Test Blueprint for National Exit Examination

2016 E.C

Test Blueprint for National Exit Examination 2016 E.C

Band: ONE

Program: Bachelor of Science Degree in Civil Engineering

(Revised Version-2016 E.C)

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CONTENTS

1. Introduction

The Ministry of Education of Ethiopia (MoE) has announced the implementation of exit exam for all undergraduate program students (public and private), beginning with the 2022/2023 academic year, in order to improve the quality of graduates produced by higher learning institutions (Colleges and Universities). The exit exam aimed at checking whether students have acquired the required knowledge, skills and attitudes or not. To implement this, it requires determining competency areas for a specific program, which is already completed. It is needed to plan the construction of tests based on the competency areas prepared. Since our institution of learning has a particular mission and objectives, we decided to conduct a separate exit test.

Planning of a test is a first and vital step in the construction of an achievement test. An achievement test demands very systematic and careful planning, as a fact that good planning is a symbol of success. Tests are the tools that provide scores that measure level of student learning and study program learning outcomes. In order to achieve the valid and reliable measurement of student learning and program learning outcomes, the development of valid and reliable test is the mandatory. Test should be able to measure student performance in all dimensions of knowledge, skill and attitude. The carefully planned test construction contributes to improve the overall quality of the test in terms of test content validity, difficulty level, discrimination power and test reliability. Test preparation is not an easy task; it requires a careful planning and guideline to make the task simple. Test construction needs the preparation of test blue print. Test blueprint is defined as a complete plan that explains how to develop a test. The term refers to a map or specification of assessment to ensure that all aspects of the curriculum and educational domains are covered by the assessment programs over a specified period of time. It helps curriculum developers/test constructors to match various competencies with the course content and the appropriate modality of assessment.

In general, a test plan will help in ensuring the quality of testing: 1) Appropriately assess the achievement of instructional objectives of the course; 2) Appropriately reflect key course goals, objectives and the material learned or covered during the instruction period; and 3) Include the appropriate item formats along with the knowledge and skills being assessed. Keeping this in mind, the team has prepared this test blueprint document in order to help the test developers or content specialists in their process of valid and reliable test construction. The major points considered in the process of preparing this test blue print guideline were the core competencies that have been already identified for the themes of courses, the course contents, course credit hours (CrHrs./ECTS), and the learning outcomes with their corresponding levels of

achievement by learning domains. In line with these, the number of test items that should adequately assess the performance of students in all the content topics is determined through discussion.

This document contains links to different sources for test blueprint methodologies as well as a general overview. Additionally, it encourages instructors to evaluate the exit exam's overall design, alignment, and administration using the learning-focused exit exam Guide.

2. Objective of Test Blueprint

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

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

3. Expected Profiles of Graduates

After the successful completion of the Bachelor of Science in Civil Engineering, the graduates would have the following profiles:

- Apply knowledge of mathematics and science in a specialized area related to Civil Engineering.
- An ability to critically analyze and interpret data in major Civil Engineering areas.
- An ability to analyze, design, Construct and manage Construction projects to meet desired needs within realistic constraints such as technical, economic, environmental, social, political, ethical, health and safety and sustainability.
- An ability to identify, formulates, and solves Civil Engineering problems in major Civil Engineering areas.
- Ability to Conduct site exploration and determine the feasibility and suitability of the site for construction
- Ability to conduct experiments, and basic and applied research concerning construction industries to solve various technical, organizational, and social problems.

- An understanding of professional practice issues such as project management, contract administration, and interactions between the development, design, and construction professions.
- Plan, manage, monitor and evaluate the operation and maintenance of civil works.

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4. General Objectives

The Civil Engineering department aims to produce professionals equipped with relevant knowledge, skills and attitude that would contribute to the development of the country. Therefore, this is profession by which many Ethiopians would be produced to serve the country. This program is aimed at training manpower required for the realization of the country's untouched Civil Engineering works. Well qualified Civil engineers with adequate knowledge in the area of construction management, structure,road and transport, geotechnical and water resources and who can be actively engaged in the planning, development and management of Civil Engineering projects will be produced through this program.

- Know about the historical context, the state-of-the-art, and emerging issues in the field of Civil Engineering and its role in contemporary society;
- Grasp a technique of critical reasoning and requisite quantitative skills to identify, formulate, and resolve Civil Engineering problems, and to create designs that reflect economic, environmental, and social sensitivities;
- Understand a systems viewpoint, critical thinking, effective communication and interpersonal skills, a spirit of curiosity, and conduct reflecting a professional and ethical manner;
- Appreciate a commitment to lifelong learning and professional development, involvement in professional activity and public service, and achievement of professional licensure;
- Be familiar with a broad intellectual training for success in multidisciplinary professional practice, in Civil Engineering or diverse related careers, and toward achieving leadership roles in construction industry.

5. Specific Objectives

The program specific learning outcomes of the B.Sc degree program in civil engineering can be categorized in to five (5) main thematic areas.

➢ Construction Engineering and Management

- Describe the Engineering properties of different construction materials that are relevant to their use in engineering applications.
- Asses characteristics, use and production processes of construction materials.
- Carry out different types of physical and mechanical tests to determine the property of construction materials required for concrete mix design, interpret the test results, design the mix using different method and determine the mix proportion.
- Understand the classification, design and performance requirement of building and select the right type of materials for different structural system of a building.
- Develop, Read and interpret working drawings for building construction project .
- Identify different building elements and system with their types of materials and construction details.
- Understand different types of specification, know how to assure and control quality of construction materials and construction projects.
- Carry out quantity surveying and prepare BoQ and payment certificates for different type of construction projects.
- Determine rates for construction activities using detailed cost estimation.
- Understand the processes involved in Procurement and Contract Management and Formulate Contract and or tender Documents and administer the contract in construction projects.
- Understand the functions and levels of management ,roles of manager and coordinate all resources and oversee the construction process to to meet the requirements.
- Understand and apply the project management knowledge areas and ensure the completion of construction project on time, within budget, and to the desired level of quality.
- Prepare construction project schedules using different techniques to ensure that all tasks are completed on time and within budget.
- Apply the principles of safety and health in construction project management and take safety and health measures in construction projects.

➢ Structural Engineering

- Understanding the mechanical Properties of concrete and reinforcing steel.
- Applying Design Philosophy for the design of reinforced concrete structure.

- Develope analysis and design of beam for flexure and shear
- Developing analysis and design of one way slabs for flexure
- Apply Ethiopian Building Code Standard and design reinforced concrete members.
- Understand Inelastic analysis of continuous beams and moment redistribution.
- Carry out the structural analysis and design of reinforced concrete columns and two-way reinforced concrete slabs.
- Apply the basic requirements for the design of steel and timber structural based on ES-EN 1993:2015 ES-EN 1995: 2015
- Develop Design for Axially loaded and Flexural members.
- Develop Design for Beam Column joint
- Develop Bolted and Welded connections
- Conduct Bridge site investigation and selection process and Based on the site conditions, bridge loading and the purpose of the bridge, select the appropriate bridge type.
- Apply principles of static and dynamic loadings.
- Develop Design for structure components of the bridge & culverts
- Develop the collapse mechanisim for beams and frames.
- Analyze and design reinforced concrete slabs using yield line and strip method
- Develop Earthquake and wind Load Load Calculation on structure.

➢ Geotechnical Engineering

- Articulate the peculiar features of soil as an engineering material and the phase relationships developed and distinguish between the various soil classification schemes.
- Evaluate the sources of stress in and on a soil mass and be able perform computations to quantify geostatic & additional stresses.
- Articulate principle of seepage through porous media and be able to determine rate of flow, effective stresses , gradients and etc
- Demonstrate fundamental knowledge of soil compaction, uses, applications, field implementations etc.
- Calculate settlements (immediate, primary and secondary consolidation) using both classical methods and Janbu's concept.
- Conduct shear strength tests for soils and interpret their corresponding results.

- Articulate the various bearing capacity and earth pressure t theories and methods of calculation.
- Exhibit a working knowledge of soil slope stability analysis.
- Identify appropriate and feasible site exploration methods for different civil engineering projects and evaluate the general suitability of a site for proposed projects.
- Identify the different types of foundations to be used under various condition to construct civil structures.
- Understand design requirements, design situations and approaches to be followed by different design philosophies and Perform geotechnical and structural designs for different types of shallow foundation.
- Apply various ground improvement techniques and strengthen the soil beneath the construction site to improve its load-bearing capacity, stability, and other engineering properties.
- Demonstrate fundamental knowledge of the analysis and design of deep foundations.
- Analysis and design of pile foundation and retaining system.
- Apply geosyntheticscis to reinforce and improve the subsoil condition.

➢ Road and Transport Engineering

- Understand the Fundamental principles of Traffic flow, including flow- density and investigate the effect of traffic congestion.
- Evaluate the capacity and level of service (LOS) of basic freeway and highway
- Apply the basic concept of traffic control and traffic safety to ensure the safety of the road users.
- Understand the basic stages of highway planning and development process of highway alignment and route selection.
- Design the horizontal and vertical alignments of highway that meet the needs of road users.
- Compute the earthwork quantities and provide economical movement of excavated materials.
- Distinguish different types of intersection and interchange

- Identify different types of pavement structure and analyze the response variables (i.e., deflection and stress-strain) in relation to traffic loading and material characterization within the pavement structure.
- Design rigid and flexible pavement structures using ERA and AACRA design Procedures.
- Design the bituminous mixtures and produce reports accordingly.
- Interpret soil, aggregate and bitumen quality test results; Compare and contrast different stabilization techniques for different layers of pavement structures.

➢ Hydraulic Engineering

- Understand the force, mode of failure and design consideration of diffrent types of dam and select the appropriate type of dams for a given site.
- Design the stability of dams, check and ensurethe safety of dams.
- Design of dam appurtenant and their outlet structures.
- Examine and evaluate the risk of failure of dams through dam safety approaches

6. Table 1. Competency and Shares of Themes

Sl. No	Themes	Competency of the theme	Share of the theme
1	Construction Engineering and Management	• Select suitable construction materials with respect to their suitability to different construction project. • Prepare specifications and BoQ for construction projects • Formulate and manage Contract and tender Documents • Administer contract for Construction Projects. • Manage project to ensure the completion of construction project on time, within budget, and to the desired level of quality. • Develop, Read and interpret working drawings for building construction project • Find innovative solution to the problem faced during design, construction and operation of infrastructural project to meet the requirements by considering factors such as budget, safety, and environmental impact.	24/100
2	Structural Engineering	• Design and analyze the structural members of buildings to ensure that structures can withstand loads and forces and meet safety and performance requirements. • Analyze and design steel and timber members subjected to gravity and lateral loading along with the connection details based on ES:EN 2015 code of standard and design the structural members of different structure. • Estimate the lateral and gravity loads as per the recent building code of standards of Ethiopia.	30/100

Sl. No	Themes	Competency of the theme	Share of the theme
		• Develop Design for structural components of the bridge and culverts according to AASHTO and ERA bridge design manual.	
3	Geotechnical Engineering	• Evaluate engineering properties of soil, the bearing capacity, lateral earth pressure, Sepage analysis and stability of slopes of soil to design and construct ogeotechnical structures. • Conduct site exploration and determine the feasibility and suitability of the site for construction. • design and construct different types of deep and shallow foundations. • Design and construct retaining structure • apply geosyntheticscis to reinforce and improve the subsoil condition.	24/100
4	Road and Transport Engineering	• Design, operate, and manage transportation systems to ensure the safety of users. • Design the horizontal and vertical alignment of the highway that meet the needs of road users and compute and balance the earthwork quantities. • Design a pavement that can withstand the expected traffic loads and environmental conditions while providing a safe driving surface.	16/100
5	Hydraulic Engineering	• design hydraulic structures such as dams, spillways flood control structures etc	6/100

7. Learning Outcomes

- Be familiar with production, properties ,nature and characteristics of different construction materials and identify them with respect to their suitability to different Engineering structures
- Understand the design and performance requirement of building, Different types of building elements and structural system and overall building construction process.
- Prepare specifications and BoQ for construction projects, and Understand the processes involved in Procurement and Contract Management and Formulate Contractand or tender documents and administer contract for Construction Projects.
- Understand and apply the project management knowledge areas and .ensure the completion of construction project on time, within budget, and to the desired level of quality.
- Design and analyze the structural members of buildings to ensure that structures can withstand loads and forces and meet safety and performance requirements.
- Understand the structural analysis and design of steel and timber members subjected to gravity and lateral loading along with the connection details based on ES:EN 2015 code of standard.
- Implement the basic design principles of plastic analysis of frame structures and estimate the lateral and gravity loads as per the recent building code of standards of Ethiopia.
- Understand the fundamental principles of bridge design and investigation and develop Design for Super-structure and Sub-structure components of the bridge according to AASHTO and ERA bridge design manual.
- Understand the concepts of the physical properties of soils as a civil engineering material and the fundamental principles of soil mechanics.
- Evaluate engineering properties of soil, the bearing capacity, lateral earth pressure, Sepage analysis and stability of slopes of soil to design and construct ogeotechnical structures.
- Conduct site exploration to determine the feasibility and suitability of the site for construction, distinguish suitable foundation type for a particular condition, apply ground improvement techniques and analyze and design different types of shallow foundations.
- Design and construct deep foundations, retaining structure and apply geosyntheticscis to reinforce and improve the subsoil condition.
- Design, operate, and manage transportation systems to ensure the safety of users by applying the basic concept of Traffic flow ,capacity and Level of Services,traffic control and traffic safety.
- Understand the basic concept of highway planning and route selection process and design the horizontal and vertical alignment of the highway that meet the needs of road users and compute and balance the earthwork quantities.

- Design a pavement that can withstand the expected traffic loads and environmental conditions while providing a safe driving surface and select the appropriate materials for constructing a roadway surface.
- Understand the fundamental techniques used in the analysis and design of hydraulic structures for water resources development projects such as reservoirs, dams, appurtenant structures, diversion weirs and design hydraulic structures such as dams, spillways flood control structures etc.

8. Table 2: Calculation of share of themes, courses and items

Themes	Courses	Crrrr	Weight of course or proportion	Share of the themes in (%)	Number of test items from each course	Learning outcomes								No. of items
						Cognitive						Affective	Psychomotor	
						Rememberin	Understandi	Application	Analysis	Evaluation	Creation/Syn			
Construction Engineering and management ***Share = 24 items from the total***	Construction Materials	3	3/12 = 0.25	$\frac{12}{50}$ $x100$ = 24	0.25*24 = 6	1	1	1	1	1		1		6
	Building Construction	3	3/12 = 0.25		0.25*24 = 6	1	1	2	1	1				6
	Contract, Specification and Quantity Surveying	3	3/12 = 0.25		0.25*24 = 6		2	1	1	2				6
	Construction project Management	3	3/12 = 0.25		0.25*24 = 6	1	1	2	1			1		6
	Theme 1 Total Credit	**12**			**24**	**3**	**5**	**6**	**4**	**4**		**2**		**24**
Structural Engineering ***Share = 30 items from the total***	Reinforced Concrete Structures I	3	3/15=0.20	$\frac{15}{50}$ $x100$ = **30**	0.20*30 = 6		1	2	2	1				6
	Reinforced Concrete Structures II	3	3/15=0.20		0.20*30 = 6		2	1	2	1				6
	Steel & Timber Structures	3	3/15=0.20		0.20*30 = 6		1	1	1	3				6
	Fundamentals of Bridge Design	3	3/15=0.20		0.20*30 = 6		1	2	3					6
	Structural Design	3	3/15=0.20		0.20*30 = 6		1	2	3					6
	Theme 2 Total Credit	**15**			**30**		**6**	**8**	**11**	**5**				**30**

Themes	Courses	Crrrr	Weight of course or proportion	Share of the themes in (%)	Number of test items from each course	Learning outcomes								No. of items
						Cognitive						Affective	Psychomotor	
						Rememberin	Understandi	Application	Analysis	Evaluation	Creation/Syn			
Geotechnical Engineering ***Share = 24 items from the total***	Fundamentals of Geotechnical Engineering I	3	3/12 = 0.25	$\frac{12}{50}$ $x100$ = **24**	0.25*24 = 6		2	1	2	1				6
	Fundamentals of Geotechnical Engineering II	3	3/12 = 0.25		0.25*24 = 6		1	2	2	1				6
	Geotechnical Engineering Design I	3	3/12 = 0.25		0.25*24 = 6		1	3	2					6
	Geotechnical Engineering Design II	3	3/12 = 0.25		0.25*24 = 6		2	1	3					6
	Theme 3 Total Credit	**12**			**24**		**6**	**7**	**9**	**2**				**24**
Highway Engineering ***Share = 16 items from the total***	Traffic and Road Safety Engineering	2	2/8 = 0.25	$\frac{8}{50}$ $x100$ = **16**	0.25*16 =4			1	1	1				4
	Geometric Design of Highways	3	3/8 = 0.375		0.375*12 = 6	2	2	2						6
	Pavement Materials, Analysis and Design	3	3/8 = 0.375		0.375*12 = 6	1	1	1	1	2				6
	Theme 4 Total Credit	***8***			**16**	**3**	**3**	**4**	**2**	**3**		**1**		**16**
Hydraulic Engineering ***Share = 6 items from the total***	Hydraulic Structures (I)	3	3/3 = 1	$\frac{3}{50}$ $x100$ = 6	1*6 = 6		2	1		2		1		6
	Theme 5 Total Credit	***3***			***6***		***2***	***1***		***2***		***1***		***6***
TOTAL		**50**		**100**		**6**	**22**	**26**	**26**	**16**		**4**		**100**

Note: Table 2 shows the calculation of thematic, course, and item shares from a total of 100 test of Civil Engineering exit exam

9. Table 3: Test Blueprint (Table of Specification) for B.Tech in Civil Engineering

SN	Themes	Cr. Hr.	Share of the themes In no.	General objective/Competency	Courses	Credit hours	Shar e of Courses	Specific objectives /learning outcomes	Learning outcomes								No. of items
									Cognitive						Affective	Psychomotor	
									Remembering	Understanding	Application	Analysis	Evaluation	Creation/Synthesis			
1	Construction Engineering and Management	12	24	Be familiar with production, nature and characteristics of different construction materials and identify them with respect to their suitability to different Engineering structures.	Constructio n Materials	3	6	Describe the Engineering properties of different construction materials that are relevant to their use in engineering applications	1				1				2
				Understand the physical and chemical property of construction				Asses characteristics, use and		1	1						2

				materials under different conditions having basic skill how to design mix proportion of concrete.				production processes of construction material.										
								Carry out different types of physical and mechanical tests to determine the property of Construction materials required for concrete mix design, interpret the test results, Design the mix using different method and determine the mix proportion.				1			1		2

				Understand the design and performance requirement of building, Different types of building elements and structural system and overall building construction process.	Building Constructio n	3	6	Understand the classification, design and performance requirement of building and select the right type of materials for for diferent structural system of a building.	1			1					2
								Develop, Read and interpret working drawings for building construction project .			1						1
								Identify different building elements and system with		1	1		1				3

								their types of materials and construction details										
				Prepare specifications and BoQ for construction projects, and Understand the processes involved in Procurement and Contract Management and Formulate Contract Documents and administer contract for Construction Projects,	Contract, Specification and Quantity Surveying	3	6	Understand different types of specification, know how to assure and control quality of construction materials and construction products					1				1
								Carry out quantity surveying and prepare BoQ and payment certificates for different type of		1		1					2

								construction projects										
								Determine rates for construction activities using detailed cost estimation,		1								1
								Understand the processes involved in Procurement and Contract Management and Formulate Contract and or tender Documents, administer the contract in			1		1					2

								construction projects.										
				Understand the functions and levels of management ,roles of manager and coordinate all resources and oversee the construction process to to meet the requirements.	Construction Project Management			Understand the functions and levels of management ,roles of manager and coordinate all resources and oversee the construction process to to meet the requirements.							1		1
								Understand and apply the project management knowledge areas and .ensure the completion of construction project on time,	1		1						2

								within budget, and to the desired level of quality.										
								Prepare construction project schedules using different techniques to to ensure that all tasks are completed on time and within budget.			1	1						2
								Apply the principles of safety and health in construction project management and take safety and health measures		1								1

								in construction projects									
					Total	**12**	**24**		**3**	**5**	**6**	**4**	**4**		**2**		**24**
2	Structural Engineering	15	30	Analysis and design of reinforced concrete structural members subjected to various loading condition using appropriate design philosophy to ensure that structures can withstand loads and forces and meet safety and performance requirements.	Reinforced Concrete Structures I	3	6	Understanding the mechanical Properties of concrete and reinforcing steel		1							1
								Applying Design Philosophy for the design of reinforced concrete structure.			1						1
								Develope analysis and design of beam for flexure and shear				1	1				2

								Developing analysis and design of one way slabs for flexure				1					1
								Apply Ethiopian Building Code Standard and design RC members.			1						1
				Analyze and design reinforced concrete structural members to ensure that structures can withstand loads and forces and meet safety and performance requirements.	Reinforced Concrete Structures II	3	6	Understand Inelastic analysis of continuous beams and moment redistribution.		1							1
								Carry out the structural analysis and design of			1	1					2

								reinforced concrete columns.										
								Carry out the structural design of two-way reinforced concrete slabs.		1		1	1					3
				Understand the structural analysis and design of steel and timber members subjected to gravity and lateral loading along with the connection details based on ES:EN 2015 code of standard and design the structural members of different structure.	Steel & Timber Structures	3	6	Apply the basic requirements for the design of steel and timber structural based on ES-EN 1993:2015 ES-EN 1995: 2015		1								1
								Develop Design for Axially loaded and Flexural members.				1	2					3

								Develop Design for Beam Column joint			1							1
								Develop Bolted and Welded connections					1					1
				Understand the fundamental principles of bridge design and investigation.and Develop Design for Super-structure &Sub-structure components of the bridge according to AASHTO and ERA bridge design manual.	Fundamentals of Bridge Design	3	6	Conduct Bridge site investigation and selection process		1								1
								Based on the site conditions, bridge loading and the purpose of the bridge, select the appropriate bridge type.			1							1
								Apply principles of static and dynamic loadings.			1	1						2

								Develop Design for Super-structure &Sub-structure components of the bridge				1						1
								Develop Design for bearings of the bridge& culverts				1						1
				Implement the basic design principles of plastic analysis of frame structure s and estimate the lateral and gravity loads as per the recent building code of standards of Ethiopia.	Structural Design	3	6	Develop the collapse mechanisim for beams and frames.				1						1
								Design Slab by yield line method.				1						1
								Analayze and design reinforced concrete slabs				1						1

								using strip method										
								Develop Earthquake Load Calculation on structure using EBCS-EN 1998-1:2013		1	1							2
								Develop Wind Load Calculation on structure using EBCS-EN 1991-1-4,2015			1							1
					Total	**15**	**30**			**6**	**8**	**11**	**5**					**30**
3	Geotechnical Engineering	12	24	Understand the concepts of the physical properties of soils as a civil engineering material and the	Fundamentals of Geotechnical Engineering I	3	6	Articulate the peculiar features of soil as an engineering material and the phase		1								1

				fundamental principles of soil mechanics.				relationships developed and distinguish between the various soil classification schemes..										
								Evaluate the sources of stress in & on a soil mass and be able perform computations to quantify geostatic & additional stresses.				1	1					2
								Articulate principle of seepage through porous media and			1	1						2

								be able to determine rate of flow, effective stresses, gradients, etc										
								Demonstrate fundamental knowledge of soil compaction, its uses, applications, field implementations etc.		1								1
				Evaluate engineering properties of soil, the bearing capacity, lateral earth pressure, Sepage analysis and stability of slopes of soil to design and construct	Fundamentals of Geotechnical Engineering II	3	6	calculate settlements (immediate, primary and secondary consolidation) using both classical methods			1							1

				ogeotechnical structures.				and Janbu's concept.										
								Conduct shear strength tests for soils and interpret their corresponding results.			1	1						2
								Articulate the various bearing capacity theories and methods of calculation.		1								1
								Articulate the various earth pressure theories and methods of calculation.				1						1
								Exhibit a working knowledge of soil					1					1

								slope stability analysis.									
				Conduct site exploration to determine the feasibility and suitability of the site for construction, distinguish suitable foundation type for a particular condition, apply ground improvement techniques and analyze and design different types of shallow foundations.	Geotechnical Engineering Design I	3	6	Identify appropriate and feasible site exploration methods for different civil engineering projects and Evaluate the general suitability of a site for proposed projects		1							1
								Identify the different types of foundations to be used under various condition to construct civil structures.			1	1					2

								Understand design requirements, design situations and approaches to be followed by different design philosophies and Perform geotechnical and structural designs for different types of shallow foundation. .			1	1					2
								Apply various ground Improvement Techniques and strengthen the soil beneath the			1						1

								construction site to improve its load-bearing capacity, stability, and other engineering properties.										
				Design and construct deep foundations,retaining structure and apply geosyntheticscis to reinforce and improve the subsoil condition.	Geotechnical Engineering Design II	3	6	Demonstrate fundamental knowledge of the analysis and design of Deep Foundations.		1								1
								Analysis and Design of pile foundation		1		1						2
								Analysis and Design of retaining system.			1	1						2
								apply geosyntheticscis				1						1

								to reinforce and improve the subsoil condition.										
					Total	**12**	**24**			**6**	**7**	**9**	**2**				**24**
4	Road and Transport Engineering	8	16	Design, operate, and manage transportation systems to ensure the safety of users by applying the basic concept of Traffic flow ,capacity and Level of Services,traffic control and traffic safety.	Traffic and Road Safety Engineering	2	4	Understand the Fundamental principles of Traffic flow, including flow-density and investigate the effect of traffic congestion.				1						1
								Evaluate the capacity and level of service (LOS) of basic freeway and highway					1					1
								Apply the basic concept of Traffic			1				1			2

								control and Traffic safety to ensure the safety of the the road users.										
				Understand the basic concept of highway planning and route selection process and , design the horizontal and vertical alignment of the highway that meet the needs of road users and compute theearthwork quantities.	Geometric Design of Highways	3	6	Understand the basic stages of highway planning and development process on highway alignment and route selection.	1	1								2
								Design the horizontal and vertical alignments highway that meet the needs of road users.		1	1							2

								Compute the earthwork quantities and provide economical movement of excavated materials.			1							1
								Distinguish different types of intersection and interchange	1									1
				Design pavement that can withstand the expected traffic loads and environmental conditions while providing a safe driving surface and select the appropriate materials	Pavement Materials, Analysis and Design	3	6	Identify different types of pavement structure and Analyze the response variables (i.e., deflection and stress-strain) in relation to traffic loading and material characterization	1			1						2

				for constructing a roadway surface				within the pavement structure											
								Design of rigid and flexible pavement structures using ERA and AACRA design Procedures.			1								1
								Design of bituminous mixtures and produce reports accordingly					1						1
								Interpret soil, aggregate and bitumen quality test results; Compare and contrast different stabilization techniques for different layers of pavement structures		1			1						2
					Total	**6**	**16**		**3**	**3**	**4**	**2**	**3**		**1**		**16**		
5	Hydraulic Engineering	3	6	Understand the fundamental techniques used in the analysis and	Hydraulic Structures	3	6	Be familiar with force, mode of failure and design		1					1		2		

				design of hydraulic structures for water resources development projects such as reservoirs, dams & appurtenant structures, diversion weirs, and river and watershed management schemes and design hydraulic structures such as dams, spillways flood control structures etc				consideration of diffrenet types of dam and Select the appropriate type of dams for a given site										
								Design the stability of dams, check and appreciate safety of dams			1		1					2
								Design of dam appurtenant and their outlet structures										1
								Examineand evaluate the risk of failure of dams through dam safety approaches					1					1
					Total	**3**	**6**			**2**	**1**		**2**		**1**		**6**	
Grand Total		**50**	**100**			**50**	**100**		**6**	**22**	**26**	**26**	**16**		**4**		**100**	

Key: In the cells/boxes there are numbers that indicate the number of items that correspond to the levels of domains

Ministry of Education

Higher Education Sub-sector

Program Name: - Civil Engineering

10. Table 4: Share of Competencies per Courses

SN	Themes	Course Name	Cr. Hrs	Share of course (%)	Share of competencies in (%)			Total
					Knowledge	Skill	Attitude	
1	Construction Engineering and management	Construction Materials	3	6	5		1	6
		Building Construction	3	6	6			6
		Contract, Specification and Quantity Surveying	3	6	6			6
		Construction project Management	3	6	5		1	6
2	Structural Engineering	Reinforced Concrete Structures I	3	6	6			6
		Reinforced Concrete Structures II	3	6	6			6
		Steel and Timber Structures	3	6	6			6
		Fundamentals of Bridge Design	3	6	6			6
		Structural Design	3	6	6			6
3	Geotechnical Engineering	Fundamentals of Geotechnical Engineering I	3	6	6			6
		Fundamentals of Geotechnical Engineering II	3	6	6			6
		Geotechnical Engineering Design I	3	6	6			6
		Geotechnical Engineering Design II	3	6	6			6
4	Road and Transport Engineering	Traffic and Road Safety Engineering	2	4	4			4
		Geometric Design of Highways	3	6	6			6
		Pavement Materials, Analysis and Design	3	6	6			6
5	Hydraulic Engineering	Hydraulic Structures	3	6	5		1	6
Total (aggregate)			**50**	**100**	**97**		**3**	**100**

11. Conclusion

The exit examination will have a vital role in improving academic programs' quality and effectiveness. It is clear that evaluating the graduates against the core competencies set out by the curriculum and in line with the industrial needs would be important to enhance the trust of the employers in the graduate's skills. To realize this, it is important to have a guideline that could be used as a reference to prepare for a comprehensive exit exam that could address the relevant focus areas of the program. Accordingly, core competencies and specific learning outcomes of **16** major courses (**50** credit hours) . Considering the time allocated for running the assessment and covering the listed learning outcomes **100** items which will assess the knowledge, attitude and skills of graduates were suggested for exit exam preparation. The exam questions based on the selected courses are believed to test the knowledge, skills, and attitudes that are expected as the attainment of the competencies and learning outcome of Civil **Engineering Degree.**