

Ministry of Education

Identified Competency Focus Areas and Core Courses for

Ethiopian Higher Education Institutions’ Exit Examination

Program: - BSc in Hydraulic and Water Resource Engineering

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## Introduction

## Hydraulic and Water Resources Engineering is a study field that deals with collecting and distributing water where and when it’s needed, while protecting the population, industry, environment, infrastructure from harmful excessive water. That means, Hydraulic and water resources engineering activities are related to water supply and wastewater (sewer) systems, irrigation and drainage systems, river training and flood protection works, dams and reservoirs for hydropower generation, water supply and irrigation purposes. Hydraulic and water resources engineering also deals with harbors and ports, as well as river and canal navigation systems.

## Undergraduate studies offer a series of basic and applied courses in the area of hydraulic, water resources and environmental engineering (fluid mechanics, hydraulics, hydrology, ground waters, hydro-informatics, water supply and wastewater systems, irrigations and drainage, river hydraulics, sedimentation, river-training works, flood protection, wastewater treatment etc.). The program also offers a broad general civil engineering education, which includes elements of geo-mechanical engineering, structural engineering, construction engineering, materials engineering, transportation engineering, geodesic surveying and geology.

## The BSc curriculum of Hydraulic and Water Resources Engineering was designed in such a way that the students’ performance, skill and attitude are evaluated at the course level. But, such 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 set. 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 exit exams. 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 identify courses from which exit exam will be prepared.

## Expected Profiles of Graduates

This program is aimed at training manpower required for the realization of the country‘s vast hydropower and water resources potential. Well-qualified Hydraulic Engineers will be produced through this program who can actively be engaged in the planning; design; development and management of water resources 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 resources projects.
* Plan water resources and hydropower projects; design hydraulic structures required for hydropower systems, water supply systems, Irrigation systems and structures which are related with environmental protection works;
* Prepare complete contract documents for water resources projects like hydropower projects, water supply projects, Irrigation projects, and projects which are related with environmental protection works like wastewater and solid waste management;
* Plan, design, manage and supervise the construction of hydraulic and hydropower structures and related civil engineering works;
* Plan, design, manage, monitor and evaluate the operation and maintenance of hydraulic and hydropower systems;
* Remodeling and rehabilitation of existing irrigation, water supply, hydraulic and hydropower systems.

## Competencies and Learning outcomes

Upon successful completion of the B.Sc. study programme the graduate of B.Sc. degree in Hydraulic and Water Resources Engineering will have acquired all necessary skills and capabilities, which enables the degree holder to plan, design, construct and operate facilities and structures for:

* Optimum utilization of available water resources for hydropower generation, industrial and domestic water supply systems, irrigation systems etc.
* Natural water flow control such as flood control, land drainage etc.

The graduate is able to participate and professionally perform engineering services in the different project phases along the project cycle, including:

* Identification of problems of existing infrastructure and elaboration of technically and economically feasible concepts for their solution
* On-site surveys, pre feasible and detail designs specifications of projects
* Preparation of bills of quantities and construction documents
* Assist in the tender process and contract administration
* Construction supervision, control and approval of contractors’ documents and settlement of claims and disputes
* Operation, management and long-term quality control of water infrastructure

## 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 65-70 courses in curriculum for exit examination to evaluate knowledge, skill and attitude of the prospect graduates of Hydraulic and Water Resource Engineering.

1. Hydraulics-II
2. Open Channel Hydraulics
3. Engineering Hydrology
4. Groundwater Engineering
5. Hydraulic Structures I
6. Hydraulic Structures II
7. Hydropower Engineering I
8. Hydropower Engineering II
9. Water Supply & Treatment
10. Wastewater & Solid Waste Management
11. Irrigation Engineering
12. Water Resources Planning & Management
13. River Engineering and Sediment Transport
14. Construction Materials
15. Construction Planning and Management

## 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, they were further divided in to themes as shown in the following table.

|  |  |  |
| --- | --- | --- |
| **S. No** | **Course Category** | **Course Theme** |
| 1 | Field Specific Specialization | Fundamental of Hydraulics |
| Hydrology |
| Hydraulic Structure |
| Hydropower |
| Water and Waste Management |
| Irrigation Engineering |
| Water Resources Planning & Management |
| 2 | Field Specific Basic Science | Building and Construction |

## Conclusion

## In addition to course wise learning outcome assessment, it’s very important to evaluate graduates knowledge, skill, attitude and over all competencies at program level. To evaluate overall learning outcomes of the BSc in Hydraulic and Water Resources Engineering program, curriculum-based exit exams have to be adopted. Curriculum-based exit exam is important not only to improve the excellence and effectiveness of program, but also to restore education and systems quality in general. Based on this, fifteen core courses have been selected for exit examination from the total of 65-70 courses in the curriculum that the students took in ten semesters (five years) study.

## Managing the exit exam at each level might be a difficult task. Particularly preparing students for the exam due to their personal worries and anxieties is a big challenge especially for the first time as the awareness of the impacts of exit exams not well known yet. Therefore, working on awareness creation among stakeholders is crucial. Moreover, acceptance, readiness and teaching skills of faculty members may need to be considered as part of the success of the exam.