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DEUTSCHE ZUSAMMENARBEIT

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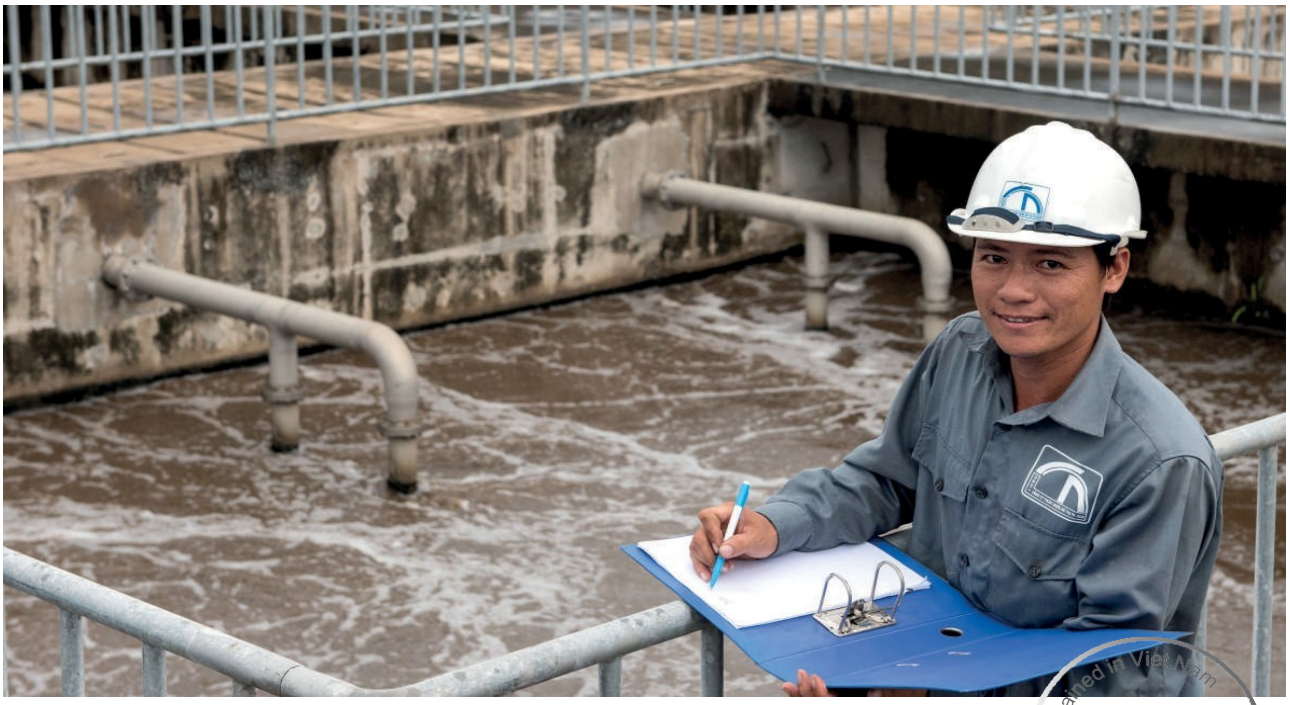
GOPA WORLDWIDE CONSULTANTS

Stadtentwässerung Dresden WIR KLÄREN DAS FÜR SIE

Cooperative Training Program

SEWAGE ENGINEERING TECHNICIAN



trained in Việt Nam
Việt Nam
Được Đào Tạo Tại Việt Nam

Level: TRANSITION FROM INTERMEDIATE TO COLLEGE

Pilot location:

CAO ĐẲNG CÔNG NGHIỆP HUẾ 1997 HueIC

CAO ĐẲNG KỸ NGHỆ II - COLLEGE OF TECHNOLOGY II HVCT

cĐXD SƠN

Vietnam, 2022

INTRODUCTION

Cooperative Training Program, designed in modular form, following international standards

1. Introduction

The Vietnamese – German Cooperation Program “Reform of TVET in Viet Nam” is supporting eleven TVET colleges to become High-Quality TVET Institutes (HQTIs) that provide demand-oriented training. The Program “Reform of TVET in Viet Nam”, is financed by the German Ministry for Economic Cooperation and Development (BMZ) and implemented by Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) together with the Vietnamese Directorate of Vocational Education and Training (DVET).

The TVET Program has supported partner TVET Colleges to develop training Programs for technical occupations that are in line with Vietnamese regulations and requirements and international/German standards. These modular training Programs are flexibly used for the implementation of cooperative training at intermediary and college level TVET institutes and short-term “on the job” training in enterprises.

The pilot training Program of the "Sewage Engineering" profession has been developed and piloted by the " Program Reform of TVET in Vietnam " in the period 2015-2020. On the basis of a first pilot between 2016 and 2020, this training Program has been further revised to integrate a modularization, as well as new content (Greening, Industry 4.0, training for people with disabilities…).

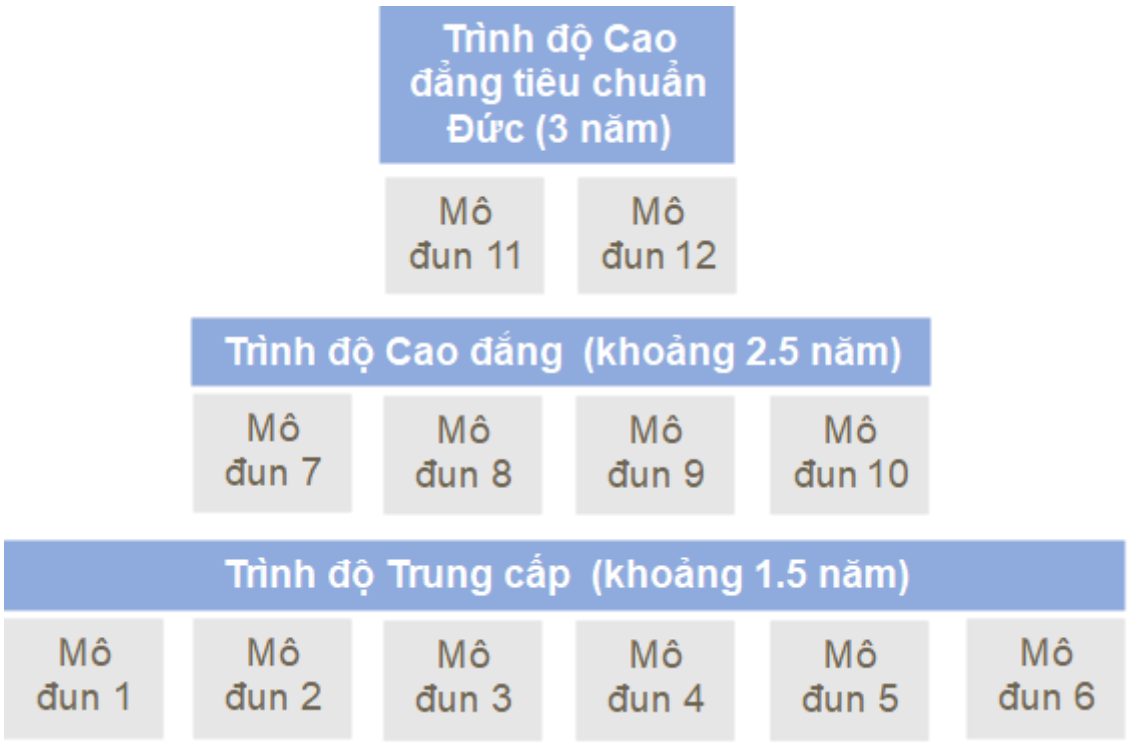
2. Characteristics of the training Program

The training Program is demand oriented and highly permeable between different training levels. It also meets the requirements formulated in Circular No.03/2017/TT-BLDTBXH of the Ministry of Labor, Invalids and Social Affairs (MOLISA) laying out the procedures for the development, appraisal, and issuance of training curricula. The modules are practice-oriented from basic to advanced level with integrated elements of:

- Digitalization and I4.0

- Greening TVET, environmental protection
- Occupational safety and health
- Gender and Inclusion

3. Structure



Training Program is designed in a modular way at different levels as follows:

- Training Program for intermediate level (approx. 1.5 years)

Besides the general compulsory subjects specified by MOLISA, learners need to complete 6 technical modules to obtain competencies, knowledge and skills of the occupation at intermediate level.

- Training Program for college level (approx. 2.5 years)

Besides the general compulsory subjects specified by MOLISA, learners need to complete 10 technical modules to obtain competencies, knowledge and skills of the occupation at intermediate and college levels.

- Training Program for advanced college level (approx. 3 years)

Besides the general compulsory subjects specified by MOLISA, learners need to complete 12 technical modules to obtain competencies, knowledge, and skills of the occupation at intermediate, college and advanced college levels that is equivalent to international/German standards.

To enable pathways and lifelong learning, also separate training Programs for students that graduated from a lower level have been developed:

- ✓ Training Programs for intermediate level transfer to college level. After graduation from intermediate level, learners may transfer to college level and need to complete 4 additional modules (from module 7 to module 10)

- ✓ Training Programs for college level transfer to advanced college level. After graduation from college level, learners may transfer to advanced college level and need to complete 2 additional modules (module 11 and module 12).

With this training Program structure, TVET institutes can flexibly implement cooperative training at different levels at their own institutes and at partner companies according to needs and capabilities. In addition to long-term training at intermediate and college levels, TVET institutes can also apply/ modify training modules to implement short-term or advanced training for workers and job seekers according to specific requirements.

The Minutes of Results for the revised training curriculum were signed in September 2022 by:

• Directorate of Vocational Education and Training

• Vietnam Water Industry Training Center / Water Supply and Drainage Association

• Hue Industrial College

• Ho Chi Minh Vocational College of Technology

- Construction Technical College No. 1
- GOPA Worldwide Consultants (Germany)
- Gesellschaft für Internationale Zusammenarbeit (GIZ)

APPENDIX 01

TRAINING PROGRAM

Occupation name	**:** Sewage Engineering Technician
Occupation code	**:** 6520311
Level	**:** College
Training form	**:** Formal
Eligible enrollment applicants	**:** Graduates of the Intermediate Level Training Program of Sewage Engineering Technician
Training duration	**: 01 year** (02 semesters)

1. Training objectives

1.1. General objectives

The Training Program for Transition from Intermediate Level to College Level of Sewage Engineering Technician shall ensure the minimum amount of knowledge and competency requirements that the graduates of the Intermediate-Level Training Program must be supplemented to achieve college level after graduation. The list, duration, and sequence of courses, modules, theoretical studying time, practical studying time, and internship time shall be clearly determined. The evaluation method for studying results shall be particularly regulated to evaluate if the learners fulfill the competency requirements after finishing the courses and modules.

1.2. Specific objectives

1.2.1. Knowledge

- Be able to describe the ecological cycle, the causes and consequences of environmental contamination, and pollution-reduction measures.
- Be able to explain the many types of microorganisms, their structure and living circumstances, as well as their role in wastewater treatment.
- Be able to demonstrate the fundamentals of chemistry and substance composition.
- Be able to demonstrate the chemical analysis methodologies and laboratory safety precautions.
- Be able to demonstrate the preparations for safety measures during operation, repair and maintenance of drainage system and wastewater treatment plant.

- Be able to demonstrate safety measures during operation, repair and maintenance of drainage system and wastewater treatment plant.
- Be able to demonstrate as-built drawings of drainage system, circuit diagrams and other technical documents.
- Be able to demonstrate energy and material conservation measures during operation, repair and maintenance of drainage system and wastewater treatment plant.
- Be able to examine the composition, physical, chemical, and biological aspects of wastewater.
- Be able to demonstrate the structure, characteristics, advantages and disadvantages of different types of drainage systems.
- Be able to describe the properties and applications of pipe and drain materials.
- Be able to demonstrate the functions, tasks and usual malfunctions of the works in the drainage system and in the wastewater treatment plant.
- Be able to present the causes, consequences and remedial measures of frequent damage to the drainage system and the wastewater treatment plant.
- Be able to describe the disease risks and potential hazards during operation, repair and maintenance of drainage system and wastewater treatment plant.
- Be able to describe the measurement, control, and adjustment procedures, as well as the structure and operation of the respective equipment.
- Be able to demonstrate the method for calculating sewer gradient, and the distance and depth of manholes.
- Be able to present the cleaning, repair and maintenance measures of sewers, manholes, connection points, and pumping stations.
- Be able to present the overview diagram of a wastewater treatment plant, treatment stages in a domestic wastewater treatment plant and a specific industrial wastewater treatment plant.
- Be able to present the decomposition processes of pollutants in each construction work and the methods to remove them.
- Be able to present the structure, function and operating principle of wastewater treatment facilities and equipment using mechanical, chemical, physical and biological methods, sterilization and deodorization structures.
- Be able to present the operation, repair and maintenance procedures for wastewater, sludge, waste and exhaust gas treatment works in a plant.

- Be able to list the sources, properties and impacts of sludge, emissions and waste in the wastewater treatment system.
- Be able to present the fundamental rights and obligations of employees and employers, national technical standards and regulations applicable to wastewater drainage and treatment, environmental protection, safety standards and regulations.
- Be able to present the names, characteristics, operating procedures, conditions of use and storage of laboratory equipment, tools, and chemicals.
- Be able to describe the techniques used to collect, transport, store, and preserve wastewater and sludge samples.
- Be able to present the criteria analysis methods in the field, factory, and laboratory for each parameter to be determined.
- Be able to present the general structure, functions, and duties of environmental protection of enterprises operating in the field of wastewater drainage and treatment.
- Be able to present the fundamental knowledge about politics, culture, society, law, national defense and security, and physical education as prescribed.

1.2.2. Skills

- Be able to use safety measures when working with microorganisms, chemicals, as well as analytical techniques in the laboratory.
- Be able to use safety measures during operation, repair and maintenance of drainage system and wastewater treatment plant.
- Be able to read as-built drawings of drainage system, technical diagrams and documents.
- Be able to cut, join and deform metal and plastic materials used in wastewater drainage and treatment systems.
- Be able to implement the techniques for measuring sludge, as well as the techniques for cleaning and dredging sludge in sewers, manholes, and troughs.
- Be able to perform the processes to inspect and evaluate joint tightness, condition of sewers, manholes, pressure capacity of manhole covers and discharge connection points.
- Be able to use energy and material conservation measures during operation, repair and maintenance of drainage system and wastewater treatment plant.

- Be able to identify and handle potential hazards during operation, repair and maintenance of drainage system and wastewater treatment plant.
- Be able to operate, control and adjust equipment and works on drainage system, at pumping stations and at wastewater treatment plants.
- Be able to evaluate the level of frequent damage, causes and consequences, and propose remedial measures for damage to sewers and works in the drainage system.
- Be able to undertake maintenance procedures for drainage system, pumping stations, and wastewater treatment plants.
- Be able to detect problems at works, equipment in factories and pumping stations, handling problems within the designated scope of duties.
- Be able to operate electrical equipment, automatic electrical systems, and backup generators in wastewater treatment plants.
- Be able to maintain operation log, record work procedures and outcomes, prepare corresponding reports, as well as implement data protection.
- Be able to collect, manage and treat all types of solid waste in accordance with regulations.
- Be able to apply national technical standards and regulations applicable to wastewater drainage and treatment, environmental protection, and safety standards and regulations.
- Be able to evaluate the quality of wastewater and sludge, identify the physical, chemical and microbiological parameters of wastewater and sludge according to technical regulations.
- Be able to select and appropriately use equipment, tools, supplies and chemicals in the field, factory and laboratory.
- Be able to collect, transport, store and preserve wastewater and sludge samples with suitable technique.
- Be able to monitor plant operations and indirect discharge points to ensure compliance with discharge regulations.
- Be able to use basic information technology as prescribed; exploit, process and apply information technology in professional roles within the industry and profession.
- Be able to use basic foreign languages, reaching level 2/6 in Foreign Language Proficiency Framework for Vietnam; use foreign languages in professional roles within the industry and profession.

1.2.3. Self-control ability and responsibility

- Maintain autonomy in environmental protection; respect the regulations on environmental protection and building a green and clean working environment; actively seek out relevant information.
- Actively save energy and resources.
- Actively improve and use environmentally friendly methods, tools and techniques.
- Actively comply with occupational safety principles and take appropriate response in case of incident.
- Comply with rules and regulations on occupational safety and health, as well as safety guidelines when working in electrically charged areas.
- Comply with regulations under the guidance of workshop assistants and instructors at the training institution.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.
- Comply with the privacy policies and occupational safety standards at the enterprise.
- Work independently or in a team, solve complicated issues and work in changing working conditions.
- Guide and supervise others to perform defined tasks; accept individual and collective accountability.
- Evaluate the quality of work outcomes and performance results of team members.

1.3. Job positions after graduation

Graduating from the training Program of Sewage Engineering Technician, College level, the learners may work at the following positions:

- Operation of drainage system.
- Repair and maintenance of drainage system.
- Operation, repair and maintenance of drainage pumping station.
- Operation of wastewater treatment plant.
- Repair and maintenance of wastewater treatment plants.
- Supervise the quality of the wastewater treatment procedure.

2. Knowledge volume and course duration

- Number of subjects, modules: 04 modules (excluding compulsory general subjects).
- Total number of course credits: 49 (credits).
- Duration of Specialized subjects and modules: 1305 hours. In which:
+ Theory: 305 hours.
+ Practice, intern, laboratory, home assignment, discussion: 948 hours.
+ Examination: 52 hours.

3. Program's content:

Subject/module code	**Module name**	**Number of course credit**	**Total**	***Total training time (hours)***		
				Theory	**Intern/ Laboratory/ Home Assignment/ Discussion**	**Examination**
II.2	**Specialized modules**	**49**	**1305**	**305**	**948**	**52**
MD 07	Electrical Installation in Wastewater Treatment	14	330	86	223	21
MD 08	Repair and Maintenance of Wastewater Treatment Plants	10	300	56	238	6
MD 09	Quality Supervision of Wastewater Treatment Procedure	13	345	90	245	10

Subject/module code	Module name	Number of course credit	Total	*Total training time (hours)*		
				Theory	Intern/ Laboratory/ Home Assignment/ Discussion	Examination
MD 10	Error Analysis and Troubleshooting	12	330	73	242	15

4. Manual instruction

According to the provisions of Circular No. 04/2022/TT-BLDTBXH dated March 30, 2022 of the Ministry of Labor, War Invalids and Social Affairs on organization of intermediate-level and college-level training by academic year or according to the method of accumulating modules or credits.

5. References

APPENDIX 03

MODULE PROGRAM

Module name: ELECTRICAL INSTALLATION IN WASTEWATER TREATMENT

Module code: MD 07

Training duration: 330 hours; (Theory: 86 hours; Practice, laboratory, discussion, assignment: 223 hours; Examination: 21 hours).

I. Position and features:

- Position: “Electrical Installation in Wastewater Treatment” module is taught along with other Specialized modules, and after the Fundamental modules.
- Features: This specialized module provides learners with basic knowledge and practical skills on electrical safety techniques and measurement techniques, installation techniques for civil lighting circuits; knowledge and practical skills on electrical machines, maintenance methods for electrical machines in general and in wastewater treatment plants in particular. In addition, it also provides learners with knowledge and practical skills in installing dynamic controlling circuits in electrical cabinets, and troubleshooting electrical systems.
- This module can be divided into chapters with different training durations and objectives as per the regulations on training duration for each module. However, this module must ensure its following main objectives.

II. Objectives

II.1. Knowledge

- Be able to present the fundamental principles and definitions of electrical safety techniques.
- Be able to present the types, roles, and functions of safety devices in electrical circuits.
- Be able to present the fundamental principles and definitions in the techniques for measuring and inspecting electrical equipment.
- Be able to present the inspecting methods and electrical circuit quantities need to be inspected; identify and describe the structure and uses of measuring devices.
- Be able to present the measurement principles and measuring values of devices in technical electrical circuits.

- Be able to classify household electrical circuits, their structures, functions and tasks.
- Be able to describe the principles of connecting devices to household electrical circuits.
- Be able to describe the principles of connecting safety devices to household electrical circuits.
- Be able to present the components and structure of machines and power stations.
- Be able to present the electrical structure of electrical machines such as electrical motors, pumps, air compressors, generators, sludge presses, and their operation and maintenance methods.
- Be able to analyze the damage and their causes to electrical machines used in environmental treatment.
- Be able to present and recognize symbols, names and orders of electrical devices on technical drawings of typical electrical circuit diagrams in a plant.
- Be able to classify switching devices, transformers, and describe their roles and functions in electrical circuits.
- Be able to classify switching devices, transformers, and describe their roles and functions in technical electrical circuit diagram.
- Be able to present the principles of connection, inspection and replacement of switching devices and transformers in electrical circuits.

II.2. Skills

- Be able to apply occupational safety and health regulations in the electrical field in specific cases.
- Master the electrical safety rules.
- Be able to convert and calculate measurands.
- Be able to measure and inspect electrical equipment on basic electrical circuits.
- Be able to apply measurements to actual equipment operation at factory.
- Be able to make connections in electrical circuits.

- Be able to connect electrical equipment to household electrical circuits as required.
- Be able to connect safety devices to household electrical circuits as required.
- Be able to explain the operating principles and applications of transformers, motors and generators.
- Be able to calculate for selecting conductors and tools for switching and protecting electrical machines in electrical cabinets. Be able to implement safe operation of electrical machines.
- Be able to propose measures to prevent damage to electrical machines used in environmental treatment.
- Be able to read electrical symbols and drawings inside and outside a work.
- Be able to apply inspection and cleaning procedures for electrical cabinets.
- Be able to connect switching devices and transformers to technical circuits and inspect their operation.

II.3. Self-control ability and responsibility

- Comply with the safety principles when exposing with power sources.
- Comply with the rules and regulations on electrical safety;
- Implement safety measures while working with electrical equipment.
- Be able to use electrical tools and measuring equipment proficiently.
- Be able to use multimeter.
- Be able to use electrical tools and measuring equipment proficiently.
- Be able to make connections of wires and cables as per technical requirements.
- Be able to perform the safety measures when connecting electrical equipment.
- Be able to perform the safety measures when connecting safety devices in an electrical circuit.
- Be able to use multimeter to measure the parameters of electrical machine.
- Be able to install control circuits, and connect motors per diagram.
- Be able to analyze, inspect and troubleshoot electrical machines.

- Be able to perform the safety measures when installing electrical equipment in an electrical cabinet.
- Be able to make the connection of electrical equipment in an electrical cabinet using proper technique.
- Be able to implement safety and inspection procedures when connecting electrical equipment in an electrical system.
- Be able to analyze, inspect and troubleshoot electrical system.
- Work independently or in a team, solve complicated issues and work in changing working conditions.
- Guide and supervise others to perform defined tasks; accept individual and collective accountability.
- Evaluate the quality of work outcomes and performance results of team members.

III. Description

1. General contents and time allocation

No.	Module name	Time (hour)			
		Total	**Theory**	**Practice, laboratory, discussion, assignment**	**Examination**
1	***Part 1: Basic electrical installation technique***	***135***	***45***	***83***	***7***
	Lesson 1: Occupational safety regulations in electricity sector 1. Occupational safety and Labor Code 2. Occupational safety principles	2	2		

No.	Module name	Time (hour)			
		Total	**Theory**	**Practice, laboratory, discussion, assignment**	**Examination**
	Lesson 2: Connecting techniques of safety devices 1. Fuses in the power distribution cabinet 2. Safety switching for motor in power distribution cabinet 3. Conductive safety switches 4. NH fuse	40	10	30	
	Lesson 3: Installation techniques in household electrical circuits 1. Fuse matching 2. Circuit diagrams 3. Connection procedure in circuit diagram 4. Connection procedure for socket in circuit diagram	80	30	50	
	Lesson 4: Measurement and inspection techniques 1. Introduction to techniques and measuring value display devices 2. Voltage and amperage measuring method	13	3	10	
	Examination	**7**			**7**
2	***Part 2: Motor installation***	***105***	***13***	***85***	***7***

No.	Module name	Time (hour)			
		Total	**Theory**	**Practice, laboratory, discussion, assignment**	**Examination**
	techniques in electrical circuits				
	Lesson 1: Motor connecting techniques in electrical circuit 1. Foundation for circuit diagram 2. Motor connecting techniques in electrical circuit	62	7	55	
	Lesson 2: Motor inspection and measuring techniques in electrical circuit 1. Inspect a recently repaired extension cable 2. Measure voltage at the terminal block of a three-phase motor 3. Measure insulation of electrical equipment and system 4. Potentiometric and current measurement based on an example of oxygen adjustment	36	6	30	
	Examination	**7**			**7**
3	***Part 3: Electrical equipment and systems of a factory***	***90***	***28***	***55***	***7***
	Lesson 1: Typical electrical circuit diagram of a factory 1. Symbols on an electrical circuit 2. Name	2	2		

No.	Module name	Time (hour)			
		Total	**Theory**	**Practice, laboratory, discussion, assignment**	**Examination**
	3. Position in a drawing				
	Lesson 2: Basic electrical machines 1. Transformers 2. USV and UPS station 3. Backup power station	1	1		
	Lesson 3: Connecting techniques of switching devices and transformers 1. Simple motor protection circuit breaker with signal display board 2. Reversing protection circuit for starting wiper 3. Replacement of malfunctioned control transformer	80	25	55	
	Examination	**7**			**7**

2. Detailed contents

PART I: BASIC ELECTRICAL INSTALLATION TECHNIQUE

Lesson 1: Law on electrical safety

Time: 2 hours

1. Lesson objectives

- Be able to present the fundamental principles and definitions of electrical safety techniques.
- Be able to apply occupational safety and health regulations in the electrical field in specific cases.
- Comply with the safety principles when exposing with power sources.

2. Lesson contents

2.1. Occupational safety and Labor Code

2.1.1. Occupational safety regulations

2.1.2. Occupational safety when working with electricity

2.2. Occupational safety principles

2.2.1. Five electrical safety principles

2.2.2. Triple-safety principle

Lesson 2: Connecting techniques of safety devices

Time: 40 hours

1. Lesson objectives

- Be able to present the types, roles, and functions of safety devices in electrical circuits.
- Master the electrical safety rules.
- Comply with the rules and regulations on electrical safety; Implement safety measures while working with electrical equipment.
- Be serious about learning and research.

2. Lesson contents

2.1. Fuses in power distribution cabinet

2.2. Safety switching for motor in power distribution cabinet

2.3. Conductive safety switches

2.4. NH fuse

Lesson 3: Installation techniques in household electrical circuits

Time: 73 hours

1. Lesson objectives

- Be able to classify household electrical circuits, their structures, functions and tasks.
- Be able to make connections in electrical circuits.
- Be able to make connections of wires and cables as per technical requirements.
- Be able to describe the principles of connecting devices to household electrical circuits.
- Be able to connect electrical equipment to household electrical circuits as required.
- Be able to perform the safety measures when connecting electrical equipment.
- Be able to describe the principles of connecting safety devices to household electrical circuits.
- Be able to connect safety devices to household electrical circuits as required.
- Be able to perform the safety measures when connecting safety devices in an electrical circuit.
- Be serious about learning and research.

2. Lesson contents

2.1. Fuse matching

2.2. Circuit diagrams

2.2.1. Open and closed circuit diagram

2.2.2. Series circuit diagram

2.2.3. Cross circuit diagram

2.3. Connection procedure in circuit diagram

2.4. Connection procedure for socket in circuit diagram

Lesson 4: Measurement and inspection techniques

Time: 13 hours

1. Lesson objectives

- Be able to present the fundamental principles and definitions in the techniques for measuring and inspecting electrical equipment.
- Be able to convert and calculate measurands.
- Be able to use electrical tools and measuring equipment proficiently.
- Be able to present the inspecting methods and electrical circuit quantities need to be inspected; identify and describe the structure and uses of measuring devices.
- Be able to measure and inspect electrical equipment on basic electrical circuits.
- Be able to use multimeter.

- Be able to present the measurement principles and measuring values of devices in technical electrical circuits.
- Be able to apply measurements to actual equipment operation at factory.
- Be able to use electrical tools and measuring equipment proficiently.
- Be serious about learning and research.

2. Lesson contents

2.1. Introduction to techniques and measuring value display devices

2.1.1. Measuring techniques

2.1.1.1. Measuring equipment, measuring chain

2.1.1.2. Measuring procedure

2.1.1.3. Analogue transmission technique of measured values

2.1.1.4. Digital transmission technique of measured values

2.1.1.5. Causes of error

2.1.2. Measuring value display devices

2.2. Voltage and amperage measuring method

2.2.1. Instruction on measuring electrical elements

2.2.1.1. Measuring electrical elements

2.2.1.2. Measuring voltage

2.2.1.3. Measuring amperage

2.2.1.4. To measure resistance

2.2.2. Measuring insulation

2.2.2.1. Overview of insulation resistance

2.2.2.2. Inspection schedule

2.2.2.3. Requirements for insulation measuring devices

2.2.2.4. Resistance value and measurement at construction site

2.2.3. Insulation monitoring device and measuring practice guideline

Examination: 7 hours

PART II: MOTOR INSTALLATION TECHNIQUES IN ELECTRICAL CIRCUITS

Lesson 1: Motor connecting techniques in electrical circuit

Time: 62 hours

1. Lesson objectives

- Be able to present the electrical structure of electrical machines such as electrical motors, pumps, air compressors, generators, sludge presses, and their operation and maintenance methods.
- Be able to calculate for selecting conductors and tools for switching and protecting electrical machines in electrical cabinets.
- Be able to implement safe operation of electrical machines.
- Be able to install control circuits, and connect motors per diagram.
- Be serious about learning and research.

2. Lesson contents

2.1. Foundation for circuit diagram

2.1.1. Open and closed protection circuit diagram

2.1.2. Self-locking by contactor

2.1.3. Timer relay

2.2. Motor connecting techniques in electrical circuit

2.2.1. Star-delta circuit

2.2.2. Star-delta circuit with soft start

2.2.3. Dahlander circuit

Lesson 2: Motor inspection and measuring techniques in electrical circuit

Time: 36 hours

1. Lesson objectives

- Be able to present how to inspect an electrical circuit.
- Be able to present the measurement principles and measuring values of devices in technical electrical circuits to ensure safety.
- Be able to apply measurements to actual equipment operation at factory.
- Be able to analyze the damage and their causes to electrical machines used in environmental treatment.

- Be able to propose measures to prevent damage to electrical machines used in environmental treatment.
- Be able to analyze, inspect and troubleshoot electrical machines.
- Be serious about learning and research.

2. Lesson contents

2.1. Inspect a recently repaired extension cable

2.2. Measure voltage at the terminal block of a three-phase motor

2.3. Measure insulation of electrical equipment and system

2.4. Potentiometric and current measurement based on an example of oxygen adjustment

Examination: 7 hours

PART III: ELECTRICAL EQUIPMENT AND SYSTEMS OF A FACTORY

Lesson 1: Typical electrical circuit diagram of a factory

Time: 2 hours

1. Lesson objectives

- Be able to present and recognize symbols, names and orders of electrical devices on technical drawings of typical electrical circuit diagrams in a plant.
- Be able to read electrical symbols and drawings inside and outside a work.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents

2.1. Symbols on an electrical circuit

2.2. Name

2.3. Position in a drawing

Lesson 2: Machines and power stations

Time: 1 hours

1. Lesson objectives

- Be able to present the components and structure of machines and power stations.
- Be able to explain the operating principles and applications of transformers, motors and generators.
- Be able to use multimeter to measure the parameters of electrical machine.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents

2.1. Transformer

2.1.1. Small-sized transformers

2.1.2. Short circuit characteristics

2.1.3. Special small-sized transformers

2.1.4. Scattered field transformers

2.1.5. Power chart of a transformer

2.2. USV and UPS station

2.3. Backup power station

Lesson 3: Connecting techniques of switching devices and transformers

Time: 80 hours

1. Lesson objectives

- Be able to classify switching devices, transformers, and describe their roles and functions in electrical circuits.
- Be able to connect switching devices and transformers to circuits and inspect their operation.
- Be able to make the connection of electrical equipment in an electrical cabinet using proper technique.
- Be able to apply inspection and cleaning procedures for electrical cabinets.
- Be able to perform the safety measures when installing electrical equipment in an electrical cabinet.
- Be able to implement safety and inspection procedures when connecting electrical equipment in an electrical system.
- Be able to present the principles of connection, inspection and replacement of switching devices and transformers in electrical circuits.
- Be able to connect switching devices and transformers to technical circuits and inspect their operation.
- Be able to analyze, inspect and troubleshoot electrical system.
- Be serious about learning and research.

2. Lesson contents

2.1. Simple motor protection circuit breaker with signal display board

2.2. Reversing protection circuit for starting wiper

2.3. Replacement of malfunctioned control transformer

Examination: 7 hours

IV. Module implementation conditions

1. Specialized classrooms and workshops

- Practical rooms of motors and electrical equipment.

2. Machine and equipment

- Electrician toolkit, training model.
- Electrical installation cabin.
- Motor, engine.

3. Learning materials, tools and consumables

- Handouts for learners.
- Electrical equipment training models.
- Diagrams, drawings;
- Soft electrical cable, tapes, etc.
- Electrical safety toolkit, electrician toolkit.
- Protective equipment

4. Other conditions

V. Assessment contents and methods

1. Description

1.1. Knowledge

1.1.1. Part 1: Basic electrical installation technique

- Be able to present the fundamental principles and definitions of electrical safety techniques.
- Be able to present the types, roles, and functions of safety devices in electrical circuits.
- Be able to present the fundamental principles and definitions in the techniques for measuring and inspecting electrical equipment.
- Be able to present the inspecting methods and electrical circuit quantities need to be inspected; identify and describe the structure and uses of measuring devices.
- Be able to present the measurement principles and measuring values of devices in technical electrical circuits.
- Be able to classify household electrical circuits, their structures, functions and tasks.
- Be able to describe the principles of connecting devices to household electrical circuits.

- Be able to describe the principles of connecting safety devices to household electrical circuits.

1.1.2. Part 2: Motor installation techniques in electrical circuits

- Be able to present the electrical structure of electrical machines such as electrical motors, pumps, air compressors, generators, sludge presses, and their operation and maintenance methods.
- Be able to analyze the damage and their causes to electrical machines used in environmental treatment.

1.1.3. Part 3: Electrical equipment and systems of a factory

- Be able to present and recognize symbols, names and orders of electrical devices on technical drawings of typical electrical circuit diagrams in a plant.
- Be able to present the components and structure of machines and power stations.
- Be able to classify switching devices, transformers, and describe their roles and functions in electrical circuits.
- Be able to classify switching devices, transformers, and describe their roles and functions in technical electrical circuit diagram.
- Be able to present the principles of connection, inspection and replacement of switching devices and transformers in electrical circuits.

1.2. Skills

1.2.1. Part 1: Basic electrical installation technique

- Be able to apply occupational safety and health regulations in the electrical field in specific cases.
- Master the electrical safety rules.
- Be able to convert and calculate measurands.
- Be able to measure and inspect electrical equipment on basic electrical circuits.
- Be able to apply measurements to actual equipment operation at factory.
- Be able to make connections in electrical circuits.
- Be able to connect electrical equipment to household electrical circuits as required.

- Be able to connect safety devices to household electrical circuits as required.

1.1.2. Part 2: Motor installation techniques in electrical circuits

- Be able to explain the operating principles and applications of transformers, motors and generators.
- Be able to calculate for selecting conductors and tools for switching and protecting electrical machines in electrical cabinets.
- Be able to implement safe operation of electrical machines.
- Be able to propose measures to prevent damage to electrical machines used in environmental treatment.

1.1.3. Part 3: Electrical equipment and systems of a factory

- Be able to read electrical symbols and drawings inside and outside a work.
- Be able to connect switching devices and transformers to circuits and inspect their operation.
- Be able to apply inspection and cleaning procedures for electrical cabinets.
- Be able to connect switching devices and transformers to technical circuits and inspect their operation.

1.3. Self-control ability and responsibility

- Comply with the safety principles when exposing with power sources.
- Comply with the rules and regulations on electrical safety; Implement safety measures while working with electrical equipment.
- Be able to use electrical tools and measuring equipment proficiently.
- Be able to use multimeter.
- Be able to use electrical tools and measuring equipment proficiently.
- Be able to make connections of wires and cables as per technical requirements.
- Be able to perform the safety measures when connecting electrical equipment.
- Be able to perform the safety measures when connecting safety devices in an electrical circuit.
- Be able to use multimeter to measure the parameters of electrical machine.
- Be able to install control circuits, and connect motors per diagram.

- Be able to analyze, inspect and troubleshoot electrical machines.
- Be able to perform the safety measures when installing electrical equipment in an electrical cabinet.
- Be able to make the connection of electrical equipment in an electrical cabinet using proper technique.
- Be able to implement safety and inspection procedures when connecting electrical equipment in an electrical system.
- Be able to analyze, inspect and troubleshoot electrical system.

2. Method

- Evaluate through examination: oral examination, multiple choice, essay, observing practical activities.

VI. Module implementation instructions

1. Scope of application

"Electrical Installation in Wastewater Treatment" module can be used to teach learners at college and advanced German standards college levels for "Sewage Engineering Technician".

2. Introductions on module teaching and learning methods

2.1. For teachers/lecturers

- Teaching methods include presentation, integration, conservation, group discussion.
- Use equipment and images to visually illustrate the theoretical lessons.
- Practice skills in using electrician's tools and circuit assembly skills.
- Teachers can use computers, projectors, and electronic lesson materials when teaching.

2.2. For learners

- Attend class on schedule with sufficient learning hours as required.
- Complete all assignments of the self-studying hours.
- Strictly follow the rules of practice workshop.
- Perform experiments under the guidance of teachers or workshop managers.
- Refer to related documents for more information.
- Actively engage in activities in class and search for in-practice information.

3. Key points requiring attention

- All lessons.

4. References

[1]. General Directorate of Vocational Training. *Electrical Engineering course book*.

[2]. Dang Van Dao and Le Van Doanh (2001). *Electrical Engineering*. Education Publishing House.

[3]. Vu Quang Hoi *Engine Control Techniques course book*. Education Publishing House.

5. Notes and explanations (if any)

APPENDIX 03

MODULE PROGRAM

Module name: MAINTENANCE OF WASTEWATER TREATMENT PLANT

Module code: MD 08

Training duration: 300 hours; (Theory: 56 hours; Practice, laboratory, discussion, assignment: 238 hours; Examination: 6 hours).

I. Position and features:

- Position: “Maintenance of Wastewater Treatment Plant” module is taught along with other Specialized modules, and after the Fundamental modules.
- Features: This specialized module provides learners with knowledge on the principles and procedures for performing operation and equipment maintenance tasks in wastewater treatment plant; the principles for ensuring occupational safety and electrical safety at work, responding to incidents as well as repairing minor faults within the scope of works. Graduates can perform the tasks related to the maintenance of wastewater treatment stations at a plant or company specializing in the collection and treatment of centralized wastewater and urban wastewater, including implementing maintenance tasks as requested by the company; making a list of backup equipment within the assigned scope; repairing machines and equipment within the assigned scope; maintaining machines and equipment of wastewater treatment plant; implementing the principles on occupational safety and environmental sanitation; recording operation log and conducting reports, etc.
- This module can be divided into chapters with different training durations and objectives as per the regulations on training duration for each module. However, this module must ensure its following main objectives.

II. Objectives

II.1. Knowledge

- Be able to identify the objectives of maintenance tasks at a wastewater treatment plant.
- Be able to present and classify maintenance strategies.
- Be able to present the list materials and equipment within the assigned scope.

- Be able to list out the potential incidents during maintenance.

- Be able to present the maintenance procedures for machines, equipment and works at a wastewater treatment plant.

- Be able to present and describe hand-held tools, equipment and machines for maintenance.

II.2. Skills

- Be able to make maintenance plans for works, machines and equipment within the assigned scope.

- Be able to formulate a preparation plan of materials and equipment within the assigned scope.

- Be able to perform proper inspection, maintenance procedures for machines and equipment.

- Be able to use hand-held tools, equipment and machines for maintenance.

- Be able to record maintenance log.

- Be able to update the maintenance activities into machine, equipment and construction monitoring log.

II.3. Self-control ability and responsibility

- Attend all classes.

- Have a sense of discipline in studying, cooperating and helping each other.

- Comply with measures to ensure occupational safety when performing inspection and maintenance work at a wastewater treatment plant.

- Work independently or in a team, solve complicated issues and work in changing working conditions.

- Guide and supervise others to perform defined tasks; accept individual and collective accountability.

- Evaluate the quality of work outcomes and performance results of team members.

III. Description

1. General contents and time allocation

No.	Module lesson	Time (hour)			
		Total	Theory	Practice, laboratory, discussion, assignment	Examination
1	***Part 1: Maintenance of wastewater treatment plant***	***120***	***56***	***60***	***4***
	Lesson 1: Overview 1. Maintenance and inspection concepts 2. Objectives of maintenance of wastewater treatment plant 3. Maintenance strategies 4. Making a list and classifying the importance of machinery and equipment 5. Inspection and maintenance planning 6. Making a list of backup supplies and equipment 7. Occupational safety when performing inspection and maintenance work at a wastewater treatment plant	**20**	**18**	**2**	
	Lesson 2: Maintenance of machine and equipment 1. Mechanical wastewater treatment works 2. Biological or chemical wastewater treatment works 3. Sludge treatment works 4. Cleaning pump chamber and	**96**	**38**	**58**	

No.	Module lesson	Time (hour)			
		Total	**Theory**	**Practice, laboratory, discussion, assignment**	**Examination**
	treatment tanks 5. Electrical control and lighting system 6. Reporting on maintenance and inspection results 7. Updating equipment and machine monitoring log				
	Examination	**4**			**4**
2	***Part 2: Practice on maintenance of wastewater treatment plant*** 1. Mechanical wastewater treatment works 2. Biological or chemical wastewater treatment works 3. Sludge treatment works 4. Electrical control and lighting system 5. Reporting on maintenance and inspection results 6. Updating equipment and machine monitoring log	***180***		***178***	***2***
	Examination	**2**			**2**

2. Detailed contents:

PART I: MAINTENANCE OF WASTEWATER TREATMENT PLANT

Lesson 1: Overview

Time: 20 hours

1. Lesson objectives:

- Be able to identify the objectives of maintenance tasks at a wastewater treatment plant.
- Be able to present and classify maintenance strategies.
- Be able to make maintenance plans for works, machines and equipment within the assigned scope.
- Be able to present the list materials and equipment within the assigned scope.
- Be able to formulate a preparation plan of materials and equipment within the assigned scope.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Maintenance and inspection concepts

2.2. Objectives of maintenance of wastewater treatment plant

2.3. Maintenance strategies

2.4. Making a list and classifying the importance of machinery and equipment

2.5. Inspection and maintenance planning

2.6. Making a list of backup supplies and equipment

2.7. Occupational safety when performing inspection and maintenance work at a wastewater treatment plant.

Lesson 2: Maintenance of machine and equipment

Time: 96 hours

1. Lesson objectives:

- Be able to present the maintenance procedures for machines, equipment and works at a wastewater treatment plant.

- Be able to perform proper inspection, maintenance procedures for machines and equipment.
- Be able to list out the potential incidents during maintenance.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Mechanical wastewater treatment works

2.1.1. Submersible pump

2.1.2. Screw pump

2.1.3. Sludge pump

2.1.4. Trash screens

2.1.5. Hand valve, gate valve, milling gate

2.1.6. Flow meters

2.2. Biological or chemical wastewater treatment works

2.2.1. Air blower

2.2.2. Air compressor

2.2.3. Chemical dosing pump

2.2.4. Stirrer

2.2.5. Hand valve, gate valve, milling gate

2.2.6. Flow meters

2.3. Sludge treatment works

2.3.1. Centrifugal concentrator

2.3.2. Centrifugal water separator

2.3.3. Belt press machine

2.4. Cleaning pump chamber and treatment tanks

2.4.1. Pump chamber

2.4.2. Equalization tank

2.4.3. Grit chamber

2.4.4. Primary sedimentation tank

2.4.5. Biological tank

2.4.6. Secondary sedimentation tank

2.4.7. Disinfection tank

2.4.8. Sludge thickening tank

2.5. Electrical control and lighting system

2.5.1. Electrical control system

2.5.2. Lighting system

2.6. Report of maintenance and inspection results

2.7. Update on equipment and machine monitoring log

Examination: 4 hours

PART II: PRACTICE ON MAINTENANCE OF WASTEWATER TREATMENT PLANT

Time: 180 hours

1. Lesson objectives:

- Be able to present the maintenance procedures for machines, equipment and works at a wastewater treatment plant.
- Be able to perform proper inspection, maintenance procedures for machines and equipment.
- Be able to present and describe hand-held tools, equipment and machines for maintenance.
- Be able to use hand-held tools, equipment and machines for maintenance.
- Be able to record maintenance log.
- Be able to update the maintenance activities into machine, equipment and construction monitoring log.
- Comply with regulations under the guidance of workshop assistants.
- Maintain workplace safety and hygiene, protect assets, and adhere to working principles.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Mechanical wastewater treatment works

2.2. Biological or chemical wastewater treatment works

2.3. Sludge treatment works

2.4. Electrical control and lighting system

2.5. Report results

2.6. Update on equipment and machine monitoring log

IV. Module implementation conditions

1. Specialized classrooms and workshops

- Theory classrooms
- Practice workshops with model
- Practice: Studying at factories or office of companies.

2. Machine and equipment

- Computers, calculators.
- Practice model of mechanical, biological or chemical wastewater treatment methods.
- Computers, calculators.
- Personal protective equipment.

3. Learning materials, tools and consumables

- Handouts for learners.
- Course books, reference materials…

4. Other conditions

V. Assessment contents and methods

1. Description

1.1. Knowledge

1.1.1. Part 1: Maintenance of wastewater treatment plant

- Be able to identify the objectives of maintenance tasks at a wastewater treatment plant.
- Be able to present and classify maintenance strategies.
- Be able to present the list of materials and equipment within the assigned scope.
- Be able to list out the potential incidents during maintenance.

1.1.2. Part 2: Practice on maintenance of wastewater treatment plant

- Be able to present the maintenance procedures for machines, equipment and works at a wastewater treatment plant.
- Be able to present and describe hand-held tools, equipment and machines for maintenance.

1.2. Skills

1.2.1. Part 1: Maintenance of wastewater treatment plant

- Be able to make maintenance plans for works, machines and equipment within the assigned scope.
- Be able to formulate a preparation plan of materials and equipment within the assigned scope.

1.2.2. Part 2: Practice

- Be able to perform proper inspection, maintenance procedures for machines and equipment.
- Be able to use hand-held tools, equipment and machines for maintenance.
- Be able to record maintenance log.
- Be able to update the maintenance activities into machine, equipment and construction monitoring log.

1.3. Self-control ability and responsibility

- Attend all classes.
- Have a sense of discipline in studying, cooperating and helping each other.
- Work independently in changing working conditions, accept individual and partial responsibility for the team.
- Instruct and supervise others performing assigned tasks.
- Follow safety and hygiene measures when working with wastewater and in confined spaces.
- Evaluate the quality of work outcomes and performance results of team members.
- Solve occupational problems.

2. Method

- Oral examination, multiple choice test, essay: Ask questions about the main and central issues.
- Partake in group discussions and presentations on topics.
- Evaluate through performance at company or plant, or examination at company or plant.

VI. Module implementation instructions

1. Scope of application

"Maintenance of Wastewater Treatment Plant" module can be used to teach learners at college and advanced German standards college levels for "Sewage Engineering Technician".

2. Introductions on module teaching and learning methods

2.1. For teachers/lecturers/trainers at enterprise

For teachers/lecturers at school

- Teaching methods include presentation, integration, conservation, group discussion, and practice;
- Following each lesson, it is required to offer questions and assignments for learners to complete independently outside of training hours.
- Teachers can use a combination of computers, projectors, and electronic lesson materials when teaching.
- Teachers need to prepare learning materials with complete instructions for implementing inspection and maintenance activities.

For teachers/lecturers at enterprise

- Joint training enterprises need to appoint qualified teachers and lecturers to train learners during their internship at the company.
- Teachers and business trainers need to be trained in pedagogical ability, the ability to assess learners' capacity and organize the appropriate division of tasks for learners.
- Teaching methods include presentation, conversation, group discussion, practice and application of practical models.
- Teaching aids such as computers, projectors, etc. can be used, and teachers can new tools to enrich the lecture content.

2.2. For learners

- Attend class on schedule with sufficient learning hours as required.
- Complete all assignments of the self-studying hours.
- Refer to related documents for more information.
- Actively participate in class activities.
- Perform proper inspection, maintenance procedures.

3. Key points requiring attention

3.1. Part 1: Maintenance of wastewater treatment plant

- Be able to evaluate the importance of each type of machine and equipment;
- Be able to make a list of backup supplies and equipment for maintenance work;
- Be able to make maintenance plans for machines and equipment within the assigned scope.

3.2. Part 2: Practice on maintenance of wastewater treatment plant

- Be able to perform proper inspection, maintenance procedures for machines and equipment.
- Apply the measures to ensure occupational safety when performing inspection and maintenance work at a wastewater treatment plant.

4. References

[1]. Nguyen Viet Anh (Ed) et al. (2017). *Sludge treatment of wastewater treatment plant.* Construction Publishing House.

[2]. Nguyen Viet Anh (Ed) and Tran Hieu Nhue (2017). *Operation and maintenance of centralized wastewater treatment plants*. Science and Technology Publishing House.

[3]. Hoang Van Hue (Ed). *Water drainage. Volume 1–Water drainage system*. Science and Technology Publishing House.

[4]. Hoang Tin. *Repaid and maintenance of industrial machine*. HCMC VNU Publishing House.

5. Notes and explanations (if any)

APPENDIX 03

MODULE PROGRAM

Module name: QUALITY SUPERVISION OF WASTEWATER TREATMENT PROCEDURE

Module code: MD 09

Training duration: 345 hours. (Theory: 90 hours; Practice, laboratory, discussion, assignment: 245 hours; Examination: 10 hours).

I. Position and features:

- Position: “Quality Supervision of Wastewater Treatment Procedure” module is taught along with other Specialized modules, and after the Fundamental modules.

- Features: This specialized module provides learners with specialized knowledge on methods of sampling and analyzing samples to assess the water quality and treatment efficiency of wastewater treatment plant. Graduates can take part in the tasks of monitoring the quality of influent and effluent wastewater treatment plant or wastewater treatment station and system of centralized wastewater treatment companies, including monitoring the operating processes of a plant, proposing recommendations to improve the quality of operation and record-storage activities; determining the parameters of influent and effluent and sampling plan; sampling wastewater and sludge; preparing analysis; analyzing basic parameters (pH, BOD_5, COD, ammonium, nitrate, bacteria...) and recording results; evaluating experimental results and proposing measures to improve quality; recording operation log and reports within the scope of work.

- This module can be divided into chapters with different training durations and objectives as per the regulations on training duration for each module. However, this module must ensure its following main objectives.

II. Objectives

II.1. Knowledge

- Be able to present the meaning and objectives of sampling, sampling conditions, sampling methods and making sampling records.

- Be able to present the methods for sample homogenization, sample filtration and sample preservation.
- Be able to describe the method for measuring field parameters.
- Be able to present the methods for analyzing pollution indicators and operating parameters in wastewater treatment plant.

II.2. Skills

- Be able to take samples and make sampling records.
- Be able to take samples of wastewater and sludge, as well as store samples properly.
- Be able to inspect and measure field parameters.
- Be able to determine the sediments in influent and effluent using Imhoff cone.
- Be able to determine the filterable solids, the amount of dry matter, the calcined residue, and loss in calcination.
- Be able to measure the content of dissolved oxygen in water using electrodes and improved Winkler method in laboratory.
- Be able to analyze the acidity and alkalinity via calculating the concentration of CO_2 using acid-base titration method.
- Be able to define the hydrogen sulfide concentration using methylene blue and lead paper.
- Be able to analyze the overall and individual parameters in wastewater using available cuvettes and standard curve construction methods.
- Be able to eliminate the errors in analysis.
- Be able to calculate and evaluate the analysis results.
- Be able to implement sensory evaluation for parameters of wastewater and sludge at work site.
- Be able to measure the parameters of wastewater at work site.
- Be able to make sampling minutes.
- Be able to analyze such operating parameters as: COD, BOD_5, nitrogen, phosphorus, and solids.
- Be able to analyze microbiological parameters such as coliform.

- Be able to observe microorganisms using microscope and evaluate the status of activated sludge sample.
- Be able to synthesize data from the quality analyzing process of wastewater and sludge.
- Be able to calculate the treatment efficiency of wastewater treatment plant and report results.

II.3. Self-control ability and responsibility

- Have a sense of discipline in studying, cooperating and helping each other.
- Comply with laboratory and factory regulations.
- Ensure the integrity of analysis results.
- Work independently or in a team, solve complicated issues and work in changing working conditions.
- Guide and supervise others to perform defined tasks; accept individual and collective accountability.
- Evaluate the quality of work outcomes and performance results of team members.

III. Description

1. General contents and time allocation

No.	Module lesson	Time (hour)			
		Total	**Theory**	**Practice, laboratory, discussion, assignment**	**Examination**
1	***Part 1: Analysis of wastewater and sludge***	***210***	***90***	***115***	***5***
	Lesson 1: Sampling and analyzing on-site parameters 1. Sampling of wastewater and sludge	**15**	**15**		

No.	Module lesson	Time (hour)			
		Total	Theory	Practice, laboratory, discussion, assignment	Examination
	2. On-site measurement parameters				
	Lesson 2: Analytical methods of wastewater and sludge parameters 1. Overall parameters 2. Individual parameters 3. Solids in wastewater and sludge 4. Other parameters	**75**	**75**		
	Lesson 3: Practice of sampling and on-site analysis 1. Sampling of wastewater and sludge 2. Visual inspection 3. Measurement of on-site parameters: temperature, pH, electrical conductivity, turbidity, sludge volume 4. Fill in sampling minutes			**9**	
	Lesson 4: Practice of determining solids 1. Determine sediments in influent sample using Imhoff cone 2. Filterable solids in treated water 3. Activated sludge and content of dry matter			**16**	

No.	Module lesson	Time (hour)			
		Total	**Theory**	**Practice, laboratory, discussion, assignment**	**Examination**
	Lesson 5: Practice of determining operating parameters 1. Measuring oxygen content 2. Determine acidity and alkalinity 3. Determine hydrogen sulfide			**20**	
	Lesson 6: Practice of analyzing pollution parameters in wastewater 1. Determine some overall parameters 2. Determine individual parameters 3. Microbiological analysis 4. Quality evaluation of treated water			**70**	
	Examination				**5**
2	**Part 2: Practice of analysis of wastewater and sludge**	***135***		***130***	***5***
	Lesson 1: Sampling and analyzing on-site parameters 1. Preparatory work 2. Determine sampling location 3. Implement sampling procedure 4. Fill in sampling minutes 5. Transport and storage samples	**15**		**15**	

No.	Module lesson	Time (hour)			
		Total	**Theory**	**Practice, laboratory, discussion, assignment**	**Examination**
	at laboratory				
	Lesson 2: Analysis of wastewater and sludge parameters 1. Overall parameters 2. Individual parameters 3. Solids in wastewater 4. Other parameters 5. Microbiological analysis	**85**		**85**	
	Lesson 3: Quality evaluation of treated water 1. Synthesis of analysis data 2. Calculate treatment efficiency of treatment works 3. Compare with QCVN 4. Report results	**30**		**30**	
	Examination	**5**			**5**

2. Detailed contents:

PART I: ANALYSIS OF WASTEWATER AND SLUDGE

Lesson 1: Sampling and analyzing on-site parameters

Time: 15 hours

1. Lesson objectives:

- Be able to present the meaning and objectives of sampling, sampling conditions, sampling methods and making sampling records.
- Be able to take samples and make sampling records.
- Be able to present the methods for sample homogenization, sample filtration and sample preservation.
- Be able to take samples of wastewater and sludge, as well as store samples properly.
- Be able to describe the method for measuring field parameters.
- Be able to inspect and measure field parameters.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Sampling of wastewater and sludge

2.1.1. Sampling method

2.1.2. Sampling storage

2.1.3. Sampling minutes

2.2. On-site measurement parameters

2.2.1. Visual inspection smell, color, turbidity

2.2.2. Basic physical and chemical parameters

2.2.3. Sludge sedimentation volume

Lesson 2: Analytical methods of wastewater and sludge parameters

Time: 75 hours

1. Lesson objectives:

- Be able to present the methods for analyzing pollution indicators and operating parameters in wastewater treatment plant.

- Be able to eliminate the errors in analysis.
- Be able to calculate and evaluate the analysis results.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Overall parameters

2.1.1. Total hardness

2.1.2. COD, BOD_5

2.2. Individual parameters

2.2.1. Nitrogen parameter

2.2.2. Phosphorus parameter

2.3. Solids in wastewater and sludge

2.3.1. Sediments

2.3.2. Filterable substances

2.3.3. Dry matter, residue, loss in calcination, and dry matter content

2.4. Other parameters

2.4.1. Alkalinity

2.4.2. Acidity

Lesson 3: Practice of sampling and on-site analysis

Time: 5 hours

1. Lesson objectives:

- Be able to implement the sampling of wastewater and sludge, as well as sample preservation using proper technique.
- Be able to inspect and measure field parameters.
- Be able to fill in sampling minutes.
- Comply with regulations under the guidance of workshop assistants.
- Maintain workplace safety and hygiene, protect assets, and adhere to working principles.

- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Sampling of wastewater and sludge

2.2. Visual inspection

2.3. Measurement of on-site parameters: temperature, pH, electrical conductivity, turbidity, sludge volume

2.4. Fill in sampling minutes

Lesson 4: Practice of determining solids

Time: 20 hours

1. Lesson objectives:

- Be able to determine the sediments in influent and effluent using Imhoff cone.
- Be able to determine the filterable solids, the amount of dry matter, the calcined residue, and loss in calcination.
- Comply with regulations under the guidance of workshop assistants.
- Maintain workplace safety and hygiene, protect assets, and adhere to working principles.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Determine sediments in influent and effluent using Imhoff cone

2.2. Filterable solids in treated water

2.2.1. Determine dry matter

2.2.2. Determine calcination residue

2.2.3. Determine loss in calcination

2.3. Activated sludge and content of dry matter

2.3.1. Determine dry matter

2.3.2. Determine calcination residue

2.3.3. Determine loss in calcination

Lesson 5: Practice of determining operating parameters

Time: 20 hours

1. Lesson objectives:

- Be able to measure the content of dissolved oxygen in water using electrodes and improved Winkler method in laboratory.
- Be able to analyze the acidity and alkalinity via calculating the concentration of CO_2 using acid-base titration method.
- Be able to define the hydrogen sulfide concentration using methylene blue and lead paper.
- Comply with regulations under the guidance of workshop assistants.
- Maintain workplace safety and hygiene, protect assets, and adhere to working principles.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Measure oxygen content

2.1.1. Measurement using electrode

2.1.2. Measurement using improved Winkler method

2.2. Determine acidity and alkalinity

2.2.1. Determine acidity

2.2.2. Determine alkalinity

2.3. Determine hydrogen sulfide

2.3.1. Methylene blue

2.3.2. Lead paper

Lesson 6: Practice of analyzing pollution parameters in wastewater

Time: 70 hours

1. Lesson objectives:

- Be able to analyze the overall and individual parameters in wastewater using available cuvettes and standard curve construction methods.
- Be able to eliminate the errors in analysis.
- Comply with regulations under the guidance of workshop assistants.
- Maintain workplace safety and hygiene, protect assets, and adhere to working principles.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Determine some overall parameters

2.1.1. Determine COD

2.1.2. Determine BOD_5

2.1.3. Determine lime reserve and organic acid content in compost slurry

2.2. Determine individual parameters

2.2.1. Using test kit

2.2.1.1. Determine ammonium, nitrate, nitrite, total nitrogen

2.2.1.2. Determine ortho-phosphate, total phosphorus

2.2.2. Determine using standard curve construction method

2.2.2.1. Standard curve construction method

2.2.2.2. Determine ammonium, nitrate, nitrite

2.2.2.3. Determine ortho-phosphate

2.3. Microbiological analysis

2.3.1. Microscopic examination of activated sludge samples

2.3.2. Analysis of Coliform and E. coli

2.4. Post-treatment quality evaluation

2.4.1. Calculate treatment efficiency of wastewater treatment plant

2.4.2. Compare with QCVN and conclude

Examination: 5 hours

PART II: PRACTICE OF ANALYSIS OF WASTEWATER AND SLUDGE

Lesson 1: Sampling and analyzing on-site parameters

Time: 15 hours

1. Lesson objectives:

- Be able to implement sampling of wastewater and sludge, transporting and preserving samples at the factory's laboratory.
- Be able to perform on-site parameter determination.
- Be able to fill in sampling minutes.
- Comply with regulations under the guidance of workshop assistants.
- Maintain workplace safety and hygiene, protect assets, and adhere to working principles.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Preparatory work

2.2. Determine sampling location

2.3 Implement sampling procedure

2.3.1. Sensory evaluation: smell, color, turbidity

2.3.2. Measurement of on-site parameters: temperature, pH, DO, electrical conductivity, turbidity

2.3.3. Measure of sludge sedimentation volume

2.4. Fill in sampling minutes

2.5. Transport and storage samples at laboratory

Lesson 2: Analysis of wastewater and sludge parameters

Time: 80 hours

1. Lesson objectives:

- Be able to analyze such operating parameters as: COD, BOD_5, nitrogen, phosphorus, solids, etc.
- Be able to analyze microbiological parameters such as coliform.

- Be able to observe microorganisms using microscope and evaluate the status of activated sludge sample.
- Comply with regulations under the guidance of workshop assistants.
- Maintain workplace safety and hygiene, protect assets, and adhere to working principles.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Determine some overall parameters

2.1.1. Determine COD

2.1.2. Determine BOD_5

2.2. Determine individual parameters

2.2.1. Nitrogen parameter

2.2.2. Phosphorus parameters

2.3. Solids in wastewater

2.3.1. Sediments

2.3.2. Filterable substances

2.3.3. Dry matter, residue, loss in calcination, and dry matter content

2.4. Other parameters

2.4.1. Alkalinity

2.4.2. Acidity

2.5. Microbiological analysis

2.5.1. Observing microorganisms under a microscope

2.5.2. Analysis of Coliform

Lesson 3: Quality evaluation of treated water

Time: 30 hours

1. Lesson objectives:

- Be able to synthesize data from the quality analyzing process of wastewater and sludge.
- Be able to calculate the treatment efficiency of wastewater treatment plant and report results.
- Comply with regulations under the guidance of workshop assistants.
- Maintain workplace safety and hygiene, protect assets, and adhere to working principles.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Synthesis of analysis data

2.2. Calculate treatment efficiency of treatment works

2.3. Compare with QCVN

2.4. Report results

Examination: 5 hours

IV. Module implementation conditions

1. Specialized classrooms and workshops

- Theory classrooms.
- Biochemistry practice laboratory.
- Studying at factories or laboratories.

2. Machine and equipment

- Computers, calculators.
- Laboratory equipment

3. Learning materials, tools and consumables

Learning materials:

- Handouts for learners.
- Course books, reference materials…

Tools:

- Laboratory instruments: pipette, burette, etc.
- Laboratory equipment

- Protection equipment

Consumables:

- Chemicals, test kit, etc.

4. Other conditions

V. Assessment contents and methods

1. Description

1.1. Knowledge

1.1.1. Part 1: Analysis of wastewater and sludge

- Be able to present the meaning and objectives of sampling, sampling conditions, sampling methods and making sampling records.
- Be able to present the methods for sample homogenization, sample filtration and sample preservation.

1.1.2. Part 2: Practice of analysis of wastewater and sludge

- Be able to describe the method for measuring field parameters.
- Be able to present the methods for analyzing pollution indicators and operating parameters in wastewater treatment plant.

1.2. Skills

1.2.1. Part 1: Analysis of wastewater and sludge

- Be able to take samples and make sampling records.
- Be able to take samples of wastewater and sludge, as well as store samples properly.
- Be able to inspect and measure field parameters.
- Be able to determine the sediments in influent and effluent using Imhoff cone.
- Be able to determine the filterable solids, the amount of dry matter, the calcined residue, and loss in calcination.
- Be able to measure the content of dissolved oxygen in water using electrodes and improved Winkler method in laboratory.
- Be able to analyze the acidity and alkalinity via calculating the concentration of CO_2 using acid-base titration method.

- Be able to define the hydrogen sulfide concentration using methylene blue and lead paper.
- Be able to analyze the overall and individual parameters in wastewater using available cuvettes and standard curve construction methods.
- Be able to eliminate the errors in analysis.
- Be able to calculate and evaluate the analysis results.

1.2.2. Part 2: Practice

- Be able to implement sensory evaluation for parameters of wastewater and sludge at work site.
- Be able to measure the parameters of wastewater at work site.
- Be able to make sampling minutes.
- Be able to analyze such operating parameters as: COD, BOD_5, nitrogen, phosphorus, and solids.
- Be able to analyze microbiological parameters such as coliform.
- Be able to observe microorganisms using microscope and evaluate the status of activated sludge sample.
- Be able to synthesize data from the quality analyzing process of wastewater and sludge.
- Be able to calculate the treatment efficiency of wastewater treatment plant and report results.

1.3. Self-control ability and responsibility

- Attend all classes.
- Have a sense of discipline in studying, cooperating and helping each other.
- Work independently in changing working conditions, accept individual and partial responsibility for the team.
- Instruct and supervise others performing assigned tasks.
- Comply with laboratory and factory regulations.
- Ensure the integrity of analysis results.

2. Method

- Oral examination, multiple choice test, essay: Ask questions about the main and central issues.
- Observe learners' performance during practice at the laboratory. experiments such as titration, determination of solid mass, optical measurement, etc.
- Observe earners' performance during internship at factory's laboratory. The experiments include titration, determination of solid mass, optical measurement, etc.
- Repeating practice of analysis steps.

VI. Module implementation instructions

1. Scope of application

"Quality Supervision of Wastewater Treatment Procedure" module can be used to teach learners at college and advanced German standards college levels for "Sewage Engineering Technician".

2. Introductions on module teaching and learning methods

2.1. For teachers/lecturers/trainers at enterprise

For teachers/lecturers at school

- Teaching methods include presentation, integration, conservation, group discussion, and practice;
- Following each lesson, it is required to offer questions and assignments for learners to complete independently outside of training hours.
- Teachers can use a combination of computers, projectors, and electronic lesson materials when teaching.
- Teachers need to prepare learning materials with complete instructions for conducting experiments.

For teachers/lecturers at enterprise

- Joint training enterprises need to appoint qualified teachers and lecturers to train learners during their internship at the company.
- Teachers and business trainers need to be trained in pedagogical ability, the ability to assess learners' capacity and organize the appropriate division of tasks for learners.
- Teaching methods include presentation, conversation, group discussion, practice and application of practical models.

- Teaching aids such as computers, projectors, etc. can be used, and teachers can new tools to enrich the lecture content.

2.2. For learners

- Attend class on schedule with sufficient learning hours as required.
- Have a sense of discipline in studying, cooperating and helping each other.
- Complete all assignments of the self-studying hours.
- Ensure the integrity of analysis results.
- Strictly follow laboratory rules at school and internship unit.
- Perform experiments under the guidance of teachers or laboratory managers.
- Refer to related documents for more information.
- Actively participate in class activities.

3. Key points requiring attention

3.1. Part 1: Analysis of wastewater and sludge

- Sampling and sample preservation techniques.
- Analyzing techniques of wastewater and sludge parameters.

3.2. Part 2: Practice of analysis of wastewater and sludge

- Sampling and sample preservation techniques.
- Analyzing techniques of wastewater and sludge parameters.
- Synthesize data and report results.

4. References

[1]. Andrew D. Eaton (2005). *Stand Methods for The Examination of Water and Wastewater.* 2005.

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[4]. Le Van Khoa et al. (2000). *Soil, water, fertilizer and crop analysis methods* (2nd Edition). Education Publishing House.

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5. Notes and explanations (if any)

APPENDIX 03

MODULE PROGRAM

Module name: ERROR ANALYSIS AND TROUBLESHOOTING

Module code: MD 10

Training duration: 330 hours; (Theory: 73 hours; Practice, laboratory, discussion, assignment: 242 hours; Examination: 15 hours).

I. Position and features:

- Position: “Error Analysis and Troubleshooting” module is taught along with other Specialized modules, and after the Fundamental modules.
- Features: This specialized module provides learners with general knowledge on evaluating and identifying methods for errors during the operation of various types of equipment and works in wastewater collection and treatment system. It also provides knowledge about emergency situations and how to respond promptly and effectively. Learners can recognize the necessity of corrective measures and data analysis methods to prevent future errors or to provide better solutions in emergencies.
- This module can be divided into chapters with different training durations and objectives as per the regulations on training duration for each module. However, this module must ensure its following main objectives.

II. Objectives

II.1. Knowledge

- Be able to present the concept, importance and impact of incidents and troubleshooting in drainage and wastewater treatment.
- Be able to describe and classify the impact level of potential incidents and risks in drainage and wastewater treatment.
- Be able to describe the troubleshooting procedures for incidents in drainage and wastewater treatment.
- Be able to describe and classify the types of incidents in drainage system.
- Be able to describe the responding and handling process for incidents in drainage system.
- Be able to describe and present technological incidents of wastewater treatment.

- Be able to describe and present equipment malfunctions of wastewater treatment.
- Be able to describe the responding and handling process for incidents in wastewater treatment.
- Be able to describe and classify incidents at internship unit.
- Be able to present and describe the incident troubleshooting process at internship unit.

II.2. Skills

- Be able to recognize the importance and impact of incidents and troubleshooting in drainage and wastewater treatment.
- Be able to evaluate the impact of incidents and risks on the operation of drainage and wastewater treatment at each level.
- Be able to use proper troubleshooting procedures for incidents in drainage and wastewater treatment.
- Be able to analyze the causes of incidents in drainage system.
- Be able to evaluate the impact of incidents and propose a plan to ensure continuous and stable operation of drainage system.
- Be able to apply proper responding and handling process for incidents in drainage system.
- Be able to handle incidents in drainage system properly.
- Be able to write reports and store records of drainage system as per regulations.
- Be able to analyze the causes of technological incidents in wastewater treatment.
- Be able to analyze the causes of incidents related to machine and equipment in wastewater treatment.
- Be able to apply proper responding and handling procedures for incidents in wastewater treatment.
- Be able to troubleshoot incidents in wastewater treatment properly.
- Be able to write reports and store records in wastewater treatment as per regulations.
- Be able to analyze the causes of incidents in drainage and wastewater treatment at internship unit.

- Be able to apply proper responding and handling procedures for incidents in drainage and wastewater treatment at internship unit.
- Be able to troubleshoot incidents in drainage and wastewater treatment at internship unit within assigned duties.
- Be able to write reports and store records at internship unit as per regulations.

II.3. Self-control ability and responsibility

- Strictly comply with occupational safety regulations.
- Comply with regulations under the guidance of instructors at the training institution.
- Maintain workplace safety and hygiene, protect assets, and adhere to working principles.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.
- Comply with occupational safety regulations of training institution.
- Comply with privacy policies of internship unit.
- Work independently or in a team, solve complicated issues and work in changing working conditions.
- Guide and supervise others to perform defined tasks; accept individual and collective accountability.
- Evaluate the quality of work outcomes and performance results of team members.

III. Description

1. General contents and time allocation

No.	Module lesson	Time (hour)			
		Total	**Theory**	**Practice, laboratory, discussion, assignment**	**Examination**
1	***Part 1: Overview of incident and troubleshooting***	***30***	***28***		***2***
	Lesson 1: Concept of incident 1. Concepts and definitions 2. Cause classification	**3**	**3**		
	Lesson 2: Cause of incident 1. Incident outside of wastewater treatment plant 2. Incident inside of wastewater treatment plant	**3**	**3**		
	Lesson 3: Impact level of incident 1. Basic to determine impact level of incident 2. Hierarchy of potential incidents and risks at wastewater treatment plant	**2**	**2**		
	Lesson 4: Troubleshooting process 1. Incident identification method 2. Assess occurrence probability 3. Solution and prevention methods 4. Documentation and update	**20**	**20**		

No.	Module lesson	Time (hour)			
		Total	**Theory**	**Practice, laboratory, discussion, assignment**	**Examination**
	manuals				
	Examination	**2**			**2**
2	***Part 2: Incidents and troubleshooting at drainage system***	***45***	***15***	***27***	***3***
	Lesson 1: Incidents of drainage system 1. Incidents related to water quality 2. Incidents related to hydraulic flow 3. Incidents related to equipment 4. Incidents related to electrical system 5. Incidents related to damage to works	**27**	**10**	**17**	
	Lesson 3: Troubleshooting, preventing measures and emergency response to incidents of drainage system 1. Organization procedures for incident troubleshooting and emergency response. 2. Emergency situations training	**15**	**5**	**10**	
	Examination	**3**			**3**
3	***Part 3: Incident and***	***120***	***30***	***85***	***5***

No.	Module lesson	Time (hour)			
		Total	Theory	Practice, laboratory, discussion, assignment	Examination
	troubleshooting at wastewater treatment plant				
	Lesson 1: Common incidents at wastewater treatment plant 1. Incidents related to operation 2. Incidents related to machines and equipment 3. Incidents related to electrical system 4. Incidents related to fire and explosion	**95**	**20**	**75**	
	Lesson 2: Troubleshooting, preventing measures and emergency response to incidents of wastewater treatment plant 1. Organization procedures for incident troubleshooting and emergency response. 2. Emergency situations training	**20**	**10**	**10**	
	Examination	**5**			**5**
4	***Part 4: Practice of troubleshooting*** 1. Common incidents of drainage system	***135***		***130***	***5***

No.	Module lesson	Time (hour)			
		Total	**Theory**	**Practice, laboratory, discussion, assignment**	**Examination**
	2. Common incidents at wastewater treatment plant 3. Incident responding and troubleshooting procedures 4. Report results 5. Update logbook and store information				
	Examination	**5**			**5**

2. Detailed contents:

PART I: OVERVIEW OF INCIDENT AND TROUBLESHOOTING

Lesson 1: Concept of incident

Time: 3 hours

1. Lesson objectives:

- Be able to present and classify the concept and causes of incidents in drainage and wastewater treatment.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Concepts and definitions

2.1.1. Concepts

2.1.2. Definition

2.2. Cause classification

2.2.1. Short-term

2.2.2. Long-term

2.2.3. Objective

2.2.4. Subjective

Lesson 2: Cause of incident

Time: 3 hours

1. Lesson objectives:

- Be able to present the causes of incidents in drainage and wastewater treatment.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Incident outside of wastewater treatment plant

2.1.1. Power outage

2.1.2. Influent quality

2.2. Incident inside of wastewater treatment plant

2.2.1. Incidents related to operation

2.2.2. Incidents related to machines and equipment

2.2.3. Incidents related to electrical system

2.2.4. Incidents related to fire and explosion

Lesson 3: Impact level of incident

Time: 2 hours

1. Lesson objectives:

- Be able to recognize the importance and impact of incidents and troubleshooting in drainage and wastewater treatment.
- Be able to describe and classify the impact level of potential incidents and risks in drainage and wastewater treatment.
- Be able to evaluate the impact of incidents and risks on the operation of drainage and wastewater treatment at each level.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Basic to determine impact level of incident

2.1.1. Economic loss/repair cost

2.1.2. Alternative equipment

2.1.3. Impact on receiving source

2.2. Hierarchy of potential incidents and risks at wastewater treatment plant

2.2.1. Common incidents

2.2.2. Emergencies

Lesson 4: Troubleshooting process

Time: 20 hours

1. Lesson objectives:

- Be able to president the importance of incident troubleshooting in drainage and wastewater treatment.
- Be able to describe and classify the impact level of potential incidents and risks in drainage and wastewater treatment.
- Be able to use proper troubleshooting procedures for incidents in drainage and wastewater treatment.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Incident identification method

2.1.1. Sampling for analysis

2.1.2. Process monitoring system (EMSR)

2.1.3. Direct inspection

2.2. Assess occurrence probability

2.3. Solution and prevention methods

2.3.1. Planning for prevention methods

2.3.2. Prepare backup machines, equipment and chemicals

2.3.3. Information series processing

2.3.2. Implement prevention measures

2.3.4. Use documents and checklists

2.3.5. Regulations for operator

2.4. Documentation and update manuals

2.4.1. Prepare analysis reports, protect evidence

2.4.2. Lessons

2.4.3. Training

Examination: 2 hours

PART II: INCIDENTS AND TROUBLESHOOTING AT DRAINAGE SYSTEM

Lesson 1: Incidents and troubleshooting at drainage system

Time: 27 hours

1. Lesson objectives:

- Be able to describe and classify the types of incidents in drainage system.
- Be able to analyze the causes of incidents in drainage system.
- Be able to evaluate the impact of incidents and propose a plan to ensure continuous and stable operation of drainage system.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Incidents related to water quality

2.1.1. Organic matter overload

2.1.2. Excessive sand, gravel and other inorganic solids

2.1.3. Unusual smell and color of wastewater

2.1.4. Ingress of strange sewage

2.2. Incidents related to continuous flow

2.2.1. Hydraulic overload

2.2.2. Sudden increase in flow

2.2.3. Interrupted/unstable flow

2.3. Incidents related to equipment

2.3.1. Malfunctioned pump

2.3.2. Pump or suction pipeline clogging

2.4. Incidents related to electrical system

2.5. Incidents related to damage to works

Lesson 2: Troubleshooting, preventing measures and emergency response to incidents of drainage system

Time: 15 hours

1. Lesson objectives:

- Be able to describe the responding and handling process for incidents in drainage system.
- Be able to apply proper responding and handling process for incidents in drainage system.
- Be able to handle incidents in drainage system properly.
- Be able to write reports and store records of drainage system as per regulations.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Organization procedures for incident troubleshooting and emergency response.

2.2. Emergency situations training

2.2.1. Identify emergency situations

2.2.2. Training plan

2.2.3. Training participants

2.2.4. Materials and equipment

2.2.5. Results and evaluation

Examination: 3 hours

PART III: INCIDENT AND TROUBLESHOOTING AT WASTEWATER TREATMENT PLANT

Lesson 1: Common incidents at wastewater treatment plant

Time: 95 hours

1. Lesson objectives:

- Be able to describe and present technological incidents of wastewater treatment.
- Be able to analyze the causes of technological incidents in wastewater treatment.
- Be able to describe and present equipment malfunctions of wastewater treatment.
- Be able to analyze the causes of incidents related to machine and equipment in wastewater treatment.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Incidents related to operation

2.1.1. Grit chamber

2.1.2. Primary sedimentation tank

2.1.3. Biological tank

2.1.4. Secondary sedimentation tank

2.2. Incidents related to machines and equipment

2.2.1. Trash screens

2.2.2. Submersible pump

2.2.3. Air blower

2.2.4. Air compressor

2.2.5. Stirrer

2.2.6. Centrifugal concentrator

2.2.7. Centrifugal water separator

2.2.8. Belt press machine

2.3. Incidents related to electrical system

2.3.1. Transformer

2.3.2. Electric generator

2.4. Incidents related to fire and explosion

Lesson 2: Troubleshooting, preventing measures and emergency response to incidents of wastewater treatment plant

Time: 45 hours

1. Lesson objectives:

- Be able to describe the responding and handling process for incidents in wastewater treatment.
- Be able to apply proper responding and handling procedures for incidents in wastewater treatment.
- Be able to troubleshoot incidents in wastewater treatment properly.
- Be able to write reports and store records in wastewater treatment as per regulations.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Organization procedures for incident troubleshooting and emergency response.

2.2. Emergency situations training

2.2.1. Identify emergency situations

2.2.2. Training plan

2.2.3. Training participants

2.2.4. Materials and equipment

2.2.5. Results and evaluation

Examination: 4 hours

PART IV: PRACTICE OF TROUBLESHOOTING

Time: 135 hours

1. Lesson objectives:

- Be able to describe and classify incidents at internship unit.
- Be able to analyze the causes of incidents in drainage and wastewater treatment at internship unit.
- Be able to present and describe the incident troubleshooting process at internship unit.
- Be able to apply proper responding and handling procedures for incidents in drainage and wastewater treatment at internship unit.
- Be able to troubleshoot incidents in drainage and wastewater treatment at internship unit within assigned duties.
- Be able to write reports and store records at internship unit as per regulations.
- Comply with regulations under the guidance of workshop assistants.
- Maintain workplace safety and hygiene, protect assets, and adhere to working principles.
- Be diligent, optimistic, hard-working, careful and self-responsible for assigned work results.
- Maintain a serious and forward-thinking approach to learning.

2. Lesson contents:

2.1. Common incidents of drainage system

2.2. Common incidents at wastewater treatment plant

2.3. Incident responding and troubleshooting procedures

2.4. Report results

2.5. Update logbook and store information

Examination: 5 hours

IV. Module implementation conditions

1. Specialized classrooms and workshops

- Theory classrooms.

- Studying at factories or laboratories.

2. Machine and equipment

- Computers, calculators.
- Personal protective equipment.

3. Learning materials, tools and consumables

Learning materials:

- Handouts for learners.
- Course books, reference materials…
- Operator's manual/manufacturer's manual.

Tools:

- A0 paper, pens, colored paper, etc.

4. Other conditions

V. Assessment contents and methods

1. Description

1.1. Knowledge

1.1.1. Part 1: Overview of incident and troubleshooting

- Be able to present the concept, importance and impact of incidents and troubleshooting in drainage and wastewater treatment.
- Be able to describe and classify the impact level of potential incidents and risks in drainage and wastewater treatment.
- Be able to describe the troubleshooting procedures for incidents in drainage and wastewater treatment.

1.1.2. Part 2: Incidents and troubleshooting at drainage system

- Be able to describe and classify the types of incidents in drainage system.
- Be able to describe the responding and handling process for incidents in drainage system.

1.1.3. Part 3: Incident and troubleshooting at wastewater treatment plant

- Be able to describe and present technological incidents of wastewater treatment.
- Be able to describe and present equipment malfunctions of wastewater treatment.

- Be able to describe the responding and handling process for incidents in wastewater treatment.

1.1.4. Part 4: Practice of troubleshooting

- Be able to describe and classify incidents at internship unit.
- Be able to present and describe the incident troubleshooting process at internship unit.

1.2. Skills

1.2.1. Part 1: Overview of incident and troubleshooting

- Be able to recognize the importance and impact of incidents and troubleshooting in drainage and wastewater treatment.
- Be able to evaluate the impact of incidents and risks on the operation of drainage and wastewater treatment at each level.
- Be able to use proper troubleshooting procedures for incidents in drainage and wastewater treatment.

1.2.2. Part 2: Incidents and troubleshooting at drainage system

- Be able to analyze the causes of incidents in drainage system.
- Be able to evaluate the impact of incidents and propose a plan to ensure continuous and stable operation of drainage system.
- Be able to apply proper responding and handling process for incidents in drainage system.
- Be able to handle incidents in drainage system properly.
- Be able to write reports and store records of drainage system as per regulations.

1.2.3. Part 3: Incident and troubleshooting at wastewater treatment plant

- Be able to analyze the causes of technological incidents in wastewater treatment.
- Be able to analyze the causes of incidents related to machine and equipment in wastewater treatment.
- Be able to apply proper responding and handling procedures for incidents in wastewater treatment.
- Be able to troubleshoot incidents in wastewater treatment properly.

- Be able to write reports and store records in wastewater treatment as per regulations.

1.2.4. Part 4: Practice of troubleshooting

- Be able to analyze the causes of incidents in drainage and wastewater treatment at internship unit.
- Be able to apply proper responding and handling procedures for incidents in drainage and wastewater treatment at internship unit.
- Be able to troubleshoot incidents in drainage and wastewater treatment at internship unit within assigned duties.
- Be able to write reports and store records at internship unit as per regulations.

1.3. Self-control ability and responsibility

- Attend all classes.
- Have a sense of discipline in studying, cooperating and helping each other.
- Comply with the regulations and strictly follow the instructions of the person in charge at the enterprise.
- Work independently in changing working conditions, accept individual and partial responsibility for the team.
- Instruct and supervise others performing assigned tasks.
- Follow safety and hygiene measures when working with wastewater and in confined spaces.
- Evaluate the quality of work outcomes and performance results of team members.
- Solve occupational problems.

2. Method

- Oral examination, multiple choice test, essay: Ask questions about the main and central issues.
- Observe learners performing group exercises or group presentations.
- Observe learners working during internship at a wastewater treatment plant or company.

VI. Module implementation instructions

1. Scope of application

"Error Analysis and Troubleshooting" module can be used to teach learners at college and advanced German standards college levels for "Sewage Engineering Technician".

2. Introductions on module teaching and learning methods

2.1. For teachers/lecturers/trainers at enterprise

For teachers/lecturers at school

- Teaching methods include presentation, integration, conservation, group discussion, and practice;
- Following each lesson, it is required to offer questions and assignments for learners to complete independently outside of training hours.
- Teachers can use a combination of computers, projectors, and electronic lesson materials when teaching.
- Teachers need to prepare learning materials with complete instructions for conducting experiments.

For teachers/lecturers at enterprise

- Joint training enterprises need to appoint qualified teachers and lecturers to train learners during their internship at the company.
- Teachers and business trainers need to be trained in pedagogical ability, the ability to assess learners' capacity and organize the appropriate division of tasks for learners.
- Teaching methods include presentation, conversation, group discussion, practice and application of practical models.
- Teaching aids such as computers, projectors, etc. can be used, and teachers can new tools to enrich the lecture content.

2.2. For learners

- Attend class on schedule with sufficient learning hours as required.
- Complete all assignments of the self-studying hours.
- Strictly follow the rules of wastewater treatment plant.
- Perform assigned tasks according to the instructions of the lecturer at the factory or company.
- Refer to related documents for more information.

- Actively participate in class activities.

3. Key points requiring attention

- Cause of incident.
- Hierarchy of incident.
- Analyze the causes, consequences and appropriate measures to handle incidents.
- Organization procedures for incident troubleshooting and emergency response.

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5. Notes and explanations (if any)

Certification of the equivalence and quality of the “Sewage Engineering Technician” vocational training program.

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Tin nhắn/ thông tin của bạn	Thông tin của chúng tôi	Người liên lạc	Thông tin liên hệ Sđt/Fax	Ngày
	BIL-knü	Annett Knüpfer	670/7670	21.09.2022

Đào tạo nghề trong " Chuyên gia công nghệ xử lý nước thải"

Kính thưa Ông/ Bà,

Kết quả cho chương trình đào tạo thí điểm 3 năm cho "Chuyên gia công nghệ xử lý nước thải" đã có ở Phòng Công nghiệp và Thương mại Dresden.

Chúng tôi xác nhận tính tương đương của chương trình đào tạo nghề "Chuyên gia công nghệ xử lý nước thải" trong quy chế đào tạo nghề về kỹ thuật môi trường do Luật Đào tạo nghề của Cộng hòa Liên bang Đức ban hành phiên bản từ ngày 17.06.2002 đến 04.05.2020.

Chúng tôi rất vui khi biết rằng với khóa đào tạo này, Luật Dào tạo nghề có nghiều khả năng được triển khai trong việc đào tạo nghề cho thanh niên ở Việt Nam.

Chúng tôi vui mừng khẳng định lại sự chất lượng của chương trình đào tạo này tại Việt Nam và chúc chương trình nhiều thành công trong quá trình triển khai.

Chào thân ái

Phòng Công nghiệp và Thương mại Dresden
Đơn vị giáo dục
(unterzeichnet)
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	IBAN: DE51850800000402390000 SWIFT/BIC: DRESDEFF850	IBAN: DE22850503003151103005 SWIFT/BIC: OSDDDE81XXX	IBAN: DE21850400000100224500 SWIFT/BIC: COBADEFFXXX