



Ministry of Education

Test Blueprint for national Exit Examination to be held in 2015E. C

Band: **IV**

Program: - Bachelor of Science Degree in Agricultural

Engineering

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January, 2023

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1. Introduction

Agricultural Engineering (AgEg) is the art and science of the application of engineering to the field of agriculture and agro-processing. Its major tasks are to apply technology and engineering tools that help to increase agricultural production and efficiency with the main intention of practicing appropriate technologies in agriculture under conditions of scarce resources, developing and exporting new varieties of agricultural products, agriculture-related industrial products, systems, and advanced know-how. To assure those professionals, an exit exam may help a university make pertinent decisions to improve the quality of institution-wide education and, in some cases, can help assess the standard of education in specific courses. Exit exams are also regarded as helpful in instituting a system of accountability and transparency through which students, instructors, higher education institutions, and academic leaders can be measured for their success or failure, based on student outcomes. Based on the graduation profile, competency, and learning outcomes, some courses are considered to be included in the exit exam. This blueprint for the national exit examination was drafted for 2015 E.C. graduates of Agricultural Engineering program based on the three main learning domains in accordance with the validated core courses competence and curriculum of the program.

2. Significance of blueprint

Test blueprint preparation is generally opted to assist the preparation of a test that is representative, broadly sampled, and consists of the complete knowledge domain expected of Ethiopian higher education students on completion of their study program. The specific objectives of the test blueprint are to:

- Facilitate the construction of representative and balanced test items for the selected courses in accordance with the competencies identified in the Agricultural Engineering program.
- Guide test developers or writers to write or set appropriate test items for Agricultural Engineering program.

3. Expected Profiles of Graduates

Due to his/her strong background, a B.Sc. Agricultural Engineering graduates can accomplish the following tasks after a brief period of on-job training.

- Design farmstead structures
- Design agricultural tools & implements
- Design irrigation and drainage schemes
- Skill in farm machinery management
- Skill in the maintenance of agricultural machinery
- Skill in evaluation and testing of farm machinery
- Skill in post-harvest handling of agricultural products
- Supervise food, feed, and fiber processing or manufacturing operation
- Skill in conducting research
- Consulting activities related with Agricultural Engineering discipline
- Manage environmental management projects in agriculture
- Soils & water conservation structures
- Watershed management activities
- Manage irrigation and drainage projects, greenhouse activities, and farmstead structure control installations and structures.

- Manage land preparation and cultivation operations.

3.1. General objective

The general objective of Agricultural Engineering related to skills, attitude and knowledge in an undergraduate degree program acquires many requirements. An undergraduate Agricultural Engineering program meant to produce such graduates must be designed to provide the students with a sufficiently broad and deep base of the following requirements: The Agricultural Engineering profession can be acquired and mastered by graduates who are well educated to enter into and dedicate to continue growing in the profession.

3.2. Specific objectives

A. In terms of knowledge

- Knowledge of
 - basic manufacturing technologies
 - system analysis in farm implement and machine design
 - the mechanics of materials,
 - farm machinery management, maintenance principles, performance evaluation and testing, promotion and sell
 - renewable energy resources handling and utilization
 - post-harvest handling and small scale processing of agricultural produce
 - animal feed handling and processing
 - fluid flow mechanisms, and heat and mass transfer
 - irrigation scheme design, construction and management, drainage structure design, water harvesting structures design, project

planning and management, Know-how of soil and water conservation structures design, farmstead structures and greenhouse design and construction, groundwater and surface water hydrology, working know-how of flow measurement in open and closed channels

➤ conduct applied research

➤ entrepreneurship,

B. In terms of Skill

- Design of
 - farmstead structures
 - agricultural tools & implements
 - household-level food processing devices
 - small scale feed processing devices
 - biomass related energy processing plants
 - irrigation and drainage schemes
- Develops technologies that optimize livestock production
- Execute agricultural water management activities
- Plan & execute reclamation of problematic soils
- Skill in
 - farm machinery management
 - sales, marketing, and promotion of agricultural machineries
 - maintenance of agricultural machineries
 - evaluation and testing of farm machineries
 - post-harvest handling of agricultural products
 - conducting research
 - conducting environmental impact assessment

- Supervise food, feed, and fiber processing or manufacturing operation
- Consulting activities related with Agricultural Engineering discipline
- Manage
 - land reclamation projects in agriculture
 - environmental management projects in agriculture (Soils & water conservation structures and Watershed management activities)
 - Irrigation and drainage projects, greenhouse activities, and farmstead structure control installations and structures.
 - land preparation and cultivation operations
 - farm implements and machineries

C. Interims of attitudes

- Increase in labor productivity, land productivity and decrease the cost of production and attitude of perception availability and utilization of modern agricultural technology
- An Attitude of Perception on water availability and utilization of these resources for sustainable development
- Attitude of making citizen of Ethiopia to be food self-sufficient by applying modern agricultural farming techniques to increase productivity

4. Theme and list of courses with credit hour

Table 1. Selected course for Exit Exam of Agricultural Engineering

No.	Selected Courses for the Exit Exam	Course Code	Cr.hr
1	Fluid Mechanics	AgEg 2101	3
2	Design of machine elements	AgEg 3132	3
3	Agricultural Processing Eng. I	AgEg 3161	3
4	Agricultural Processing Eng. II	AgEg 3163	3
5	Alter. Energy Resources	AgEg 3181	3
6	Soil Physics & Mechanics	AgEg 2092	2
7	Farm Power Unit	AgEg 3182	3
8	Farm Implement & Machinery	AgEg 3191	2
9	Maintenance of Agricultural Machineries	AgEg 4193	4
10	Soil and Water Conservation Eng. I	AgEg 3211	3
11	Soil and Water Conservation Eng. II	AgEg 4212	3
12	Research Methods in Agricultural Engineering	AgEg 5141	3
13	Selection and mgt of Farm Machinery	AgEg 3192	3
14	Performance Evaluation & Testing	AgEg 5204	3
15	Irrigation Engineering I	AgEg 3213	3
16	Farm Management	AREM 5144	3
Total credit hour			47

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Table 2. Test Blueprint (Table Specification) for BSC in Agricultural Engineering

Themes and Share of the themes in %	Name and Share of the Courses in %	Cr.hr	General objective/Competency	Specific objectives /learning outcomes	Learning outcomes								No. of items (%)
					Cognitive (%)						Affective	Development	
					Knowledge	Understanding	Application	Analysis	Evaluation	Creation / Innovation			
Theme one: Applied science for Agricultural Engineering (%) =13	Soil Physics and Mechanics(%) = 7	3	To give students the required knowledge and skill in fundamentals of soil physics and Mechanics.	- To give students the required knowledge and skill; fundamentals of soil physics and Mechanics, in plant-water-soil interactions, in the kinematics of soils. - Evaluate basic soil weight-volume relationships for soil and related characterization and classification schemes,	1	2	1	1	1	-	1	-	7%
	Fluid	3	To learn how to	Understand concepts,	-	2	1	1	1	-	1	-	6%

	Mechanics(%) = 6		calculate static and dynamic water pressure on structures; hydraulic phenomena in open and closed conduits; compute head losses and flows in simple pipes and channels	principles, laws, observations, and models of fluids at rest and in motion, • Provides basis for understanding fluid behavior for engineering design and control of fluid systems, • Develop competence with mass, energy and momentum balances for determining resultant interactions of flows in an engineering and natural systems, • Learn how to calculate static and dynamic water pressure on structures, • Learn how to calculate hydraulic phenomena in open and closed conduits,															
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				• Learn methods for computing head losses and flows in simple pipes and channels, • Provide basis for understanding of different hydraulic structures.											
	Theme one total Cr.hr	6													
Theme Two: Design (%) =19	Design of Machine Elements (%) = 7	3	To introduce various types of machine elements that are commonly used as components, parts machines and equipment	• Machine design concepts and procedure of designing of machine components • Identification or selection of proper safety factor to avoid failure before the expected life of the component; • Stress concentration • Fatigue life and fatigue strength of machine elements;	-	1	2	2	-	1	1	-	7%		

	total Cr.hr												
Theme three: Manufacturing Engineering (%) = 49	Processing Engineering I (%) = 4	2	Knowledge of post-harvest handling and small scale processing of agricultural produces	- Understand and reiterate the scope of agricultural processing & the challenges in post-harvest handling of agricultural products; - Identify and measure the basic physical properties of plant products for use in engineering unit operation and storage structures; - Demonstrate a confidential knowledge in analyzing size reduction and drying of cereals & feed grains.	1	1	1	-	-	-	1	-	4%
	Processing Engineering II (%) = 6	3	Apply engineering and technology to agricultural product handling and processing	- Identify & categorize various products based on their post-harvest behaviors; - Evaluate post-harvest	-	1	1	-	1	-	2	1	6%

				losses with their causes & recommend appropriate measures to maintain their quality; • Assist in selecting the right technique & operation from those available for harvesting, cleaning, size reduction & drying products of a given farm; • Conduct a case study on post-harvest problems of a crop & participate in the management of local producers & community owned processing establishments.										
	Alternative Energy Resources (%) = 5	2	Get acquaintance with the working principle and applications of alternative energy source mainly solar,	• Acquaint students with the working principle and applications of alternative energy source mainly solar,	-	1	2	-	-	1	1	-	5%	

			wind, hydro, biomass and geothermal energies.	wind, hydro, and geothermal energies ; • Help students to design and implement alternative energy source in the rural areas.										
	Farm Power Units (%) = 9	4	Give basic understanding of the operation of internal combustion engine, Engine systems, test and evaluate power unit.	• It provides the material needed for a basic understanding of the operation of internal combustion engines related to tractors. • Both spark ignition and compression ignition engines are covered, as are those operating on four-stroke and two-stroke cycles. • It gives the students sufficient knowledge of the different systems of a tractor.	-	2	1	-	1	-	2	3		
	Farm	3	To comprehend the	• Will understand farm	1	2	1	-	-	-	1	2	7%	

	implements & Machinery (%) = 7		application of different types of tillage, planting, harvesting, and threshing machines on the farm.	mechanization and its scope. Will comprehend the application of different types of tillage, planting; weed control, harvesting, and threshing machines on the farm										
	Selection and Management of Farm Machinery (%) = 6	3	Make key management decisions such as: when to replace mechanization: inputs, comparing between hiring and owning a mechanization input and comparing between mechanization alternatives	- Select a mechanization system suitable to a policy environment, soils, climate, crop and operation at hand; - Evaluate the performance of labor, machine and power unit involved in field operation, identified data required for the selection and management of agricultural mechanization inputs;	-	1	-	2	2	-	1	-	6%	

	machinery(%) = 6		evaluation and testing of farm machineries	and elsewhere; • Test and evaluate the performance of a power unit; • Test and evaluate the performance of Farm machinery; • Take available test and evaluation report to the end user.									
	Theme three total Cr.hr	23											
Theme four: Environmental Sciences (%) =19	Soil and Water Conservation Eng. I (%) = 6	3	To contribute to the endeavors to combat soil degradation and better management of soil and water and introducing new technologies in the use of fertilizers and cultivation practices	• To introduce students with natural resources and their rate of depletion, • To introduce students with the basic concepts of soil erosion mechanisms, and factors contributing for resources depletion, • To equip students with the tools required for	2	2	1	-	-	-	1	-	6%

				soil loss assessment and estimation.															
	Soil and Water Conservation Eng. II (%) = 6	3	Know-how of soil and water conservation structures design, construction and management. Have increased understanding of the major processes involved in soil degradation and the capacity to design and implement relevant interventions, techniques and strategies, easy decision on type of mechanization	• The knowledge of wind and water initiated erosion processes, • The concepts of agronomic and mechanistic soil conservation measures, • The skill to undertake soil and water conservation practices at a field level, • The skill to monitor and control gully erosion, • The concept and skill of onsite water conservation • The concepts of soil and water conservation economics.	-	1	1	-	1	1	1	1	1	1	6%				
	Irrigation Engineering I (%) = 7	3	To introduce students with the basic concepts of soils,	• To give students the required knowledge and skill in the basics of	2	2	2	-	-	-	1	-	7%						

			water, plant, their interactions, as well as surface irrigation methods	surface irrigation methods										
	Theme four total Cr.hr	9												
	Total for the program	47				7	22	17	9	10	6	19	10	100%
				Share of domains in %	71							19	10	

NB: Share of the Themes/Courses/Items in Percentage (%) in table above

- Share of themes (T) = $\frac{a}{b} \times 100$, Where “a” is the credit hour of a theme and “b” is the total credit hour of the program. Credit hour of a theme is the sum of credit hours of courses in the theme.
- Share of courses per theme (C) = $\frac{\text{Credit hour of the course}}{\text{Credit hour of the theme}} \times 100$
- Share of items per course = *Share of the course X Total number of items*

5. Conclusion

A blueprint for the national exit examination was drafted for 2015 E.C. graduates based on the three main learning domains (cognitive, affective, and psychomotor) in accordance with the validated core courses competence and curriculum of the program in order to meet the graduate profile, competency and learning outcome in the profession of undergraduate in the Agricultural Engineering program. Therefore, this test blueprint help to guide test developers or writers to write or set appropriate test items.