Ministry of education Identified Competency Focus Areas and Core Courses for National Exit Examination

Program: - Bachelor of Science Degree in Water Supply and Environmental Engineering (WSEE)

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1. INTRODUCTION

Water Supply and Environmental Engineering is a study field that deals with collecting and distributing water where and when it's needed, while protecting the population, industry, environment, and infrastructure from harmful excess water. That means, Water Supply and Environmental Engineering activities are related to water supply and wastewater treatment systems, irrigation and drainage engineering, groundwater hydrology, surface water hydrology, environmental engineering, solid waste management, environmental impact assessment, sanitation, and sewerage.

Undergraduate studies offer a series of basic and applied courses in the areas of water supply, water treatment, water resources, and environmental engineering (open channel hydraulics, groundwater hydrology, surface water hydrology, sewer systems, irrigation and drainage engineering, wastewater treatment, etc.). The program also offers a broad general concept of computer application in water supply systems and civil engineering.

The BSc curriculum in Water Supply and Environmental Engineering was designed in such a way that the students' knowledge, skill, and attitude are evaluated at the course level. But such an assessment method needs mapping with program learning outcomes to assess the overall competence of the graduates. Therefore, additional learning outcome measurement techniques have to be established. In this regard, higher education institutions offering this program and other concerned organizations (professional associations) have to develop, validate, and standardize assessment instruments that can directly measure students' achievement of program learning outcomes. The most accepted assessment tool, that directly measures student achievement of program learning outcomes is the exit exam. Specifically, curriculum-based exit exams play a crucial role in program assessment and measuring student achievement in line with competencies set on the program curriculum. The aim of this document is to set competencies and identifying core courses from which exit exam will be prepared.

1.1. Objectives of the exit exam

The water supply and Environmental Engineering exit exam would have started with the following objectives:

- To evaluate the students whether they excelled with their specialized department or not.
- Ensuring the students to be competent with other university/country students with the same field of specialization.
- To make sure that the students would have exactly meets the need of skilled, competence and creative minded for the companies.
- Improving public trust and confidence in WSEE professionals
- Creating competitive spirit among the same faculties/departments in Ethiopia with the competes to encouraging them to give due attention to the national standards
- To make available skilled and competent manpower for national and international market and industries.

1.2. Significance of the document

It is important to set competency areas of the subject matter (program) in order to measure how much graduates are acquired skills, knowledge and attitudes with this program. The following shows us the significance or setting competencies and identifying core courses of the program;

- To set competencies that helps to assess the basic skills, knowledge and attitude of graduating students
- To systematically identify the core courses which will be included the exit exam

2. EXPECTED PROFILES OF GRADUATES

This program is aimed at training manpower required for solving of the country ‘s critical water supply, sanitation and Environmental problems which are emerging in the current scenario. Well-qualified Water Supply and Environmental Engineers will be produced through this program who can actively be engaged in the study, planning; design; development and management of Water Supply and Environmental Engineering projects in general. Specifically, the trainees will be equipped with the knowledge that enables them to execute the following tasks:

- Undertake project identification, pre-feasibility, and feasibility studies of water supply and environmental engineering projects.
- Plan the design of water supply systems, sanitary landfills, sanitation infrastructures, and structures that are related to environmental protection works;
- Create new water and wastewater treatment facilities and model treatment plants as per the acquired knowledge.
- Prepare complete contract documents for water supply and environmental projects like sanitation projects, water supply projects, EIA projects, and projects that are related to environmental protection works like wastewater and solid waste management;
- Plan, design, manage, monitor, and evaluate the operation and maintenance of water supply systems, wastewater treatment projects, environmental engineering projects, and solid waste management projects, as well as the environmental impact assessment for the projects.
- Remodelling and rehabilitation of existing water supply, wastewater treatment, and solid waste management systems.
- Work and communicate effectively with others on multi-disciplinary teams to develop practical, technically sound, cost-effective solutions to complex and diverse environmental engineering problems;

3. COMPETENCIES AND LEARNING OUTCOMES

The Water Supply and Environmental Engineering program is primarily designed to train viable, job-oriented, marketable and problem solving professionals in the planning, design, construction and operation of water supply and sanitation facilities as well as other related infrastructure of environmental protection of natural resources, such as air, water and soil. Hence, the professional profile of Water Supply and Environmental Engineering program is to Optimum utilization of available water resources for commercial, industrial and domestic water supply systems, irrigation systems etc.

3.1. Knowledge

The graduate is expected to know the basic concept of:

- Planning, design and implementation of a rural and urban water supply system
- Water and waste water treatment system at all levels within the community or at the time of emergency water supply and sanitation system
- Analyse the water and waste water quality based on Ethiopian and international standards.
- Design and monitor sanitary and sewerage systems, municipal or hazardous water disposal sites
- Monitor air pollution, understand control equipment, and predict the movement of contaminants in air, water, and soil.
- Conduct environmental impact assessments, take remedial actions to address environmental impacts, and develop environmental regulations and standards.

3.2.Skill

The graduates of water supply and environmental Engineering are able to participate and professionally perform engineering services in different project would have the following skills:

- Identification of problems with existing infrastructure and elaboration of technically and economically feasible concepts for their solution
- Should be able to supervise construction, control and approve contract documents, and settle claims and disputes within the community and governmental bodies
- Controlling and managing water supply and sanitation construction periods

- Select proper sites, ensuring the quality of facilities to be rehabilitated or constructed, and follow up to ensure proper utilization of available resources.

3.3.Attitude

The water supply and Environmental Engineer should have the following attitudes:

- Recognize the importance of potable water supply and environmental protection for the economic growth of the country.
- Desire to plan the protection and achievement of water resources in the given community to have a protected environment in the country.
- Interested in viewing a community with good water quality, adequate water supply, and a clean environment.

4. CATEGORIZING COURSES INTO THEMES

The selected courses have been classified into specialization and basic sciences categories. Then after, based on the interrelation of the courses, there are six thematic areas to be included in the exam as shown in the following

These are:

1. Water Supply
2. Wastewater Engineering
3. Industrial waste and Environmental protection
4. Water Resources and Environment
5. Water Quality and Sanitation
6. Construction Material

5. COURSES TO BE INCLUDED IN THE EXIT EXAM

Based on the graduate profile and competence of the program, the following fifteen (15) major courses has been selected from total of 66 courses in curriculum for exit examination to evaluate knowledge, skill and attitude of the prospect graduates of Water Supply and Environmental Engineering.

1. Water supply Engineering
2. Water treatment
3. Community water supply and Sanitation
4. Sewer system
5. Wastewater treatment
6. Solid and hazardous waste management
7. Air, noise and soil pollution and management
8. Introduction to Environmental Engineering
9. Environmental Impact Assessment
10. Groundwater Hydrology
11. Water and Environmental law
12. Water supply and sanitation Installation
13. Water Quality Management and Modelling
14. Sanitation
15. Construction materials

The details of course categories, thematic areas and all major and related Courses to be included in the exit exam with corresponding with credit hour is tabulated in the following table.

Course Category	**Courses' Theme**	**Course Name**	**Cr. Hr**
Field Specific Specialization	Water Supply	Water supply Engineering	3
		Water treatment	3
		Community water supply and Sanitation	2
	Wastewater Engineering	Sewer system	3
		Wastewater treatment	4
	Industrial waste and Environmental protection	Solid and hazardous waste management	2
		Air, noise and soil pollution and management	3
	Water Resources and Environment	Introduction to Environmental Engineering	2
		Environmental Impact Assessment	2
		Groundwater Hydrology	3
		Water and Environmental law	2
	Water Quality and Sanitation	Water supply and sanitation Installation	3
		Water Quality Management and Modelling	2
		Sanitation	2
Field Specific Basic Science	Construction Material	Construction materials	2
		Total	**38**

6. CONCLUSION

In addition to course wise learning outcome assessment, it’s very important to evaluate the graduate’s knowledge, skill, attitude, and overall competencies at the program level. To evaluate the overall learning outcomes of the BSc in Water Supply and Environmental Engineering program, curriculum-based exit exams have to be adopted. A curriculum-based exit exam is important not only to improve the excellence and effectiveness of a program, but also to restore education and system quality in general. Based on this, fifteen core courses have been selected for exit examination from the total of 66 courses in the curriculum that the students took in ten semesters (five years) of study. Managing the exit exam at each level might be a difficult task. Preparing students for the exam due to their personal worries and anxieties is a big challenge, especially for the first time, as the impacts of exit exams are not well known yet. Therefore, working on creating awareness among stakeholders is crucial. Furthermore, faculty/department members' acceptance, readiness, and teaching skills may need to be considered as part of the exam's success.