

Ministry of Education

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

Program: Bachelor of Science in Geology

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Courses and Competencies Focused for Exit Exam, 2015 (First Draft)

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Courses and Competencies Identified for Exit Exam 2015 (First Draft)

1. Introduction

The field of geology encompasses the composition, structure, physical properties, and history of Earth's components, and the processes by which it is shaped. Geologists typically study rock, sediment, soil, rivers, and natural resources and the dynamics of how planet Earth works on a variety of temporal and spatial scales. The practice of professional geoscience is the performing of any activity that requires application of the principles of the geological sciences, and that concerns the safeguarding of public welfare, life, health, property, or economic interests, including but not limited to:

- Investigations, interpretations, evaluations, consultations or management aimed at discovery or development of metallic or non-metallic minerals, rocks, nuclear or fossil fuels, precious stones and water resources;
- Investigations, interpretations, evaluations, consultations, or management relating to geoscientific properties, conditions or processes that may affect the well-being of the general public, including those pertaining to preservation of the natural environment.

The goals of the BSc program in Geology are:

- To build the intellectual and human resources capacity through teaching geosciences
- To generate high quality knowledge and advance problem-solving geosciences research in Ethiopia

The general objective of the program in geology is to produce geologists with a broad understanding of geosciences and ability to:

- Carry out professional work in various public and private institutions and companies engaged in activities related to the broad fields of geosciences, and
- Identify geological problems and work towards their solutions through independent or collaborative research

The Ministry of Education has developed a Policy to introduce exit examinations for all undergraduate programs in the universities of Ethiopia. The exams, scheduled to begin in 2015 E.C, aim to improve the quality of graduates coming out from both public and private universities. As part of the ongoing effort to upgrade the quality of the academic programs, the MoE requires all students to take these examinations to measure knowledge and skills gained through the courses.

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1.1. Objectives of the Exit Examination

The Geology 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 Geology
- Ensuring whether the graduation profile of Geology curriculum have achieved at least common standards of knowledge and practical skills
- Improving public trust and confidence in Geology 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
- Creating competitive spirit among Geology departments in Ethiopia with the aim of encouraging them to give due attention to the national standards.

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 have acquired skills, knowledge and attitudes. The following shows the significance or setting competencies and identifying core courses of the program;

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

2. Expected profiles of graduates

Graduate profile is an expression of the minimum expected outcome of students after completing their education. According to the national curriculum of the BSc program in Geology, graduates successfully completing the program will have the following profiles:

1. Ability to measure, describe, record, map, interpret, and report geologic features, processes, and resources using conventional and up-to-date methods, equipment and standards
2. Sufficient tacit and explicit competence to compare, analyze and synthesize data on geologic and geologic processes, features and resources. Convert this competence into

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actions in sectors such as earth resources evaluation, development and management, geo-hazards and environmental changes detection and mitigation

3. Ability to conduct basic and applied research in Earth sciences (including problem identification, comparing and contrasting, inventorying) and be able to communicate with individuals and the community
4. Ability to teach Earth Science subjects in schools, colleges and higher institutes
5. Attitude and caliber to transform theories and principles from one Earth science discipline to another
6. Cognizance of the ethics, attitude, and value of own profession and that of responsible citizenship

In addition to the above profiles, graduates successfully completing the BSc program in Geology will have capabilities to work in the following professional sectors:

1. In the exploration and exploitation of metallic and non-metallic minerals
2. In the exploration and exploitation of energy resources such as hydrocarbon deposits (petroleum, coal, natural gas) and geothermal energy
3. In the exploration and exploitation as well as management of surface and ground water
4. In the area of civil engineering work such as site investigations, material selection and hazard evaluation for buildings, dams, roads, railways, and tunnel constructions
5. In the environmental protection sector such as in Pollution control and avoiding resource depletion problems
6. In making assessments and predictions of natural disasters such as earthquakes, volcanic eruptions, landslides, tsunami, etc.
7. In the area of urban and regional planning

3. Competencies and learning outcomes

3.1. Competencies of undergraduate students

Competency describes the desired knowledge, skills, and behaviors of a student graduating from a program. It defines the applied knowledge and skills that enable graduates to successfully perform in professional, educational, and other life contexts.

The curriculum of the BSc program in Geology is expected to offer graduates with the following broad competencies:

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3.1.1. Knowledge

- Transform theories and principles from one Earth Science discipline to another.
- Investigate, resource exploration on earth resources (including problem identification, comparing and contrasting, inventorying) and be able to communicate with individuals and the community nationally and internationally.
- Conduct basic and applied researches in earth sciences (including problem identification, comparing and contrasting, inventorying) and be able to communicate with individuals and the community.

3.1.2 Skill

- Measure geological structures and their orientations, water level, describe, record, map, interpret, and report geologic features, processes, and resources using conventional and up-to-date methods, equipment's and standards.
- Compare, analyze and synthesize data on geologic and geologic processes, features and resources.
- Convert this competence into actions in sectors such as earth resources evaluation, development and management, geo-hazards and environmental changes detection and mitigation
- Teach Earth Science subjects in high school, colleges and institutes

3.1.3 Attitude

- Be cognizant of the ethics, attitude, and value of own profession and that of responsible citizenship
- Appreciate naturally existing geologic features and resources
- Have the attitude and caliber to transform theories and principles from one Earth Science discipline to another.

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3.2. Learning outcomes

Learning outcomes are measurable statements that articulate what students should know, be able to do, or value as a result of taking a course or completing a program. Learning outcome describes a wider range of, knowledge, skill and behavior that makes up the basis of learning. From the curriculum of the BSc program in Geology the overall learning outcomes may be stated as follows:

- Have the sufficient tacit and explicit knowledge to compare, analyze and synthesize data on geologic and geologic processes, features and resources
- Have the skill to measure, describe, record, report, and map geologic features, processes, and resources using conventional and up-to-date methods, equipment's and standards
- Have the attitude and caliber to transform theories and principles from one Earth Science discipline to another
- Be able to convert the attained knowledge to actionable knowledge in sectors such as earth resources evaluation, development and management, geohazards and environmental changes detection and mitigation
- Be able to conduct basic and applied researches in earth sciences (including problem identification, comparing and contrasting, inventorying) and be able to communicate with individuals and the community
- Be cognizant of the ethics, attitude, and value of own profession and that of responsible citizenship
- Integrate to be as part of a large organization, or equally, they could work for a consultancy firm (groundwater exploration, Geotechnical, Mining and environmental) and the capacity to undertake lifelong learning

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4. Selected Courses With Themes To Be Included In The Exit Exam

4.1. Themes

The BSc program in Geology consists of a total of 49 core courses listed in the Appendix of which 42 are compulsory and 9 are elective. These courses may be categorized into the following themes:

No.	Themes	Percentage (weight)
1	Earth materials (crystals, minerals, rocks, sediments)	40%
2	Historical geology	5%
3	Earth structure and tectonics	10%
4	Mapping	20%
5	Geological resources	15%
6	Engineering and environment	5%

7	Geology of Ethiopia	5%
Total		100%

4.2. Selected courses for exit exam

Selecting courses to be included in the exit exam remains a very difficult task as practically all courses mentioned in the curriculum are needed to achieve the graduate profile/competency and hence should be included in the exit examination. On the other hand the Ministry of Education demands that a maximum of fifteen courses should be selected to be included in the exit exam, In order to comply with this condition, we have selected the list of courses below.

Themes Code	No.	Course title	Code
2	1	Paleontology	Geol 2021
2	2	Stratigraphy & Earth History	Geol 2023
1	3	Crystallography & Mineral optics	Geol 2031
1	4	Mineralogy	Geol 2033
3	5	Structural Geology	Geol 2041
1	6	Sedimentary Petrology	Geol 2051
1	7	Igneous Petrology	Geol 2053
1	8	Metamorphic Petrology	Geol 2055
4	9	Mapping Techniques and Report Writing	Geol 3061
7	10	Geology of Ethiopia	Geol 4151
1	11	Geochemistry	Geol 3081
3	12	Geophysics	Geol 3091
5	13	Principles of Hydrogeology	Geol 3101
6	14	Engineering Geology	Geol 4112
5	15	Economic Geology	Geol4121

Note: Course codes and credits or ECTS may vary from university to university

Courses no Exam 2015 (First Draft)

Theme	Number	Courses Identified	Credit hour
Earth materials (crystals, minerals, rocks, sediments)	1	Crystallography & Mineral optics	2
	2	Mineralogy	2
	3	Sedimentary Petrology	2
	4	Igneous Petrology	2
	5	Metamorphic Petrology	2
	6	Geochemistry	3
Historical geology	7	Paleontology	2
	8	Stratigraphy & Earth History	3
Earth structure and tectonics	9	Structural Geology	3
	10	Geophysics	3
Mapping	11	Mapping Techniques and Report Writing	3
Geological resources	12	Principles of Hydrogeology	3
	13	Economic Geology	3
Engineering and environment	14	Engineering Geology	3
Geology of Ethiopia	15	Geology of Ethiopia	3

Note: Course codes and credits or ECTS may vary from university to university

It should be emphasized here that, although the above fifteen courses are selected, all core courses in the curriculum are essential for the Geology comprehensive exit examination.

5. Conclusions

The exit examination for B.Sc. degree in Geology is expected to be a comprehensive examination covering the contents of the core courses which themselves are intended and designed to offer the desired competencies and learning outcomes of successful graduates. It is assumed that these core courses, if offered to students by competent instructors and with the necessary learning facilities and tools will enable graduates to attain the stated graduate profile or competencies. Although fifteen courses have been selected for the exit exam, we consider all core courses to have equal weight in the exit examination. We would like to emphasize that this report was prepared in short time and remains to be improved through further discussions involving a wider representation of academicians in the field of study.

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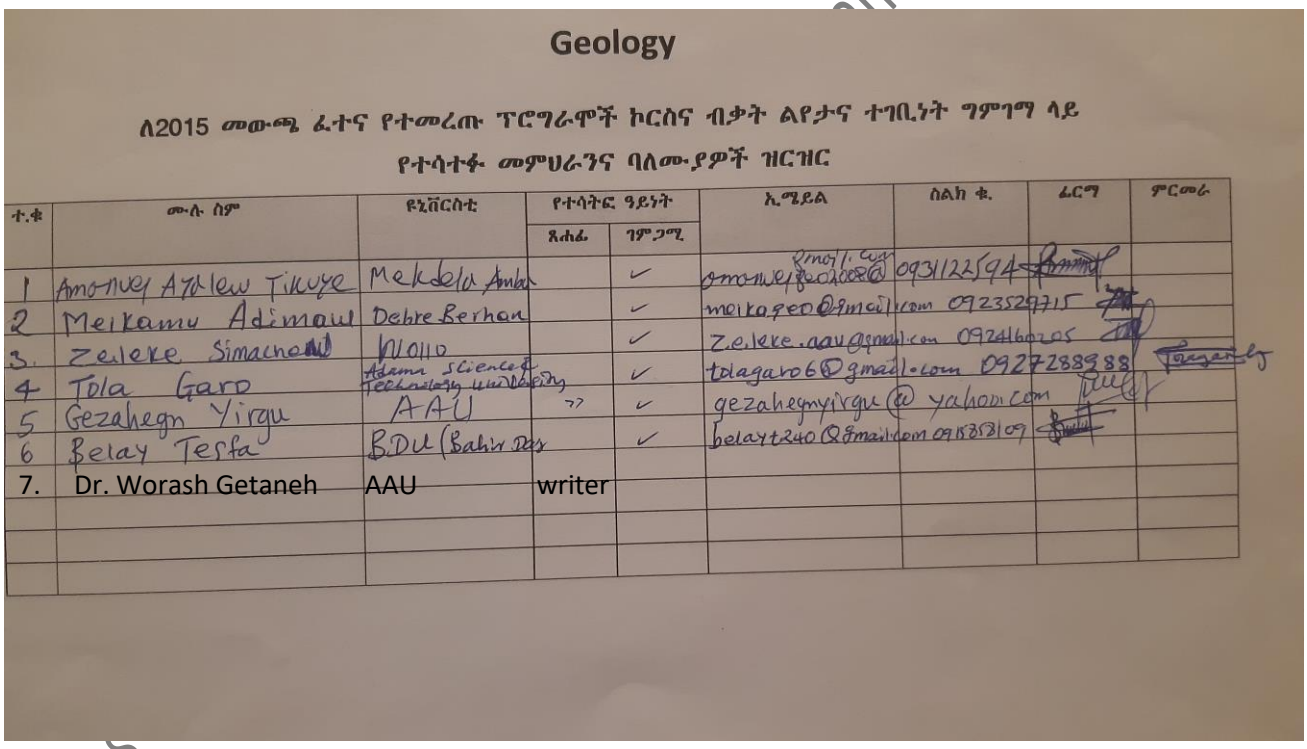
Remarks:

We think that the curriculum is the principal document on which the exit exam should be based. Selecting a maximum of fifteen courses out of the list of core geology courses is unnecessary and perhaps an erroneous approach for the exit exam. This is because students and instructors will think and believe that the selected courses alone are more important and more relevant for the exit exam than those not selected. Consequently, in their interest to pass the exit exam, students will put more study efforts on the selected courses and undermine the rest. This will undoubtedly create classification of important and less important courses and impose negative consequences on the entire program. We suggest a preferred approach in which emphasis is given to the thematic areas and the relative weights or percentages given to them.

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Appendix

Writers and Evaluators



Geology

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Courses 2015 (First Draft)

List of all Geology Courses

No	Themes	Compulsory	Credit	Remark
1	1-7	General Geology	4	
2	1-7	Geomorphology	2	
3	3	Paleontology	2	
4	3	Practical Paleontology	1	
5	3	Stratigraphy & Earth History	3	
6	1	Crystallography & Mineral optics	2	
7	1	Practical Crystallography & Mineral optics	1	
8	1	Mineralogy	2	
9	1	Practical Mineralogy	1	
10	2	Structural Geology	3	
11	2	Practical Structural Geology	1	
12	2	Tectonics	2	
13	1	Sedimentary Petrology	2	
14	1	Practical Sedimentary Petrology	1	
15	1	Igneous Petrology	2	
16	1	Practical Igneous Petrology	1	
17	1	Metamorphic Petrology	2	
18	1	Practical Metamorphic Petrology	1	
19	4	Maps & Mapping Techniques	3	
20	4	Field Geology and Report Writing	2	
21	4	Remote Sensing & GIS	3	
22	4	Mapping Sedimentary Terrain	2	
23	4	Mapping Igneous Terrain	2	
24	4	Mapping Metamorphic Terrain	2	
25	1	Geochemistry	3	
26	1	Techniques of Geochemical analysis	2	
27	2	Geophysics	3	
28	5	Exploration Geophysics	3	
29	5	Principles of Hydrogeology	3	
30	5	Groundwater Exploration & Development	3	
31	6	Fundamentals of Soil & Rock Mechanics	3	
32	6	Engineering Geology	3	
33	5	Economic Geology	3	
34	5	Practical Economic Geology	1	
35	5	Mineral Exploration & Resource Evaluation	2	
36	5	Mining Geology	3	
37	5	Petroleum & Coal Geology	3	
38	5	Volcanology & Geothermal Resources	3	
39	6	Environmental Geology	3	

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40	7	Geology & Geologic Resources of Ethiopia	3	
41	4	Research Methods in Geosciences	2	
42	1-7	Senior Project	3	
No		**Electives**	Credit	
1		Industrial Minerals, Rocks and Gems	3	
2		Precambrian Geology	3	
3		Applied Sedimentology	3	
4		Groundwater Resources Management	3	
5		Quaternary Geology	3	
6		Earth History and Global Changes	3	
7		Environmental Impact Assessment	3	

Note that the numbers under the "Themes" column represent the geology themes to which the courses are categorized on page 8.

Note also that course codes and credits or ECTS may vary from university to university

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