FDRE Ministry of Education (MOE)

Identified Competency Focus Areas and Core Courses for National Exit Examination

Program: Bachelor of Science in Information Technology

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1. Introduction

2. Overview

Information Technology involves designing, implementing, and maintaining technology solutions and support for users of technology. Information Technology curricula focus on crafting hardware and software solutions as applied to networks, security, client-server and, web applications, multimedia resources, communications systems, and the planning and management of the technology lifecycle. According to this, some of the curricula were developed for B.Sc. in Information Technology based on international experiences with some professionals at different university levels. In Ethiopia, the first Information Technology harmonized curriculum was started in 2004 EC and the new harmonized curriculum was designed and implemented in 2012 EC.

In the education system, the main purpose is to produce highly competent students that acquired knowledge, skills and attitude in their professions. The output of this competent manpower will be useful for solving the community problems and involving the country's economic development. One of the best tools to assure this is the exit exam for graduated students, where its results provide trust in Higher Education Institutes' outcomes. The FDRE Ministry of Education (MoE) has proceeded according to some existing experiences in Health and Law programs done so far. This was represented in a set of procedures, including the stages of building question banks and linking them to learning outcomes in the curricula. Based on this experience the MoE is designed this guideline to implement the national exit exam to be held in 2015 EC for other programs. So, this guideline is designed to implement the National Exit Examination of Bachelor of Science in Information Technology. This guideline focuses on the graduate profile, competencies, learning outcomes, and industry demands of the professionals. Based on this, the courses are listed and categorized for the exit exam.

2.1. Objectives of the Exit Examination

The national public administration 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 public administration and development management (PADM)

- Ensuring whether the graduation profile of PADM curriculum have achieved at least common standards of knowledge and practical skills
- Improving public trust and confidence in public administration 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 sprit among PADM departments in Ethiopia with the vies to encouraging them to give due attention to the national standards

2.2. 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;

3. Expected Graduate Profile

The expected graduate profile for Bachelor of Science in Information Technology should acquire the basic knowledge and skills in adapting and utilization of new technology with minimum effort and resources. Accordingly, the B.Sc. in Information Technology graduates will have the following graduate profiles:

A. Cognitive skill

- Analyse, identify and define the IT requirements that must be satisfied to address problems or opportunities faced by organizations or individuals.

- Demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to Information Technology.
- Identify and evaluate current and emerging technologies and assess their applicability to address the user's needs.
- analyse, adopt and demonstrate IT best practices, standards and their application.
- analyse the impact of technology on individuals, organizations and society, including ethical, legal and policy issues;
- Identify and analyse user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems.
- Demonstrate an understanding of best practices and standards and their application;

B. Technical skill

- Use and apply current technical concepts and practice in the core area of Information Technology.
- Design effective and usable IT-based solutions and integrate them into the user environment.
- Assist in the creation of an effective project plan.
- Demonstrate independent critical thinking and problem-solving skills
- Use current techniques, skills, and tools necessary to maintain and administer computer-based systems.

C. Attitude skill

- Collaborate in teams to accomplish a common goal by integrating personal initiatives
- Communicate effectively and efficiently with clients, users and peers both verbally and in writing, using appropriate terminology.
- Understand and explain the quantitative dimensions of a problem.
- Manage one's own learning and development, including time management and organizational skills
- Keep abreast of current developments in the discipline to continue one's own professional development.

- Recognize and be guided by the social, professional, and ethical issues involved in the use of computer technology

4. Competencies and Learning Outcomes

This guideline incorporates the ideas of Competence Based Education (CBE) on the Bachelor of Science in Information Technology national harmonized curriculum in 2013 EC. The core competency areas of Information Technology graduated students are identified according to a learning outcome and graduate profiles, which are measurable and achievable.

4.1. Competencies

The competencies of one program will be measured according to the three key areas competencies which are Knowledge, Skill and attitudes. The competency areas of Bachelor of Science in Information Technology are identified according to the program learning outcomes and market demand of the as follows.

4.1.1. Knowledge

Students of Bachelor of Science in Information Technology students are expected to understand, identify and define core concepts in Information Technology. The knowledge competencies are the followings.

- Identify the basic Components of Computer Organization and Architecture
- Identify problems and apply different approaches and techniques in SDLC to support software project management and the production of high-quality software
- Identify transmission media, protocols, and networking standards

4.1.2. Skills

Skills refer to capabilities and methods that develop actively through deliberate practice and interactions with others. Skills in Information Technology require engagement in activities such as programming, and the "know-how" dimension. The following skills are expected from Information Technology graduated students.

- Design and develop software using different programming languages and develop Rapid Application Development for immediate problem-solving

- Design and develop databases used for transaction management, distributed database, and database administration
- Design and develop static and dynamic websites by using Server/client-side scripts for commercial and scientific programs.
- Design and configure Networking devices and security management

4.1.3. Attitudes

Attitudes encompass to carry out tasks to know when and how to engage in those tasks with others. The attitudes are listed as follows.

- Identify threats, risks, and vulnerabilities in Information System
- Comprehend the communication, emotional skills, ethics, and behaviors

4.2. Learning Outcomes

Learning outcomes of the Bachelor of Science in Information Technology are listed as follows.

- Identifying failures of computer hardware and software and properly applying the procedures of maintenance and repairing of computer hardware
- Develop the necessary skills in designing, coding, debugging and documenting large programs using different programming languages
- In addition, they will understand and implement varieties of algorism analysis and implementation techniques.
- The students will develop the skills in identifying and analysing and implementing classes using programming languages and apply Rapid Application Development.
- Describe the information systems development life cycles (SDLC) to demonstrate the object-oriented system analysis and design concepts, tools, techniques, to support software project management and the production of high-quality software
- Understands the different database models, distributed database system and they will also design and create databases, tables, views, triggers and indices and write SQL queries and database programs.
- Develop the skills of static and dynamic websites, in creating Server/client-side scripts for commercial and scientific programs and also, they will develop Mobile Application and Web Server programming for different applications.

- Understands data transmission and media, protocols, the concept of layering, recognize the importance of networking standards
- They will have the knowledge and understanding of installation and configuration of network operating system, they get familiar with the concepts of network administration and network device installation
- The students will properly identify threats, Risks and vulnerabilities, data Security Policies or Administration Security, information Systems Security concepts, and designing secure systems.

5. Courses to be included

To select courses for this national exit exam the course of the program is categorized to different course themes. We have categorized overall course of the program which are 34 core courses into six themes. Out of the 34 total core courses of the program, 15 courses are selected and five themes out of seven themes are included in the exit exam. According to the competency area and learning outcomes correlated with graduate profiles, the following courses are selected for the national exit examination. The exit examination focuses on the key knowledge and skill of undergraduate Information Technology graduates.

5.1 Course Themes and list of selected courses

The courses' themes are done based on the relatedness and similarity of courses. Course of the program is categorized in to seven including Elective theme. From these themes the course themes and courses selected are mentioned in the Table 1. According to this, five themes are selected for exit exam. The total themes of the program are categorized as follows.

1. Computer System
2. System/Software Development
3. Information and Database management
4. Networking and Information Security
5. Mobile Application and Web Development
6. Miscellaneous
7. Elective

Table 1: Course Theme and list

SN	Course Theme	Course Title	Course code	Credit hrs./ECTS
1.	Computer System	1. Computer Maintenance and Technical Support	ITec3031	4/6
2.	System/Software Development	1. Object Oriented Programming in Java	ITec3051	3/5
		2. IT Project Management	ITec3062	3/5
		3. Advanced Programming	ITec3056	3/5
		4. Event-driven programming	ITec3054	3/5
		5. System Analysis and Design	ITec3061	3/5
3.	Database System and Information Management	1. Fundamentals of Database System	ITec2071	3/5
		2. Advanced Database System	ITec3071	3/5
4.	Mobile Application and Web Development	1. Internet Programming-I	ITec2092	3/5
		2. Internet Programming-II	ITec3093	3/5
		3. Mobile application Development	ITec3058	3/5
5.	Networking and Information Security	1. Data communications and Computer Networks	ITec2102	3/5
		2. System & Network Administration	ITec4112	3/5
		3. Network Device & Configuration	ITec4111	3/5
		4. Information Assurance and Security	ITec4133	2/3
	Total ECTS/ Cr. Hrs.			**45/74**

6. Conclusion

This guideline is designed to implement the National Exit Examination for B.Sc. in Information Technology undergraduate programs throughout Ethiopian Higher Education Institutes. To prepare this guideline the following criteria were considered into account.

- ✓ Expected graduate profiles,
- ✓ Competency and learning outcomes of the programs
- ✓ Correlation of graduate profiles and competency of the program
- ✓ Selection of core competency courses

The key competencies of the program are selected, and the courses which match the competency areas are selected for the exit exam. The exam contents will focus on key knowledge of the program from each course and the courses which match the exit exam types. Accordingly, 15 courses are selected for the exit exam from a total of 56 courses in the

program and they are grouped into different four thematic areas. The selected courses are thematized to groups according to their similarities.

The exit exam focuses on core competency areas of the B.Sc. in Information Technology Program. This guideline will be modified and change the categorized courses based on the adaptability and customization techniques when the curriculum is revised.

Appendix: **List of the program courses with their themes**

S/N	Theme Name	Course	Course Title	ECTS	Cr. Hrs.
1.	Computer Systems	ITec2024	Computer Organization and Architecture	5	3
		ITec2022	Operating Systems	5	3
		ITec3031	Computer Maintenance and Technical Support	6	4
2.	System/ Software Development	ITec2041	Fundamental Programming-II	5	3
		ITec2052	Data structure and Algorithms	5	3
		ITec3051	Object Oriented Programming in Java	5	3
		ITec3054	Event-Driven Programming	5	3
		ITec3056	Advanced programming	5	3
		ITec3061	System Analysis and Design	5	3
		ITec3062	Information Technology Project Management	5	3
3.	Database Systems and Information Management	ITec2071	Fundamentals of Database Systems	5	3
		ITec3071	Advanced Database Systems	5	3
		ITec3082	Information Storage and Retrieval	5	3
		ITec4081	GIS and Remote Sensing	5	3
4.	Network and Information Security	ITec2102	Data Communication and Computer Networks	5	3
		ITec3102	Introduction to Distributed Systems	5	3
		ITec4102	Wireless Networking and Telecom Technologies	5	3
		ITec4114	Network Design	5	3
		ITec4112	System and Network Administration	5	3
		ITec4133	Network Device and Configuration	5	3
		ITec4111	Information Assurance and Security	3	2
5.	Mobile Application and Web Development	ITec2092	Internet Programming-I	5	3
		ITec3093	Internet Programming-II	5	3
		ITec3058	Mobile Application Development	5	3
6.	Elective	ITec4148	Integrative Programming and Technologies	5	3
		ITec4144	Int. to Data mining and Warehousing	5	3
		ITec4146	E-Commerce	5	3
		ITec4142	Computer Graphics	5	3
7.	Miscellaneous	ITec4151	Internship	3	2
		ITec4131	Seminar on Current Trends in Information Technology	3	1
		ITec3121	Multimedia Systems	5	3
		ITec4121	Artificial Intelligence	5	3
		ITec4134	Social and Professional Ethics in IT	3	2
		ITec4155	Basic Research Method in IT	3	2
		ITec4153	Final year Project I	5	3
		ITec4154	Final year Project II	5	3

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