Ministry of Education

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

Program: BSc Degree Program in Biology

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1. Introduction

1.1. Background

The science of biology deals with the systematized acquisition of knowledge on living things and their environments in its basic aspects and the use of such knowledge to benefit mankind in its applied aspects. Biological issues are at the heart of the daily life and survival of humans irrespective of differences in culture, geographical location, wealth and levels of advancement. Biological principles are practiced ranging from primitive societies that use crude ways of getting food and other survival requirements from the immediate environment through hunting and gathering to the most advanced societies that use cutting edge technologies to solve problems that challenge the survival and wellbeing of mankind. Research in climate change, biofuel production, and rapid propagation of crops, gene therapy and cloning are examples of the latter category.

The relevance and importance of biological teaching and research to Ethiopia is thus apparent. As a developing nation aspiring to achieve overall advancement, the country has the option to combine both low and high level knowledge in biology to benefit its society particularly in the areas of food security, health, environmental protection and climate change. The country promotes the science of biology through advanced level university study and research. Accordingly, the newly revisedHarmonized Modular Curriculum of Biology for the Bachelor Degree Program which is readjusted to four years is in linewiththevisionofthe country:"Buildinganeducationandtrainingsystemwhichassuresqualityandequity ofeducation that produce competent citizens".

As one of the tools to enhance the quality of education at higher institutions, administration of **Exit Exam** to assess the competence of the graduate is very important. Exit exam is an exam which a student is required to pass in order to complete a course of study. The primary purpose of the exit exams is to assess students' educational achievement in the courses in their major area of program study. It is designed to assess the basic knowledge, skills and attitude of the graduates. The exam is also supposed to measures the learning outcomes of the program as a whole not the individual courses.

Moreover, one way to improve student learning in a way it links with the labor market and economic growth is the introduction of exit exams throughout higher education institutions. In this case, the redesigning of the assessment based on key learning competencies requires the introduction of nationwide quality indicators for placement and exit tests administered in the Ethiopian Higher Education system. It is recommended in the Education Roadmap that following such excellent practice is important to institutionalize exit exams for all first-degree graduates and put as a requirement accreditation of graduate programs. Accordingly, the Ministry of Education plans to administer exit examinations in 2015 E.C to some selected undergraduate programs in order to improve the quality of higher education. One of the programs selected for this purpose is theBSc DegreeProgram in Biology. In this document, courses/focus areas for the Exit Exam of graduatesare identified and listed.

1.2. Objectives of the Exit Examination

The biology applied exit exam shall have the following objectives.

- To produce skilled and competent manpower to national and international market;
- Assessing students' educational achievement in major areas of Biology;
- Ensuring whether the graduation profile ofthe curriculum of BSc Degree Program in Biology have achieved at least common standards of knowledge and practical skills;
- Improving public trust and confidence in biology applied activities of professionals;
- Facilitating the efforts of students to revise the core learning outcomes of the courses covered by the exit examination;
- Ensuring all graduates from HEIs satisfy the requirements of the labor market and employability through the national wide implementation of competency-based exit exam and
- Creating competitive spirit among the Biology Departments in Ethiopian Universities with the aim to encouraging them to give due attention to the national standards

1.3. Significance of the Document

It is important to set competency areas of the subject matter (program) in order to measure the how much graduates are acquired with skills, knowledge and attitudes. 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 Profile of the Graduates

Up on completing the undergraduate study program in Biology, graduate is supposed to acquire the following knowledge, skills and attitudes.

Critical thinking andproblem-solving ability

- Graduateswillbeabletosolveproblemsbyimplementationofthescientificprocessof forming hypotheses,gathering dataandcritically evaluating information.
- Employing experimentaldesigninlaboratory,fieldsettingsand synthesizing andanalyzing information byusingnumerical and statistical techniques.
- Graduates will be able to create their own business enterprise by applying the knowledge they will grasp from their education journey.

Scientific concepts (Knowledge):

- Proficiency in a range of basic biological concepts such as: molecular, cellular and organismal perspectives.
- Demonstrateknowledgeofmaterialandanunderstanding ofa rangeofconceptsandissues in those areas of Biology.

Effective communication

- Graduates will be able to engage in effective scientific communication in a professional setting, including technical writing, oral presentation and use of available technologies.

Ethical responsibility

- Applyethicalpracticeandbehaviorinallaspectsofbiologicalscientificendeavorsand demonstratestheethicalaspectsofscience,theirconductasascientistandtheirconductas a citizens.
- Respects the diversity of culture, ethnicity, religion etc. of the others.

Cultural diversity

- Graduateswillbeabletoapproachandsolvebiologicalproblemscriticallywithscientific literacyin individual andgroupsettings andincorporate adiversityof ideas andapproach.
- Interact professionally in situation with others having different background culture, education and interests.

3. Competencies and Learning Outcomes

3.1. Competencies

Upon completing the undergraduate study (Bachelor of Science) in Biology, a graduate should have the following competencies.

- Useand handle basic biological lab equipment,chemicalsandreagents effectively.
- Understand basic knowledge concerning cellular biology.
- Understandthe concepts of anatomy,morphology,physiology and adaptationof plants and animals to different environmental conditions.
- Value theeconomic andecological importanceofplants and animals.
- Designand formulateinsect pest andvector management strategies.
- Establish business enterprise in apiculture and sericulture products
- Designandapplyaquaculturetechniquesinthecommercialproductionofaquatic organisms.
- Apply microbial techniques in isolation, identification, cultivation and characterization of microorganisms used in Agriculture, Medicine, Industries, Environment and related sectors.
- Design and apply fungi identification and cultivation techniques for various uses
- Applyherbarium and zoological museum techniques.
- Design preventiveand management measuresagainst infectious diseases.
- Developprojectproposals,conductBiologicalresearchesandwritescientificreport in Agricultural, Medicinal,Industrial andrelated sectors.

3.2. Learning Outcomes

After completing the undergraduate program in Biology, a graduate will be able to:

- Handle and use basic biological lab equipment, chemicals and reagents effectively.

- Comprehend the concepts of anatomy, morphology, physiology and adaptation of plants and animals to different environmental conditions.
- Designand applyinsect pest andvector management strategies
- Design and establish business enterprise in apiculture and sericulture products
- Prepare projects and apply fisheries & aquaculture techniques in the commercial production of aquatic organisms.
- Applybasics herbarium and zoological museum techniques in order to identify organisms
- Applymicrobialtechniquesin isolation, identification, cultivationand characterization ofmicroorganisms used in various sectors.
- Design and apply fungi identification and cultivation techniques for various uses
- Planbasic preventiveand management measuresagainst infectious diseases and apply it.
- Design and apply the principles of biology to identify and solve societal problems related to environment, agriculture, health, industry and teaching.
- Teach biology in high schools and higher learning institutions of the Country after taking the necessary pedagogical trainings.
- Carry out basic practical researches in order to lay out the foundations for a tradition of research oriented and practical system of biology education in the country.

4. Courses/Focus Areas Categorized into Themes

Table 1: Courses/Focus Areas Categorized into Themes

No	Theme	Title of the Course/Focus Areas
1	Cell Biology and Genetics	Cell Biology
		Genetics
2	Botanical and Zoological Sciences	Seed Plants
		Plant Anatomy and Physiology
		Vertebrate Zoology
		Mammalian Anatomy & Physiology
		Applied Entomology
		Fisheries and Aquaculture
3	Microbiology and Biomedical Science	General Microbiology
		Mycology
		Parasitology
4	Ecological and Environmental Biology	Principles ofEcology
		Conservationand ManagementofNatural Resources
5	Lab and Field Techniques and Scientific Writing	Biological Laboratory & Field Techniques
		ResearchMethodsandReport Writing inScience

5. Courses/Focus AreasSelected for the Exit Exam

Table 2. Courses/focus areas selected for the exit exam and exam coverage

No	Title of the course/focus areas	Cr Hr.	Exam coverage (%)
1	Cell Biology	3	7
2	Genetics	3	7
3	Seed Plants	3	7
4	Plant Anatomy and Physiology	4	9
5	Vertebrate Zoology	4	9
6	Mammalian Anatomy & Physiology	4	9
7	Applied Entomology	3	7
8	Fisheries and Aquaculture	2	5
9	General Microbiology	3	7
10	Mycology	2	5
11	Parasitology	3	7
12	Principles ofEcology	3	7
13	Conservationand ManagementofNatural Resources	2	5
14	Biological Laboratory & Field Techniques	2	5
15	ResearchMethodsandReport Writing inScience	2	4

6. Conclusions

- As one of the tools to enhance the quality of education at higher institutions, administration of Exit Exam to assess the competence of the graduate is very important.
- The primary purpose of the exit exams is to assess students' educational achievement in the courses in their major area of program study. It is designed to assess the basic knowledge, skills and attitude of the graduates.
- The exit exam is supposed to measures the learning outcomes of the program as a whole not the individual course.
- The courses/focus areas selected and listed in this document are selected based on the expected graduate profile,graduate competencies and the number of credit hours for the selected courses/focus areas.
- For some related course (consecutive courses), **focus areas** are selected rather than selecting only one course by excludes the others.
- The theme of the selected courses/focus areas are assigned based on the modularized harmonized curriculum of the program.

Appendix

Table: Biology Core/Compulsory Modules

Module No	Module title	Module Code	Course Name	Course code	Cr.Hr	L	T	P	H	CP
02	Cellular Biology Module	Biol-M1021	Biological laboratory and field techniques	Biol2021	2	1	-	3	2	3
			Cell Biology	Biol2023	3	2	-	3	5	5
				Total	**5**					**8**
03	Botanical Sciences	Biol-M2031	Phycology	Biol2031	2	1	-	3	2	3
			Bryophytesand Pteridophytes	Biol2032	2	1	-	3	2	3
			Seed Plants	Biol3031	3	2	-	3	5	5
			Plant Anatomy and Physiology	Biol3032	4	3	-	3	8	7
			Principlesof Taxonomy	Biol3034	2	2	-	-	4	3
				Total	**13**					**21**
04	Zoological Sciences	Biol-M2041	Invertebrate Zoology	Biol2042	4	3	-	3	8	7
			General Entomology	Biol2044	3	2	-	3	5	5
			Vertebrate Zoology	Biol3041	4	3		3	8	7
			Mammalian Anatomy & Physiology	Biol3042	4	3	-	3	8	7
			Applied Entomology	Biol3043	2	1	-	3	2	3
				Total	**17**					**29**
05	Genetics and Molecular Biology	Biol-M3051	Principles of Genetics	Biol3051	3	2	-	3	5	5
			Biochemistry	Biol3052	3	2	-	3	5	5
			MolecularBiology	Biol4051	2	2	-	-	4	3
			Fundamentalsof Biotechnology	Biol4052	3	2	-	3	5	5
			Evolution	Biol4056	3	3	-	-	7	5
				Total	**14**					**23**
06	Microbiology	Biol-M2061	General Microbiology	Biol2061	3	2	-	3	5	5
			Mycology	Biol2062	2	1	-	3	2	3
			Applied Microbiology	Biol2064	2	1	-	3	2	3

				Total	**7**					**11**
07	Fisheries and Aquatic Sciences courses	Biol-M4071	AquaticScience andWetland Management	Biol4071	3	3	-	-	7	5
			Fisheriesand Aquaculture	Biol4072	2	1	-	3	2	3
				Total	**5**					**8**
08	Ecological and Environmental Biology	Biol-M3081	Introduction to Ethnobiology	Biol3084	3	3		7		5
			Principles ofEcology	Biol3086	3	3	-	-	7	5
			WildlifeEcology and Management	Biol4081	2	2	-	-	4	3
			Soil Science	Biol4082	2	1	-	3	2	3
			Conservationand managementofNatural resources	Biol4084	2	2	-	-	4	3
				Total	**12**					**19**
09	Biomedical Science	Biol-M3091	Principles of Parasitology	Biol3091	3	2	-	3	5	5
			Virology	Biol3092	2	2	-	-	4	3
			Introductionto Immunology	Biol4092	2	2	-	-	4	3
				Total	**7**					**11**
10	Biological Research Methods and Applications	Biol-M4101	ResearchMethodsandReport Writing inScience	Biol4101	2	2	-	-	4	3
			SeniorProject	Biol4102	3	-	-	-	10	5
			Internship	Biol4103	1	-	-	-	6	2
				Total	**6**					**10**

Biology/ Applied

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