

**Ministry of Education**

**Identified Competency Focus Areas and Core Courses for Ethiopian Higher Education Institutions’ Exit Examination**

**Program: - Water Resources and Irrigation Engineering** **in BSc.**

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# Introduction

A study of Water Resources and Irrigation Engineering is a field of study that deals with collecting and distributing water where and when it’s needed. The field gives greater emphasis to irrigation Engineering and drainage systems, river training and flood protection works, construction of dams and reservoirs for water supply and irrigation purposes as a whole. Undergraduate studies offer a series of basic engineering and applied courses in the area of water resources, irrigation and water supply engineering (fluid mechanics, hydraulics, hydrology, ground water, water supply and wastewater systems, irrigations and drainage, river hydraulics, sedimentation, river-training works, flood protection etc.). The program also offers Civil-engineering courses, which includes elements of geo-mechanical engineering, structural engineering, construction engineering, materials engineering, transportation engineering, geodesic surveying and geology.

Ensuring quality and relevant education in Higher Education institutions is one of the challenges that remained to be solved. In a pursuit to rise educational outcomes in terms of quality and relevance, many countries currently aim to improve accountability in the school system. Many school systems provide educational outcome information. However, the Exit exam provides outcome information to be comparable across schools on an external standard.

The primary purpose of the exit exams is to assess students' educational achievement in the courses in their major area of program study. The exam is supposed to measures the learning outputs of the program as a whole not the individual courses. Exit exams have been argued to improve the signaling of educational achievement on the labor market and to increase labor-market productivity through increased human capital.

The exit exam is intended to ensure all graduates from HEIs have developed adequate mastery of the core competencies articulated in the respective curricula thereby satisfying the requirements of the labor market and employability through the nationwide implementation of curriculum-based exit examination. Moreover, several concerns regarding the scheme of exit exam including efforts and costs to maintain the process, opposing arguments, exposing potential weakness in the education system, fear of impeding flexibility within curriculum, quality and reliability of the employee, ownership, exam administration, and management and cheating will be considered.

# Expected Profile of Graduates

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

# Competences and Learning Outcomes

Upon successful completion of the B.Sc. study program, the graduate of B.Sc. degree in Water Resources and Irrigation Engineering will acquire all the necessary skills and capabilities, which enable the degree holder to plan, design, construct, operate and manage facilities and structures for:

* Optimum utilization of available water resources for irrigation, industrial and domestic water supply 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 water resources and irrigation projects phases along the project cycle, including the following:

* Identification of water resources and irrigation 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 irrigation and water resources projects
* Preparation of bills of quantities and construction documents
* Assistance 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
* Training of operational technical staff

The graduates will have the capacity to innovate, transfer technology & entrepreneurship. He/she can understand the way of creating new business idea, competitiveness contributes to new business products, and also the entrepreneurship traits and skills needed in entrepreneurship. Furthermore, the B.Sc. degree in Water Resources and Irrigation Engineering as the first academic degree may also be the starting point for further academic qualification as for example in the framework of post-graduate studies in various water related fields such as:

* Irrigation and Drainage Engineering
* Irrigation Engineering and Management
* Hydrology and Water Resources Engineering
* Groundwater Engineering
* Hydraulic and Hydropower Engineering
* Water Supply and Environmental Engineering
* Water Resources Engineering and Management
* Hydro-Informatics
* Hydraulic Engineering and River Basin Development
* Integrated River Basin Management
* Soil and Water Conservation Engineering
* River Engineering

# Courses to be Included in the Exam

The study program consists of ten semesters with the following sequence: two freshman semesters, five basic studies semesters, one internship semester, and two semesters for project-based studies. The program comprises 17 modules and 68 courses that can equip students with relevant knowledge, skills and attitude to effectively carry out their future duties and responsibilities with courses from diverse fields that include mathematics and natural sciences, field-specific basic sciences, field-specific specialization, non-field specific subjects, and practice-based studies.

From the curriculum, some major courses and that have direct impact on the study were included for the selection of the courses. The following table shows the courses to be included in the exam. The selection of the courses was triggered and directly related to the career of the trainee.

|  |  |
| --- | --- |
| SN | Selected Courses for the Exit Exam |
| 1 | Hydraulics II |
| 2 | Construction Materials and Equipment |
| 3 | Open Channel Hydraulics |
| 4 | Surface Water Hydrology |
| 5 | Groundwater Hydrology |
| 6 | Surface Irrigation |
| 7 | Pressurized Irrigation |
| 8 | Drainage Engineering |
| 9 | Dam Engineering -I |
| 10 | Dam Engineering -II |
| 11 | Irrigation Structures |
| 12 | Water Supply Engineering |
| 13 | Water Resources Planning and Management |
| 14 | River Engineering |
| 15 | Construction Planning and Management |

# Categorizing Courses in to Themes

This is basically focused on the courses that will be categorized based on the curriculum of the program as of the following table.

|  |  |  |  |
| --- | --- | --- | --- |
| SN | Courses’ Theme | Selected Courses for the Exit Exam | Remarks |
| 1 | Construction Management | Construction Planning and Management |  |
| 2 | Construction Technology | Construction Materials and Equipment |  |
| 3 | Engineering Hydrology | Surface Water Hydrology |  |
| Groundwater Hydrology |
| 4 | Fundamental of Hydraulics | Hydraulics II |  |
| Open Channel Hydraulics |
| 5 | Hydraulic Structures | River Engineering |  |
| Dam Engineering -I |
| Dam Engineering -II |
| 6 | Irrigation and Drainage Engineering | Surface Irrigation |  |
| Pressurized Irrigation |
| Drainage Engineering |
| Irrigation Structures |
| 7 | Water Resources Study, Planning and Management | Water Resources Planning and Management |  |
| 8 | Water Supply and Sanitation Engineering | Water Supply Engineering |  |

# Conclusion

Depending up on the importance and rationale of exit examination the following conclusions can be drawn out;

* Many states use high school exit exams as a means of maintaining graduation standards across public high schools. In these states, exit exams are required for all public-school students, and must pass them to earn high school diploma. Therefore, exit examination in Higher Educations in Ethiopia will be important for gaining their certification and degree.
* It is believed that to bring quality and supportive education, letting of curriculum based an exit examination in university will bring a change on the quality.
* Exit exam for graduate students will assesses a student's overall understanding of their educational experience. This helps that the students can easily identify their professional focus area when they do their career.
* For proper manipulation of the exit exam, establishing independent exit exam organization like Ministry of Education by online exam administration, awareness creation before full implementation of exit exam and identifying each stakeholder’s role are some of the recommendations forwarded.