



Ministry of Education

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

Band: Three

Program: - Bachelor of Science degree in Medical Laboratory/ Medical Laboratory Sciences/ Medical Laboratory Technology

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1. Introduction

The Ministry of Education of Ethiopia 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. 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. Based on the competency areas prepared, it needs to plan the construction of tests.

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.

Generally, test blueprint will help to ensure tests: 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,

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 will be determined through discussion with the content specialists who construct the blueprint and test for their corresponding study program.

2. Objective and Significance of Test Blueprint Document

2.1. Objective of the test blueprint Document

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.

2.2. Significance of Test Blueprint 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. Test blueprint is a three-dimensional chart that shows the placement of each question in respect of the objective and the content area that it tests. The following shows us the significance of the test blueprint;

- o Test blueprint used for examination contains the strategy of exam by an educational institution;
- o a test blueprint will help us plan which questions to include in your exam and ensure that it adequately assesses the learning objectives of the course; and
- o It defines the knowledge, skills and attitude you want to assess and will enable you to build purpose-driven, successful assessments.

3. Expected profile of the graduates

- In general, the graduate of the program is expected to provide quality, comprehensive and evidence based medical laboratory services. Hence, after successful completion of the training, graduates will be able to apply his/her knowledge, skills, and attitudes as follows:

Knowledge

- Understand management, policies, principles and procedures of the medical laboratory sciences
- Use his/her critical thinking to improve the laboratory-working environment
- Familiarize him/herself with latest scientific findings to improve the quality of medical/clinical laboratory services rendered to the society.
- Recognize and interpret laboratory findings and correlate with common disease pathogenesis
- Identify factors that affect procedures and test results, and suggest appropriate action within predetermined limits.
- Recognize ways of surveillance of communicable diseases
- Confirm and verify results through an in-depth knowledge of scientific methods, principles and instrumentation theory.
- Recognize laboratory logistic procurement, evaluation, setup specification and equipment auditing
- Understand international Medical/Clinical laboratory quality standards
- Understand pathogenesis and diagnostic principles and methods of bacterial, viral, fungal and parasitic diseases.
- Recognize the physiological and pathological conditions which may affect the biochemical and hematological parameters.
- List factors that influence down time of lab instruments-based SOP
- Explain the principle of radioactive detection and safety issues according to SOP
- Identify the operating procedures of micropipettes, spectrophotometer, electrophoresis, chromatography, cell counting automation and electrochemical techniques.
- Understand the definitions and principles of related to supply chain management
- Acquire understanding and knowledge of project management skills, centralized procurement and tracking of supplies and logistics
- Understand the supply chain management and logistics system
- Understand the process of supply chain management
- Understand importance and role of supplier and vendor in supply chain management
- Describe cost accounting, financial statements, and bidding process in procurement
- Acquire cost-to-serve understanding

- Understand the technical requirements, cross-cultural and global business and financial issues in supply chain management
- Understand information technology, automation knowledge, electronic business and electronic purchases, catalogue reading and product searching
- Define criteria for supplies or materials to be purchased
- Consider the advantages and disadvantages of purchasing “brand name” compared to “generic” products
- Understand business ethics and Understand any local or national government requirements that need to be accommodated in the contracts
- Know supply chain management troubleshooting and problem solving, and understand supplier relationship management
- Know how to negotiate for the best price without undermining quality.
- Understanding of the legal issues involved in managing contracts
- Discuss the basic principles of resources mobilization
- Acquire knowledge of efficient resources utilization
- Understand the use of national resource mobilization formats
- Describe stakeholder mapping and analysis
- Understand the principle of receiving, inspecting, testing, storing, and handling of materials
- Understand the process of assessing and maintaining inventory management
- Understand the proper distribution of laboratory supplies
- Acquire knowledge about supplies and equipment acceptance

Attitude

- Maintain the medical laboratory ethical code of conduct standards and contribute to stewardship of their profession
- Adhere to Laboratory standard operative procedures while performing tests
- Advocate the proper use of laboratory tests.
- Promote safety, quality control and quality assurance in clinical and public health laboratories
- Participate in policy, professional standards, continuing professional development issues pertaining to medical laboratory profession

- Respectful, compassionate and caring to patients, their relatives and other professionals
- Apply business ethics
- Practice constant learning and thorough understanding
- Develop good working network and integrate multiple systems

Skill

- Adhere and follow standards for quantification, inventory management, storage and distribution of laboratory equipment and supplies
- Adhere and follow standard products specification
- Aspire accreditation as important as service delivery
- Perform routine and advanced biochemical, bacteriological, virological, mycological, parasitological, hematological, immunologic, and molecular tests, on clinical, environmental, drugs, toxins and specimens of public importance.
- Participate and contribute in surveillance and control of communicable disease and information dissemination in diseases outbreak situations.
- Assist, participate and conduct operational and basic research and involve in development of new medical laboratory diagnostic technologies.
- Establish and monitor programs to ensure the accuracy of tests.
- Plan and monitor laboratory logistic procurement, evaluation, setup, auditing and safe disposal
- Provide professional services, leadership and quality assurance in clinical/public health laboratories
- Monitor and maintain proper functioning of medical laboratory equipment/reagents
- Supervise medical laboratory staff.
- Develop, evaluate and update laboratory standard operational procedures.
- Demonstrate leadership and management skills in health/research institutions
- Engage in policy, professional standards, and continuing professional development issues pertaining to medical laboratory profession.
- Collect, preserve, store and transport referral specimens for proper and safe testing
- Communicate effectively both verbally and non-verbally.
- Collect, document, retrieve and interpret laboratory data clearly and safely.

- Forecast laboratory supplies and equipment for procurement
- Undergo method selection process and prepare acceptance criteria for supplies and equipment after procurement
- Review all contracts to make sure the laboratory's requirements are being met.
- Prepare specification and undergo item selection process for purchase
- Engage in preparation of contractual agreement and legal frame work
- Determine how payments will be made, and how the vendor will assure reliable availability and delivery of supplies and reagents.
- Follow-up the logistics system

4. Objective of the program

4.1. General Objective

- The aim of this program is to produce BSc level Medical Laboratory Science Practitioners capable of providing quality, comprehensive and evidence based medical laboratory services

2.2. Specific objectives

The specific objectives of Generic Medical Laboratory Science program are to train:

- Qualified medical laboratory science practitioners to work in health institutions, higher institutions, research institutions and industries.
- Graduates capable of developing and promoting the medical laboratory profession for human good.
- Competent medical laboratory science practitioners to meet the human power needs of various health and health related institutions
- Graduates equipped with skills to utilize classical and advanced laboratory techniques in clinical diagnosis of human disease (in both clinical and public health laboratory settings).
- Graduates who can test and analyze tissue, blood, and other biological specimens collected for the purposes of criminal and other legal investigations.
- Graduates who can participate in identifying and solving the community problems in various health perspectives.
- Graduates with managerial, supervisory and quality assurance responsibility.
- Competent practitioners who can maintain the professional code of ethics.

5. Themes and courses to be included in the exit exam

Table 1: themes and course included in the exit exam

R.No .	Themes	Lists of selected courses	ECTs	Remark
1	Basic medical Laboratory Science	Molecular Biology and Applied Genetics	8	
		Basic to Medical Laboratory Sciences	12	
		Immunology and serology	10	
2	Hematology	Hematology and Immunohematology	19	
		Histopathology	3	
3	Microbiology and Parasitology	Medical Parasitology and Vector Biology	17	
		Medical Bacteriology and Public Health Microbiology	17	
		Medical Virology	5	
		Medical Mycology	3	
4	Clinical Chemistry	Clinical Chemistry and Toxin Analysis	17	
		Urine and Body Fluid Analysis	7	
5	Laboratory Management and Quality Assurance	Quality Assurance in Medical Laboratory	3	
		Health Laboratory Management	3	
Total (Aggregate)			124	

6. Share of the Themes/Courses/Items in Percentage (%)

Table 2: Share of the themes/courses/items and KSAs in percentage (%)

Themes	Course Name	Learning	E C Ts	Weight of course or proportion	Number of test items from each course	Cognitive						Affective	Psychomotor	Total
						Remember	Understand	Apply	Analyze	Evaluate	Create			
Basic medical Laboratory	Molecular Biology and Applied Genetics		8	8/30= 0.27	0.27*24= 6.5	1	2	1	-	-	-	0.5	1	6.5
Science: Share = 24% items from the total	Basic to Medical Laboratory Sciences		12	12/30= 0.4	0.4*24= 9.6	1	2.5	0.5	1	0.6	-	2	2	9.6
	Immunology and serology		10	10/30= 0.33	0.33*24= 7.9	0.9	3	1	-	0.5	-	0.5	2	7.9
	Theme one total credit		30											
Hematology Share = 18% items from the total	Hematology and Immunohematology		19	19/22 = 0.86	0.86*18= 15.5	2	5	1	3	-	-	0.5	4	15.5
	Histopathology		3	3/22 = 0.14	0.14*18= 2.5	0.5	1	0.2	-	-	-	0.3	0.5	2.5
	Theme two total credit		22											
Microbiology	Medical Parasitology		17	17/42 = 0.4	0.4*34= 14	2.5	5	1	1	-	-	0.5	4	14

and Parasitology Share = 34% items from the total	and Vector Biology													
	Medical Bacteriology and Public Health Microbiology		17	$17/42 = 0.4$	$0.4*34= 14$	3	5	1	0.5	-	-	1	3.5	14
	Medical Virology		5	$5/42 = 0.12$	$0.12*34= 4$	1	1.7	0.3	-	-	-	0.5	0.5	4
	Medical Mycology		3	$3/42=0.07$	$0.07*34=2$	0.5	0.8	-	-	-	-	0.2	0.5	2
	Theme three total credit		42											
Clinical Chemistry Share = 19% items from the total	Clinical Chemistry and Toxin Analysis		17	$17/24= 0.71$	$0.71*19= 13$	2	4	1	2	0.5	-	0.5	3	13
	Urine and Body Fluid Analysis		7	$7/24 = 0.29$	$0.29*19= 6$	0.5	2	0.5	0.5	-	-	0.5	2	6
	Theme four total credit		24											
Laboratory Management and Quality Assurance Share = 5% items from the	Quality Assurance in Medical Laboratory		3	$3/6 = 0.5$	$0.5*5= 2.5$	0.25	0.75	0.25	0.25	0.25		0.25	0.5	2.5
	Health Laboratory Management		3	$3/6 = 0.5$	$0.5*5= 2.5$	0.5	1	0.25	0.25	-	-	0.5	-	2.5
	Theme five total credit		6											

total													
Total for the program		12 4											

7. Test blueprint Table (Table of Specification) table

Table 3: Test Blue-Print

Ministry of Education (Table 3)													
Higher Education Sub-sector Test Blueprint (Table Specification) for BSc. in Agribusiness and Value Chain Management													
Themes and Share of the team	Name of the Course s and share of the course	E C Ts	General objective/Co mpetency	Specific objectives /learning outcomes	Learning outcomes								No. of items
					Cognitive						Affective	Psychomotor	
					Remembering	Understanding	Application	Analysis	Evaluation	Creation/			
Basic medical Laboratory Science: (24%)	Molecu lar Biology and Applied Genetic s (6.5%)	8	To understand and apply the principles of genetics and molecular biology techniques in producing accurate results in the diagnosis and treatment of disease.	<ul style="list-style-type: none">To describe the principles of genetics including gene expression and control in prokaryotes and eukaryotes, meiosis and mito-genetics and inheritance and non-Mendelian inheritanceto describe the central dogma of molecular biology in gene replication and expressions both in prokaryotes and	1%	3%	1%				0.5 %	1%	6.5 %

				<p>eukaryotes</p> <ul style="list-style-type: none">• To describe how to perform molecular techniques in the diagnosis and treatment of microbial and genetic diseases in modern medicine.• Understand the relationship of genes and chromosomes and the cell cycle in normal and abnormal situation• Explain the application of principles of genetics for diagnostic testing such a gene mapping, human Cytogenetics and study of bacterial genetics										
	Basic to Medical Laboratory Sciences(9.6)	12	To equip students with the fundamentals of medical laboratory practice including principles of specimen	<ul style="list-style-type: none">• To describe ethics and philosophical, laws related to practice of Medical Laboratory Science and professionals.• To describe the principle of Laboratory instruments, operating	1%	2.5%	0.5%	1%	0.6%		2%	2%	9.6%	

				<p>acute phase protein tests according to procedure.</p> <ul style="list-style-type: none">• Practice HIV test and hepatitis tests applying appropriate algorithms• Apply appropriate specimen collection, preparation and preservation technique for different types of serological tests• Report the overall serological test results based on internal quality control									
Hematology (18%)	Hematology and Immunohematology (15.5%)	19	To enable students understand, perform, and interpret the basic hematological and immunohematological procedures	<ul style="list-style-type: none">• To describe basics of Hematopoiesis;• Able to collect blood specimens from various sources,• Understand the basic principles of manual methods of hematological investigations• Perform and interpret manual methods of hematological investigations following Standard Operating Procedures (SOPs).	2%	5%	1%	3%	-	-	0.5	4%	15.5%

				activities in immunohematology and haematology laboratories									
	Histopathology	3	Understand the basic concepts of histopathology and cytotechnology, and apply histopathological and Cytohistopathological techniques in the diagnosis of tissue abnormality.	<ul style="list-style-type: none"> Describe Cytohistopathology Discuss pathologic changes in cells and tissues Discuss the significance of cyto-histopathological examinations Explain the different types of specimen in cytology and histopathology (pathology) lab Explain methods of preservation of the various pathological specimens Perform sample handling, processing, preservation, transporting and staining Perform cell concentration and fixation techniques Prepare histopathological smears and Stains 	0.5 %	1%	0.2		-	-	0.3	0.5 %	2.5 %

				<ul style="list-style-type: none">• Apply quality assurance system in histopathological investigation• Comply safety measures in histopathological investigation									
Microbiology and Parasitology (34%)	Medical Parasitology and Vector Biology (14%)	17	To understand and practice the basic concepts of medically important vectors, medical parasitology including medically important helminths and protozoa; the principles of different diagnostic techniques of medical parasitology	<ul style="list-style-type: none">• Understand the basic concepts on medical Parasitology; classification of medically important Protozoa, medically important helminthes, life cycle, mode of transmission, pathogenesis, clinical manifestations, laboratory diagnosis, prevention and control of medically important parasites;• Understand different diagnostic techniques used in medical parasitology (principles and techniques for diagnosis of parasitic disease); preparation, processing, proper storage and maintaining quality	2.5 %	5%	1%	1%	-		0.5 %	4%	14 %

				control of different reagents used in medical parasitological investigations; <ul style="list-style-type: none">• Perform specimen collection, processing, examination and reporting for parasitological tests;• Apply basic quality control measures in medical parasitology laboratory• Understand basic concepts in vector biology• Understand the biological aspects and identification of arthropod vectors of medical importance and• Describe the prevention and control methods of medically important arthropod vectors									
	Medical Bacteriology and Public	17	To understand and practice the basic concepts of medical	<ul style="list-style-type: none">• To describe historical background of bacteriology, and classification of bacteria, the basics of medically important	3%	5%	1%	0.5%			1%	3.5%	14%

	Health Microbiology		bacteriology and public health microbiology , the basic principles in bacteriological investigations and apply them in diagnosis and treatment of bacterial infections.	<ul style="list-style-type: none">bacteriaTo understand the basic principles and applications of public health microbiologyTo understand principles of sterilization, disinfection and decontaminationTo understand the diagnostics methods in medical bacteriology and public health microbiologyTo perform the diagnostic procedures in medical bacteriology and public health microbiology									
	Medical Virology	5	To explain important features of viruses, transmission, clinical feature, Pathogenesis, diagnosis, treatment prevention and control methods of	<ul style="list-style-type: none">To define virology and VirusesDescribe the properties, classification, replication, and pathogenesis of medically important viruses.Identify the different lab. diagnostic techniques employed in the diagnosis of viral	1%	1.7%	0.3	-	-	-	0.5 %	0.5 %	4%

			infections due to pathogenic virus.	<ul style="list-style-type: none"> • Perform laboratory examination of medically important viruses. • Acquire knowledge in cell culture, isolation, antibody detection (rapid methods). • Discuss the various emerging and reemerging viral diseases • Perform collection, transportation, & storage of clinical specimen; processing, examination and identify viral pathogens • Follow safety rules and standard operational procedures in order to ensure quality in virology laboratory 									
	Medical Mycology	3	To understand basics of mycology; Classification of fungi; morphological features of fungi;	<ul style="list-style-type: none"> • Describe the general characteristics, morphology, reproduction and classification of fungi 	0.5	0.8					0.2	0.5 %	2. %

				<p>picture and laboratory diagnosis of subcutaneousmycoses.</p> <ul style="list-style-type: none">• Discuss the etiological agents, epidemiology, and mode of transmission, pathogenesis clinical picture and laboratory diagnosis of systemicmycoses.• Perform diagnosis of systemicmycoses• Discuss medically important opportunisticmycoses• Perform diagnosis of candidiasis and Cryptococcalmeningitis• Describe types and mechanisms of actions of anti-fungalagents• Perform anti-fungal susceptibility testing• Interpret, record and report results correctly										
	Clinical Chemistry and toxin analysis (13)	17	To equip students with the physiological basis, major principles,	<ul style="list-style-type: none">• Describe clinical chemistry and its• Describe the different types of solutions• List the types and expression of solution	2%	4%	1%	2%	0.5 %	-	0.5 %	3%	13 %	

Clinical chemistry (19%)			and skills to perform clinical chemistry and toxin analysis procedures	<p>concentration</p> <ul style="list-style-type: none"> • Discuss the principles and fundamental laws in radiant energy • Discuss the principles, concepts and fundamentals components of analytical instruments • Review specimen collection, handling and processing for biochemical analysis • Explain carbohydrate metabolism, determination of glucose and glucose tolerance test • Discuss renal function tests (RFT): Creatinine, urea/BUN, uric acid tests • Describe principles of Renal clearance tests (creatinine and inulin) • Explain protein metabolism and determination of total protein, albumin and protein fractions • Discuss the metabolism of lipids and lipoproteins 										
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				<p>accordance with SOPs following safety standards</p> <ul style="list-style-type: none">• Perform toxin analysis using different methods and instruments following standard operating procedure.• Use automated equipment and instruments capable of performing a number of tests simultaneously.• Interpret record, document and report laboratory test results based on quality standards									
	Urine and Body Fluid Analysis (6%)	7	To equip students with basic knowledge and Skills on overview of anatomy and physiology of urinary system, urine and body fluid formation	<ul style="list-style-type: none">• Describe the urinary system and briefly state their function• Collect and preserve urine specimen• Perform physical, chemical and microscopic examination of urine• Identify the different body fluids• Perform Body fluid analysis• Properly interpret,	0.5 %	2%	0.5%	0.5%	-		0.5 %	2%	6%

			and composition; collection and preservation of urine and body fluid specimen; physical, chemical and microscopic examination of urine and body fluids; application of quality assurance for laboratory examination of urine and body fluids.	report and document urine and body fluid analysis test results									
Laboratory Management and Quality Assurance (5%)	Quality Assurance in Medical Laboratory (2.5%)	3	To equip students with the basic concepts of quality assurance and the ability to apply the concept of quality assurance in	<ul style="list-style-type: none"> Describe the component and importance of quality assurance; Identify different types of quality control, Interpret quality control data and document quality control charts and graphs; practice quality 	0.25%	0.75%	0.25%	0.25%	0.25%		0.25%	0.5%	2.5%

			the health laboratory to provide quality laboratory services.	assurance in the routine professional activities <ul style="list-style-type: none"> • Prepare standard operational procedures in all laboratory disciplines. 									
	Health Laboratory Management (2.5%)	3	To understand the level of laboratory organizations and their roles, principle of laboratory management and management of time, resource, troubleshooting laboratory supplies and quality of laboratory services.	<ul style="list-style-type: none"> • Discusses organization of clinical laboratories • List the different levels of laboratory based on laboratory policy • Describe principles of health laboratory management • Explain principles of preparing specification, order request, purchase, procurement and distribution of materials, equipment and laboratory reagents • Discuss job analysis and job description • Explain the types and advantages of health laboratory information system • Discusses laboratory quality services and safety management Skill • Develop skill on time and other resources 	0.5 %	1	0.25	0.25			0.5	-	2.5 %

				<div>management</div> <ul style="list-style-type: none">• Design standardized laboratory• Demonstrate teamwork in the laboratory• Influence and organize the human resources										
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8. Share of Competencies (KSA) per Courses / Summery/

Table 4: Share of Competencies (KSA) per Courses

R.No .	Theme s	Course Name	ECTs	Share of Courses (%)	Share of Competencies (in %)			Remark
					Knowledge	Skill	Attitud e	
1	Basic medical Laboratory Science	Molecular Biology and Applied Genetics	8	6.5	5	1	0.5	
		Basic to Medical Laboratory Sciences	12	9.6	5.6	2	2	
		Immunology and serology	10	7.9	5.4	2	0.5	
	Hemato logy	Hematology and Immunohematology	19	15.5	11	4	0.5	
		Histopathology	3	2.5	1.7	0.5	0.3	
	Medica l microbi ology and parasito logy	Medical Parasitology and Vector Biology	17	14	9.5	4	0.5	
		Medical Bacteriology and Public Health Microbiology	17	14	9.5	3.5	1	
		Medical Virology	5	4	2.5	1	0.5	
		Medical Mycology	3	2	1.3	0.5	0.2	
	Clinical chemist ry	Clinical Chemistry and Toxin Analysis	17	13	9.5	3	0.5	
		Urine and Body Fluid Analysis	7	6	3.5	2	0.5	
	Laborat ory manage ment and quality assuran ce	Quality Assurance in Medical Laboratory	3	2.5	1.75	0.5	0.25	
		Health Laboratory Management	3	2.5	2	-	0.5	
Total (Aggregate)			124	100	68.25	24	7.75	100

9. Conclusion

Exit examination can have a vital role in producing knowledgeable, skillful and attitudinally matured graduates. It contributes to prepare competent graduates as it can serve as a quality check for effectiveness. It also helps in improving academic programs quality and effectiveness. Furthermore, it can create the platform for cooperation among academic programs at different universities to work jointly to improve the programs quality.

In view of this, this document is produced to assist the setting of the exit examinations for Medical Laboratory Science program, which is being delivered by Ministry of Education. To meet the graduation profile, competency and learning outcome, exit exam competency selection and identifying core course was done for 2015 EC graduating students. As a result, preparing test blueprint is necessary to prepare fairly distributed items based on the above criteria.