hr.
AGR IRD2 05 0322	Lay Micro Irrigation Systems	**AGR IRD2 M03 0522**	Micro Irrigation Systems	• Materials and tools for installation • Site preparation • Installation of micro irrigation • Commission of installation	46 hr.
AGR IRD2 06 0322	Operate and maintain basic Surface Irrigation System	**AGR IRD2 M04 0522**	Surface Irrigation System	• Operation of surface irrigation system • Maintenance of surface irrigation system • Cleaning and store irrigation equipment • Maintenance activities • Record and reporting	60 hr,
AGR IRD2 07 0322	Prepare Technical Drawings and Specifications	**AGR IRD2 M05 0522**	**T**echnical drawings and specifications	• Tools and equipment • Map reading • Checking specification document • Implementation of map • Cleaning work area and equipment	46 hr.
AGR IRD2 02 0322	Perform Irrigated crops and Pasture Production	**AGR IRD2 M06 0522**	Crop and Pasture establishment	• Pasture establishment • Site for pasture production • Pasture crop handling	20 hr.
AGR IRD2 08 0322	Construct Irrigation and Drainage	**AGR IRD2 M07 0522**	Irrigation and Drainage Structures	• Material and tools for irrigation and drainage • Masonry and concrete work	80 hr.

	Structures			• Construction materials • Drainage channels and pipe Installation • Formwork and cleaning • Work site and equipment restoration	
AGR IRD2 06 0322	Operate and Maintain Irrigation Pumps	**AGR IRD1 M08 0522**	Irrigation Pump	• irrigation pumps site • Pump Installation and operation • pump inspection • pump maintenance • Report maintenance activities	68 hr.
AGR IRD2 09 0322	Apply Basic Techniques of Water Harvesting Structures	**AGR IRD2 M09 0522**	Water Harvesting Structures	• Data collection • Design water storage • Construction materials • Water harvesting techniques • Micro catchment and flood water harvesting • Roof top Water harvesting structure • Ground surface and water storage structure • Catchment, diversion canals & sediment pond	40 hr.
AGR IRD2 10 0322	Apply Erosion and Sediment Control Activities	**AGR IRD2 M10 0522**	Erosion and Sediment Control	• Erosion and sediment control principles • Erosion and sediment control measures	36 hr.

1.4 Duration of the TVET-Program

The Program will have duration of **462 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	Module title	TVET Institution training		Cooperative training	Total hours	Remark
		Theory	Practical			
1	Select Irrigation Methods	10.8	14.4	10.8	36 hr.	
2	Estimate Crop Water Requirement	9	12	9	30 hr.	
3	Micro Irrigation Systems	13.8	18.4	13.8	46 hr.	
4	Surface Irrigation System	18	24	18	60 hr.	
5	Technical drawings and specifications	13.8	18.4	13.8	46 hr.	
6	Crop and Pasture establishment	6	8	6	20 hr.	
7	Irrigation and Drainage Structures	24	32	24	80 hr.	
8	Irrigation Pumps	20.4	27.2	20.4	68 hr.	
9	Water Harvesting Structures	12	16	12	40 hr.	
10	Erosion and Sediment Control	10.8	14.4	10.8	36 hr.	
Total hour		**139**	**139**	**185**	**462**	
Project work title					Maximum one week	

N.B. *The cooperative training time can be managed for implementations according to the context of the training environments of the institution.*

1.5 Qualification Level and Certification

Qualification is a formal certificate issued by an official agency in recognition to that an individual has been assessed as achieving learning outcomes or competencies to the standard specified for the qualification title. A qualification confers official recognition of value in the labour market and in further education and training. Based on the descriptors elaborated on the Ethiopian National TVET Qualification Framework (NTQF) the qualification of this

specific TVET Program is Certificate (I, II, III, IV) according to the level. The trainee will be awarded transcript and the institutional certificate after successfully completing all the modules in the level.

1.6 Target Groups

Any citizen 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

In principle everyone should be able to access training based on the labor market. Hence the prospective participants of this program are any citizen who possess the entry requirement 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 training delivery is in the institution and co-operative training. Cooperative training is a model of training by the cooperation of enterprises/industries and TVET institutions whereby trainees spend much of their time in the enterprises/industries to acquire industrial knowledge, skills, experiences, and attitudes of the industrial environment and the remaining time in TVET institutions to acquire basic skills and theoretical concepts. Therefore, it is necessary to make the TVET sector more effective by strengthening a system of cooperative training accepted by the industry.

The program will employ different alternatives of cooperative training such as apprenticeships, internship and traineeship based on the nature of the occupation, location of the TVET institutions, and interest of the industry. 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 should have to take an agreement to co-operate with regard to the implementation of this program.

1.9 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.

1.10 TVET Teachers Profile

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

1.11 Training and Assessment methodology

The program is delivered using a variety of training methods. The table below shows training and assessment methodology for non-impaired trainees and with reasonable adjustment for impaired trainees. In addition, as per the nature of the module title the trainer can use recommended and possible training and assessment methodology.

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

Demonstration	❖ Conduct close follow up ❖ Use verbal description ❖ Provide special attention in the process of guidance ❖ facilitate the support of peer trainees ❖ Prepare & use simulation	❖ use Sign language interpreter ❖ Use video recorded material ❖ Ensure attention of the trainees ❖ Provide structured training ❖ Show clear and short method ❖ Use gesture ❖ 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 ❖ Brief the thematic issues of the work	❖ Use sign language interpreters ❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	❖ Introduce the trainees with their peers
Exercise	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/practical training ❖ Introduce new and relevant vocabularies	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/ practical training	❖ Assign peer trainees ❖ Use additional nominal hours if necessary

Individual assignment	❖ prepare the assignment questions in large text ❖ Encourage the trainees to prepare and submit the assignment in large texts ❖ Make available recorded assignment questions ❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy	❖ Use sign language interpreter ❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	

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

2 Learning Module Design

Module Code and Title	AGR IRD2 M01 0522 : Irrigation Methods Selection
Nominal Duration:	36 Hours

Module Description: This module covers the knowledge, skills and attitude required to gathering of relevant information and Select appropriate Irrigation Method.

Training Outcomes

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

- Practice indigenous irrigation methods
- Select appropriate Irrigation Method

Module Contents:

Unit one: Practice indigenous irrigation methods

1.1 Indigenous practices
1.2 Gather information
1.3 Soil data collection

Unit two: Irrigation Method

2.1 Advantage and dis advantage of irrigation methods
2.2 Irrigation method selection criteria
2.2.1 Soil and crop type
2.2.2 land use capability
2.2.3 water source potential and utilization policy
2.2.4 Topography
2.3 Comparison of indigenous with conventional irrigation method

Learning Methods:

- Lecture
- Group discussion
- Demonstration
- Simulation
- Case study
- Problem based learning
- Field visit

Assessment Methods:

- Written test
- Oral questioning
- Practical demonstration
- Presentation
- Observation in prepared checklist
- Direct observed practice

Assessment Criteria:

Unit 1: **Practice indigenous irrigation methods**

- Gather information on Indigenous practice irrigation method
- Discus with target group on irrigation practices
- Collect soil data using standard guide lines

Unit 2: Select appropriate irrigation method

- Identify irrigation method based on crop type and land use capability of the area
- Select Irrigation method based on water source potential in agreement with water resource utilization policy
- Determine land gradient of the command area using contour map
- Compare chosen method with indigenous method in light of productivity

Module Code and Title	AGR IRD2 M02 0522: Basic Estimation of Crop water Requirement
Nominal Duration:	40 Hours

Module Description: This module covers the knowledge, skills and attitude required to Collect & organize all Required Data and compilation of data and compute crop water requirement.

Training Outcomes

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

- Collect & organize all Required Data
- Compute crop water requirement

Module Contents:

Unit one: Collect & organize all Required Data

1.1 Understanding of Crop water requirements

1.2 Identifying factors influencing Crop water requirement (CWR)

1.2.1 Climatic factors

1.2.2 Crop factor

1.2.3 Soil factor

1.2.4 Management and environmental conditions

1.3 Crop characteristics

1.3.1 Growth stage, Growing period and Crop coefficient

1.3.2 Root depth

1.4 Collecting and organizing climatic data and crop types

1.4.1 Collecting and organizing Climate Data

1.4.2 Collecting and organizing crop types

1.5 Collecting and organizing Soil data.

1.6 Using and maintaining tools, Materials and Equipment

1.7 Conducting Crop water requirement works.

Unit two: Compute crop water requirement

2.1 Crop selection

2.1.1 Economically

2.1.2 Agro-ecologically

2.2 Selecting methods crop water requirement estimation

2.3 Estimating Crop Water Requirement.

Learning Methods:
• Lecture • Group discussion • Demonstration • Problem based learning • Field visit • Brainstorming
Assessment Methods:
• Written test • Oral questioning • Practical demonstration • Presentation • Project work vs Product evaluation • Observation in prepared checklist • Direct observed practice

Assessment Criteria:

Unit 1: **Collect & organize all Required Data**

- Factors influencing Crop water requirement (CWR) are identified
- Crop characteristics, crop coefficient, growth stage, period and root depth at different growth stages are identified from official research publication.
- Data of climate , crop types, sunshine hour, wind speed, humidity are Collected from methodology agency or from relevant institute and Organized
- Soil related data are collected and organized.
- Tools, Materials and Equipment Proper Use and Maintenance are conducted.
- Crop water requirement works are conducted according to OHS requirements.

Unit 2: Compute crop water requirement

- Economically and agro-ecologically beneficial crop is selected in accordance with preference of site.
- Method for estimating crop water requirement is selected based on data preference.
- Crop Water Requirement is estimated.

Module Code and Title	AGR IRD2 M03 0522 : Micro Irrigation System
Nominal Duration:	**46 Hours**

Module Description: This module covers the knowledge, skills and attitude required to prepare tools and materials, setting out, installing components and complete layout and installation work of micro irrigation systems

Training Outcomes

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

- Prepare tools and materials for installation
- Set out and prepare site
- Install irrigation components
- Complete installation work

Module Contents:

Unit one: Materials and tools for installation

1.1 Materials, tools and accessories

1.2 Surveying and leveling equipment

1.3 Checking parts and accessories

1.4 Installation of micro-irrigation system

Unit two: Set out site preparation

4.1 Cleaning site

4.2 Setting out installation work

4.3 Personal protective equipment

4.4 OHS hazards

Unit Three: Micro irrigation System installation

3.1 Components and techniques of micro irrigation

3.2 Assembling and connecting components

3.3 Irrigation components installation

3.4 Maintaining, clean and safe working area

Unit Four: Complete micro irrigation installation

4.1 Site restoration and remove waste material

4.2 Finishing earthwork

4.3 Flushing and commissioning the system

4.4 Clean, maintain and storing tools

4.5 Reporting operation fault

Learning Methods:
• Lecture • Group discussion • Demonstration • Simulation • Problem based learning • Field visit • Brainstorming
Assessment Methods:
• Written test • Oral questioning • Practical demonstration • Presentation • Project work vs Product evaluation • Observation in prepared checklist • Direct observed practice

Assessment Criteria:

Unit 1: Materials and tools for installation

- Select materials, tools and accessories
- Identify surveying and leveling equipment
- Check parts and accessories
- Install micro-irrigation

Unit 2: Set out site preparation

- Clean up the site
- Set out installation work
- Select personal protective equipment (PPE)
- Identify OHS hazards

Unit 3: Micro irrigation System installation

- Identify components and techniques of micro irrigation
- Assemble and connecting components
- Install irrigation components
- Clean working area

Unit 4: Complete micro irrigation installation

- Clean, maintain and store tools
- Identify fault material and tool
- Flush out and commission the system
- Identify and report operating fault
- Check installation work.

Module Code and Title	AGR IRD2 M04 0522 : Surface Irrigation System
Nominal Duration:	**60 Hours**

Module Description: This module covers the knowledge, skill and attitude required to prepare and set up field for surface irrigation operation, carry out irrigation operations and maintenance, and clean and store surface irrigation equipment.

Training Outcomes

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

- Operate Surface irrigation system
- Maintain surface irrigation system
- Clean and store irrigation equipment
- Record and report maintenance activities

Module Contents:

Unit one: Operation of surface Irrigation system

1.1 Surface irrigation system

1.2 Handling and positioning irrigation equipment

1.3 Water delivery mechanisms

1.4 Water control devices

Unit Two: Maintenance of surface irrigation

2.1. Open and shut down gate valves

2.2. Maintenance activities

2.2.1. Preseason maintenance

2.2.2. Post season maintenance

2.2.3. Routine maintenance

2.2.4. periodic maintenance

2.3. Maintenance of irrigation components

2.4. Desilting activities

2.5. Siphons installation

2.6. Monitoring water flow

2.7. Irrigation shift

Unit Three: Clean and store irrigation equipment

3.1. cleaning equipment

3.2. loading and storing equipment

Unit Four: Record and report maintenance activities

4.1. Record damage and blockage of the system

4.2. Recording routine maintenance activities

Learning method

- Lecture
- Group discussion
- Demonstration
- Problem based learning
- Brainstorming

Assessment Methods:

- Written test
- Oral questioning
- Assignment
- Presentation
- Project work

Assessment Criteria:

Unit 1: Operate Surface Irrigation system

- Identify surface irrigation systems
- Handle and position Irrigation equipment
- Set water delivery mechanisms for surface irrigation
- Install water control devices

Unit 2: Maintain surface irrigation system

- Perform open and shut down gate valves
- Identify maintenance type
- Maintain head and water levels
- Maintain fittings, inlets, outlets
- Implement silt clean
- Set and lift siphons
- Monitor water flow
- Carry out and mark irrigation change
- Shift irrigation equipment

Unit 3: Clean and store irrigation equipment

- Clean equipment
- Load equipment
- Store equipment

Unit 4: Record and report maintenance activities

- Record damaged and blockage of the system
- Record routine maintenance activities

Module Code and Title	AGR IRD2 M05 0522 : Crop and pasture establishment
Nominal Duration:	**30 Hours**

Module Description: This module covers the knowledge, skill and attitude required to Perform crop and pastures establishment operations, prepare the site for planting and Care for young plants.

Training Outcomes

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

- Perform pasture establishment
- Prepare site for pasture production
- Carry out planting operations
- Handle pasture and crop

Module Contents:

Unit one: Pasture establishment

1.1. Interpretation of instructions
1.2. Selection of machinery, equipment and tools
1.3. OHS hazards
1.4. Personal protective equipment

Unit Two: Site for pasture production

2.1 Remove and disposal of waste materials
2.2 Soil sample testing
2.3 Soil treatment and amendments
2.4 Preparation of growing media
2.5 Crop protection implementation
2.6 Planting pattern marking
2.7 Operation of materials & tools

Unit three: planting operations

3.1 Selection of Planting material
3.2 Planting material treatment
3.3 watering plant
3.4 Handle and transportation
3.5 Plantation

Unit Four: Handle pasture and crop

4.1 Application of treatments
4.2 Water application to plant

Learning method
• Lecture • Group discussion • Demonstration • Simulation • Field visit • Brainstorming
Assessment Methods:
• Written test • Oral questioning • Practical demonstration • observation in prepared checklist

Assessment Criteria:

Unit 1: Perform Pasture establishment

- Interpret instructions about establishing the crop and pasture
- Select machinery, equipment and tools
- Identify OHS hazards, risks assessed and reported to the supervisor
- Personal protective equipment (PPE) selected, used and maintained.

Unit 2: Prepare Site for pasture production

- Removal, disposal of old crop and other waste materials
- Test soil sample
- Soil treatment and amendments are applied according to soil test results
- Prepare growing media based on crop establishment plan.
- Crop protection is implemented according to guidelines.
- The planting pattern is marked out according to the crop establishment plan.
- Materials & tools are operated according to enterprise guidelines

Unit 3: Carry out planting operations

- Select planting material
- Treat planting material
- Apply water to planting material
- Planting material is handled and transported to the site
- Carryout planting

Unit 4: Handle pasture and crop

- Apply Treatments to plantings
- Apply water to plantings based on schedule
- Train plants

Module Code and Title	AGR IRD2 M06 0522 : Technical drawing and spécification
Nominal Duration:	**60 Hours**

Module Description: This module covers knowledge, skills and attitudes required to draw, interpret, prepare and use plans, maps, drawings and specifications.

Training Outcomes

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

- Use tools and equipment
- Read and interpret map
- Check specification document
- Implement map based on specification
- Clean work area and equipment

Module Contents:

Unit one: Tools and equipment's for Drawing

1.1 Drawing tools and equipment

1.2 Drawing instruments

1.3 Basic data to produce drawing

1.4 Confirmation of drawing requirements

1.5 Drawing object identification

1.6 Drawing scale and legend

1.7. Measurement of features on map and ground.

1.8. Map preparation

1.9. Drawing symbols and abbreviations

Unit two: Map reading

2.1 Types of maps, plans, drawings and specifications

2.2 Map and site plan

2.3 Symbols and abbreviation interpretations

2.4 Features on maps, plan and drawings

2.5 Environmental effect of the project

Unit three : **Check specification document**

3.1 Working instructions

3.2 Read and interpret specification document

3.3 Validation of map, plan and drawing

3.4 Amendments for project documentation

Unit four : **Implementation of map**

4.1 Map, plan, drawing and specification

4.2 Translation of technical data**.**

4.3 Map scale.

4.4 Features orientation and boundaries

4.5 Error identification

Unit five : **Cleaning work site and equipment**

5.1 Cleaning and inspection

5.2 Tagging faulty unserviceable equipment

Learning Methods:

- Lecture
- Group discussion
- Demonstration
- Simulation
- Role playing
- Problem based learning
- Field visit
- Brainstorming

Assessment Methods:

- Written test
- Oral questioning
- Practical demonstration
- Presentation
- Observation in prepared checklist
- Direct observed practice

Assessment Criteria:

Unit 1: Tools and equipment's for Drawing

- Identify purpose of drawing tools and equipment
- Use drawing instruments
- Identify basic data's to produce drawing
- Draw relevant personnel and timeframes
- Identify drawing object
- Use drawing scale and key
- Read map legend
- Measure features on map and ground.
- Prepare local area map
- Draw symbols and abbreviation

Unit 2: Map reading

- Identify types of maps, plans, drawings and specifications
- Identify key features of maps and site plans
- Interpret symbols and abbreviation
- Identify natural and man-made features on maps, plans and drawings
- Assess environmental effect of the project

Unit 3 : **Check specification document**

- Follow and used Working instructions
- Read and interpret specification document
- Check and validate map, plan or drawing
- Check and amend project documentation

Unit 4 : **Implement map based on specification**

- Perform maps, plans, drawings and specifications.
- Translate technical data into work site environment.
- Read map scale.
- Observe feature orientation and boundaries
- Identify error

Unit 5 : **Cleaning work site and equipment**

- Clean and inspection of equipment and work area
- Identify and tag faulty unserviceable equipment

Module Code and Title	AGR IRD2 M07 0522 : Irrigation and Drainage Structures
Nominal Duration:	80 hr.

Module Description: This module covers knowledge, skills and attitude required to plan and prepare for work, set out for masonry and concrete work, construct and install drains**,** channels**,** pipes and associated fittings, Inspect construction material for masonry and concrete works, carry out masonry and concrete works, carry out Strip formwork and cleanup for concrete works, and Restore work site and equipment

Training Outcomes

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

- Prepare materials and tools for irrigation and drainage
- Set masonry and concrete work
- Perform construction materials
- Install drainage channels and pipe
- Formwork and cleanup
- Restore work site and equipment

Module Contents:

Unit one: Materials and tools for irrigation and drainage

1.1. Determination of work requirement
1.2. Site identification
1.3. Drainage and diversion structures
1.4. Equipment and excavation methods
1.5. Signage requirements
1.6. Selection of plant, tools and equipment
1.7. Environmental protection requirements

Unit Two: Masonry and concrete work

2.4 Setting straight lines
2.5 Checking grades
2.6 Service identification

Unit Three: Construction materials

3.1. Provision of foundations
3.2. Construction of earthen channels, batters and cast
3.3. Concrete and mortar construction ratio
3.4. Pointing and plastering masonry works
3.5. Damage and blockage recording

3.6.Construction and installation

3.7. Selection and installation of pipe systems

Unit Four: Install drainage channels and pipe

4.1 . Inspection of stone and sand

4.2 . Performing cement ratio

4.3 . Curing

4.4 . Reinforcement and formwork

4.4.1 Drawings and specifications

4.4.2 Reinforcement materials

4.4.3 Fixing and fasteners selection

4.4.4 Cut, bent and tied reinforcement

4.4.5 Location of cast-ins

Unit Five: Formwork and cleanup

5.1 Edge boxes and braces

5.2 Cleaning timber and steel components.

5.3 Discard damage formwork components

5.4 Cleaning screen and work areas

5.5 Cleaning tools and equipment

Unit Six: Restore work site and equipment

6.1. Storing equipment, tools and materials

6.2. Restore environmental improvements controls

6.3. Maintaining workplace area.

Learning method

- Lecture
- Group discussion
- Demonstration
- Problem based learning
- Brainstorming

Assessment Methods:

- Written test
- Oral questioning
- Assignment
- Presentation
- Project work

Assessment Criteria:

Module Contents:

Unit 1: Materials and tools for irrigation system

- Determine work requirement
- Identify Site
- Arrange drainage and diversion structures
- Identify equipment and excavation methods
- Signage requirements
- Select tools and equipment
- Apply environmental protection
- Identify service

Unit 2: Maintain surface irrigation system

- Identify string lines and grade
- Identify services

Unit 3: Clean and store irrigation equipment

- Construct bed and foundation
- Construct cearthen channels, batters and cast
- Concrete and mortar ratio
- Point and plaster masonry work
- Record damage and blockage systems
- Construct and install work
- Install pipes, fittings and prefabricated components

Unit 4: Record and report maintenance activities

- Inspect stone and sand
- Perform cement ratio
- Apply water for mortar and curing
- perform steel reinforcement and formwork
- Draw reinforcement specification
- Fix selection
- Cut, bent and tie reinforce
- Prepare reinforcement materials

Unit 5: Formwork and cleanup

- Fix edge boxes and braces
- Clean timber and steel components.
- Discard damaged formwork components
- Clean screen and work areas
- Clean tools and equipment

Unit 6: Restore work site and equipment

- Store equipment, tools and materials

- Restoration environmental improvements control
- Maintenance of workplace area

Module Code and Title	AGR IRD2 M08 0522 : Irrigation pump
Nominal Duration:	46 Hours

Module Description: This module covers the knowledge, skills and attitude required to site selection for irrigation pumps. It requires the ability to select, install, operate, and carry out pre- and post-seasonal inspection, out routine maintenance activities on irrigation pump and store irrigation pumps.

Training Outcomes

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

- Site selection for irrigation pump
- Install and operate irrigation pump
- Carry out seasonal pump inspection
- Carry out routine maintenance activities on irrigation pump
- Record and report maintenance activities

Module Contents:

Unit one: Site selection for irrigation pumps

1.1 pump site selection

1.2 Optimizing power suction & delivery head.

Unit two: Pump installation and Operation

2.1 Pump selection criteria

2.2 Types of irrigation pump

2.3 Components of pump

2.4 Pump installation

2.5 Pump operation

2.6 Irrigation pump maintenance

Unit Three: Pump inspection

3.1 Maintenance activities

3.1.1 Pre- season maintenance
3.1.2 post-season maintenance
3.1.3 Routine maintenance
3.1.4 Periodic maintenance

3.2 Small motor and manual irrigation pump

3.3 Flushing and cleaning pump components

Unit Four: Report maintenance activities 4.1 Recording and reporting faulty pump components
Learning Methods:
• Lecture • Group discussion • Demonstration • Simulation • Field visit • Brainstorming
Assessment Methods:
• Written test • Oral questioning • Practical demonstration • Presentation • Project work vs Product evaluation • Observation in prepared checklist • Direct observed practice

Assessment Criteria:

Unit 1: Site selection for irrigation pump

- Select pumping site
- Optimize power suction & delivery head.

Unit 2: Install and Operate pump

- Identify type of irrigation pump
- Identify components of pump
- Install and operate pump
- Maintain of irrigation pump
- Determine pump capacity (horse power)

Unit 3: Pump inspection

- Identify maintenance activities
- Characterize small motorized and manual irrigation pump
- Clean pump component

Unit 4: Report maintenance activities

- Record faulty pumps component
- Record and report damage and, blockage component

Module Code and Title	AGR IRD2 M09 0522 : Water harvesting structures
Nominal Duration:	60 Hours

Module Description: This module covers the knowledge, skill and attitude required collect, organized and identify all required data, design water storage capacities, identify construction material, design and construct flood water harvesting, micro catchments techniques, construct roof top water harvesting structures, ground and surface water storage structure, ground Surface catchments, diversion canals & sediment ponds.

Training Outcomes

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

- Collect data
- Design water storage structures
- Identify construction materials
- Identify water harvesting techniques
- Construct micro catchment and flood water harvesting structures
- Construct roof top water harvesting structure
- Design ground surface and water storage structure
- Identify catchment, diversion canals & sediment pond

Module Contents:

Unit one: Data collection

1.1 Metrological data collection
1.2 Runoff estimation
1.3 Soil sampling and sampling techniques
1.4 Soil sample analysis
1.5 Catchments and cultivation area selection
1.6 Crops selection criteria

Unit two: Design storage capacity

2.1 Identification of water demand and supply
2.2 Design capacity

Unit three : **Construction materials**

3.1 Construction material selection
3.2 Tools and equipment selection.

Unit four : **Water harvesting techniques**

4.1 Design procedures for water harvesting structures
4.2 Construct water harvesting structures

Unit five : **Roof top Water harvesting structure**

5.1 Site selection
5.2 Materials for construction.
5.3 Supply and demand

5.4 Construction of ferro-cement storage structure

Unit six : **Ground surface and water storage structure**

6.1 Construction materials
6.2 Design Structures based on catchment area.
6.3 Surface storage structure

Unit seven : **Catchment, diversion canals & sediment pond**

7.1 Surface catchments, diversion canals and sediment ponds
7.2 Materials for construction
7.3 Construct water harvesting infrastructure

Learning Methods:

- Lecture
- Group discussion
- Demonstration
- Simulation
- Problem based learning
- Field visit
- Brainstorming

Assessment Methods:

- Written test
- Oral questioning
- Practical demonstration and work
- Presentation
- Direct observed practice

Assessment Criteria:

Unit 1: Data collection

- Collect metrological data
- Estimate runoff
- Identify soil sampling and sampling techniques
- Analyze Soil sample
- Select catchments and cultivation area
- Perform crops selection criteria

Unit 2: Design water storage

- Identify water demand and supply
- Design storage structures capacity

Unit 3 : **Construction materials**

- Collect construction materials for storage structures
- Select tools and equipment.

Unit 4 : **Water harvesting techniques**

- List water harvesting techniques
- Design flood water harvesting structures
- Design graded structures
- Design water harvesting structures based on procedures

Unit 5 : **Roof top Water harvesting structure**

- Select site for roof top Water harvesting structures
- Prepare required materials and requirement.
- Construct ferro-cement water harvesting Structure.
- Calculate supply and demand for structure design

Unit 6 : **Ground surface and water storage structure**

- Collect construction materials
- Design Structures based on catchments area.
- Construct water harvesting structures

Unit 7 : **Catchment, diversion canals & sediment pond**

- Identify Surface catchments, diversion canals and sediment ponds
- Select materials for construction
- Construct water harvesting infrastructure

Module Code and Title	AGR IRD2 M10 0522; Erosion and Sediment Control
Nominal Duration:	36 Hours

Module Description: This unit of covers the knowledge, skill and attitude required to apply work site practices with erosion and sediment control principles and implement erosion and sediment control principles.

Training Outcomes

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

- Assess erosion and sediment control principles
- Implement erosion and sediment control measures

Module Contents:

Unit one: Erosion and sedimentation control

1.1 Erosion and sedimentation control principles

1.2 Erosion and sedimentation control methods

1.3 Erosion and sedimentation control structures

1.4 Erosion and sedimentation legislations

1.5 Catchment characteristics

Unit two: Erosion and sediment control measures

2.1 Apply erosion and sediment control

2.2 Cost estimation of erosion and sedimentation structure

Learning Methods:

- Lecture
- Group discussion
- Demonstration
- Simulation
- Role playing
- Case study
- Problem based learning
- Field visit
- Brainstorming

Assessment Methods:

- Written test
- Oral questioning
- Practical demonstration
- Presentation
- Project work vs Product evaluation
- Observation in prepared checklist
- Direct observed practice

Assessment Criteria:

Unit 1: Erosion and sediment control principles

- Select erosion and sedimentation control methods
- Construct erosion and sedimentation control structures
- Adhere erosion and sedimentation legislation
- Identify catchment characteristics of erosion and sedimentation

Unit 2: Erosion and sediment control measures

- Apply mathematical ideas and techniques
- Eestimate cost for erosion and sedimentation strictures

3 Resource Requirements

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	(Author, year, editions and publisher)		
2.1	Small scale irrigation, Water harvesting	Chinese instructor team Archana Mishra, 1st edition, 2006	5pcs	1:5
2.2	Irrigation engineering and Hydraulics structure	S.K. Garg ,2006,19th revised edition	5pcs	1:5
2.3	Drainage engineering	Garg 2005 revised edition	5pcs	1:5
2.4	Technical irrigation information	2nd Editions by George's	5pcs	1:5
2.5	Irrigation and drainage management	2nd Editions FAO by W.R. walker	5pcs	1:5
2.6	Manual on soil, plant and water analysis	Dhyan singh P.K Chonkar B.S Dwived	5pcs	1:5
2.7	Irrigation water management	2nd Editions FAO C. Brouwer	5pcs	1:5
2.8	Metrology and climatology	Wanda,2001	5pcs	1:5
2.9	Climate	Ganja 2002	5pcs	1:5
2.10	Metrology	Minaret,1998	5pcs	1:5
3.	Journals/Publication/Magazines			
B.	***Learning Facilities & Infrastructure***			
1.	Lecture Room	8*7m	1	1:25
2.	Library	37*13m	1	1:25
3.	Laboratory	12*10m	1	1:25
4	Store	10*8m	1	1:25
5	Practical site	100*50	1	1:25
C.	***Consumable Materials***			
1	Paper	A4	10000 Pcs	1:400
2	Flip chart		10 Pcs	2:5
3	Black board	Standard (3m*1.2)	1 Pcs	1:25
4	White board	Standard (3m*1.2)	1 Pcs	1:25
5	Marker	Permanent	250 Pcs	10:1

6	Pen	Ball point pen	500 Pcs	20:1
7	USB flash disk	64 GB	50 Pcs	2:1
8	External hard disk	4 TB	20 Pcs	4:5
9	Chalk		30 Pcs	6:5
10	Geomembrane		400m^2	16:1
11	White board marker	Temporary	1500 Pcs	60:1
D.	***Tools and Equipments***			
1	Tape meter	telescopic tape measure PVC + glass fiber size: 150 cm weight: 0.022 kg	5	1:5
2	line level	Standard	50 pcs	2:1
3	chaining pins	Standard	50 pcs	2:1
4	Ranging pole	Standard	50 pcs	2:1
4	Staff	4m	50 pcs	2:1
6	Clinometers	SUNNTO P-5	5 pcs	1:5
7	Global positioning system	GARMIN H72	5 pcs	1:5
8	Compass	SUNNTO P-5	5 pcs	1:5
9	Auger	Dutch type	5 pcs	1:5
10	core sampler		5 pcs	1:5
11	Spatula		25 pcs	1:1
12	Oven		5 pcs	1:5
13	pressure apparatus		5 pcs	1:5
14	sensitive balance		10 pcs	2:5
15	Sieve		5 set	1:5
16	soil grinder		1 pcs	1:25
17	hydro meter		5 pcs	1:5
18	Shaker		5 pcs	1:5
19	measuring cylinder		25 pcs	1:1
20	Thermometer		5 pcs	1:5
21	stop watch		5 pcs	1:5
22	Flasks		25 pcs	1:1
23	Shovel		25 pcs	1:1
24	Rakes		25 pcs	1:1
25	Spades		25 pcs	1:1
26	Rope		10 rol1	2:5
27	plumb bob		5 pcs	1:5
28	Hoe		25 pcs	1:1
29	tracing paper		10 pcs	2:5
30	Pencil	HB, 1H,2H,4H	100 pcs	4:1
31	graph paper		100 pcs	4:1
32	Fixer	H 0.7 and H0.5	100 pcs	4:1
33	topographic map		10 pcs	2:5

34	drawing compass set		30 pcs	6:5
35	LCD projector		5 psc	1:5
36	Water mains	Good quality	5 psc	1:5
37	Services	Good quality	5 psc	1:5
38	Valves		10 psc	2:5
39	Polyvinyl chloride (PVC)	(25,32,50,75,110,200) mm diamet er	25 psc	1:1
40	Polyethylene (HDP)	1/2,3/4,1,2inch,2 00inch	25 psc	1:1
41	Cast iron		10 psc	2:5
41	Wind vane	Electromagnetic	1	1:25
43	Rian gage	Recording type	1	1:25
44	Lysimetr	Drainage type	1	1:25
45	Pan evaporation	USA class A pan	1	1:25
47	Anemometer	Digital	1	1:25
E	**Personal protective equipment**			
1	Steel Capped Boots/Shoes		25 pcs	1:1
2	Overalls		25 pcs	1:1
3	Gloves		25 pcs	1:1
4	Sun Hat		25 pcs	1:1
5	Sunscreen Lotion		25 pcs	1:1
6	Goggles Safety		25 pcs	1:1
7	Face Mask		25 pcs	1:1
8	Ear Protectors		25 pcs	1:1
II	**Fittings including:**			
1	Jointing systems for pipe types	Union, socket, cross-t, reducer	25 sets	1:1
2	J-bolt	16-24 depend on load?	5 sets	1:5
3	Bolted flanges	Good quality	10 pcs	2:5
F	**Others construction materials:**			
1	Cement	C-25(1:2:3)	25 bag	1:1
2	Sand	sild content<7	10 m^3	2:5
3	Aggregate	0.2cm,0.1cm	25 m^3	1:1
4	Reinforcement	(6,8,10,12,- 32)mm diameter	10 pcs	2:5
5	Timber	3cm - 5cm	30 pcs	6:5
6	Eucalyptus poles	L(10- 12cm),u(10cm)p ost diagonal(10cm)	50 pcs	2:1
7	Nails	3cm-15cm	25 kg	1:1
8	black wire	1.5mm wire	10 roll	2:5
9	Bitumen		50 Lit.	2:1
10	construction joints(expansion or shupud)	8mm stire foam	10 pcs	2:5
11	Water stops		10 pcs	2:5

4 Developers profile

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