Ministry of Education

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

Band: One

Draft

Program:

- ✓ Bachelor of Science Degree in Electrical and Computer Engineering
- ✓ Bachelor of Science Degree in Electrical Engineering
- ✓ Bachelor of Science Degree in Electrical Power and Control Engineering
- ✓ Bachelor of Science Degree in Electronics and Communication Engineering
- ✓ Bachelor of Science Degree in Computer Engineering

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1. Introduction

The modern world witnessed, and is experiencing a tremendous competition about improving learning outcomes for development. The competition could be considered as an opportunity and a threat in maintaining sustained development and producing world class personnel. In fact, without loss of generality improving learning outcomes to the level required relies on knowledge and skill. On one hand knowledge survival is accompanied by the presence of qualified human forces, whose minds are invested in developing the system of life and competency is the key player in economic uplifting on the other. The educational system is considered as the main tributary for both. Particularly the university education plays an important role in safeguarding the knowledge and producing competent workforce.

To ensure competent human forces there by guaranteeing developed system of life, one of the most important tools is the Exit Exams, measure of outputs according to the regulating scientific controls. It provides an honest reading of the level of university outcomes, as it aims to measure the outcomes of learning the academic programs that the target group has been studying over years. The MoE has a plan of implementing the exit exam as of 2015 E.C.

With this in mind, the ministry decided to prepare this Competency Focus Areas and Core Courses for National University Exit Examination for many undergraduate programs. As part of this effort, a document was prepared and validated in July 18 – 19, 2022 and August 09-10, 2022 respectively by the taskforce formed by the ministry. The document is well prepared and is believed to meet the intended objectives. However, certain issues needed to be addressed. Consequently, we incorporated some changes and edit the document

The electrical and computer engineering program targets broad-based training to provide flexibility of career choices and focused training to provide competence in five major area, namely Electronic Communications, Electrical Power, Computer, Industrial Control, and Electronics Engineering.

Undoubtedly, the objectives of the Exit Exam vary in general, according to the vision of educational institutions and their ability to direct this type of tests in serving this vision. The objectives shall involve around:

- Measuring the extent to which the skills needed for employment have been achieved among the targeted students.
- Evaluating the quality of academic programs, in terms of learning outcomes, course descriptions and study plans, and reconsidering defects, if any.

- A number of indicators related to the quality of the teaching and evaluation processes have been reached in all academic programs and reconsidering defects, if any.
- Rectifying shortcomings of the study plans.
- Promoting the level of Ethiopian HEI graduates to achieve the requirements of the labor market, and achieve competitiveness in the quality of outputs at national, regional and international levels.

1.1. 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 spirit among PADM departments in Ethiopia with the vies to encouraging them to give due attention to the national standards

2. Objective of Test Blueprint Preparation

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.

Generally, test blueprint will help to ensure tests:

- Appropriately assess the achievement of instructional objectives of the course;

- Appropriately reflect key course goals, objectives and the material learned or covered during the instruction period; and
- 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.

3. Expected profiles of graduates

Electrical engineers and computer engineers work at the frontier of high technology and are involved in research, the creation of new ideas, the design and development of new products and technologies, manufacturing and marketing activities. They design and implement devices, circuits, and systems for communication, computing, power, control, medical diagnostics, and transportation.

To realize these, they are expected to be equipped with basic skills, must have engineering knowledge accompanied by the necessary skills and knowledge related to their particular specialization.

3.1. Basic skills

The target group (graduates) should have the following basic (but not limited to) skills in order to serve the country efficiently. Skills that make them able to.

- Able to understand the state of art techniques, devices, software, protocols.
- Proceeding in methodical approach to solve problems.
- Working independently, assuming responsibility.
- Communicate effectively, in both written and orally, on complex electrical and computer engineering activities with a variety of audiences.
- Communicative, cooperative and transparent as a team member.
- Managing projects, productions, manpower and resources cost effectively.

- Recognize the personal, national and global needs for in the broadest context of technological dynamism.

3.2. Engineering knowledge and skill

The target group (graduates) should have the following basic (but not limited to) skills in order to serve the country efficiently. Skills/knowledge that make them able to

- Understand the fundamentals of engineering mathematics and apply to engineering problems.
- Have fundamental knowledge in physics, electromagnetic fields, and semiconductors.
- Have knowledge of electrical machines, electronic analogue and digital circuits, signal & system analysis, measurements, control, microprocessor, and communication.
- Design solutions for complex engineering problems and systems considering for public, health, safety, cultural, societal and environmental considerations.
- Conduct experiments, analyze, and interpret results.
- Create, select and apply appropriate techniques, resources and modern engineering and ICT tools to solve complex electrical and computer engineering problems.
- Have a profound knowledge in computer hardware and software

3.3. Engineering Attitude

The target group (graduate) should develop the following basic attitudes.

- Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional Electrical Engineering practice.
- Recognize the need for, and have the preparations and ability to engage in independent and lifelong learning in the broadest context of technological change.
- Apply ethical principles and commit to professional ethics and responsibilities and norms of Electrical Engineering practice.
- Communicate effectively and function within a team to collaborate and create an inclusive environment with the scientific community and stakeholders.

3.4. Profiles for streams (thematic areas)

The following streams (focus areas) of Electrical and Computer Engineering are identified as very important for development of the country. A student selects one of these streams at later stage of his/her study and specializes in the area.

3.4.1. Computer engineer

A Computer Engineering graduate should be able to

- Analyze, design and implement computer hardware and software systems and applications.
- Integrating and administering hardware and software systems.

3.4.2. Electronic Communication engineer

An Electronic Communication Engineering graduate should be able to

- Analyze, design and implement modern communication equipment and systems.
- Manage and upgrade communication/telecommunication industries.

3.4.3. Electronic and Communication engineer

An Electronic and Communication Engineering graduate should be able to

- Analyze, design and implement modern communication equipment and systems.
- Produce and test electronics system for various application.

3.4.4. Electronics engineer

An Electronics Engineering graduate should be able to

- Analyze, design, develop, produce and test electronic systems.

3.4.5. Electrical power and control engineer

An Electrical Power and Control Engineering graduate should be able to

- Analyze and design electric power systems.
- Analyze, design and implement industrial control equipment and instrumentation.
- Analyze and design protection systems for electrical and mechanical systems.

3.4.6. Industrial control engineer

An Industrial control engineering graduate should be able to

- Analyze, design and implement industrial control equipment and instrumentation.
- Analyze and design microprocessor based control systems and algorithms.

3.4.7. Electrical power engineer

An Electrical Power Engineering graduate should be able to

- Analyze and design electric power systems.
- Participate in the assessment and development of renewable energy technologies for the national grid expansion as well as rural electrification efforts.
- Analyze and design protection systems for electrical and mechanical systems.

4. General Objective

The general objective or competencies and learning outcomes envisaged to be evaluated by the university exit exam of electrical and computer engineering are categorized into core electrical engineering and specialization specific objectives.

4.1. Core electrical engineering objectives

These are the heart of the program, which provides foundation for the electrical and computer engineering and are common for all specialization area. The core learning outcomes are the following.

- The target group should be able to analyze and use
    - Fundamental concepts of signals & systems,
    - The basics electrical and electronic engineering.
    - Digital logic design
    - Programming concept

4.2. Knowledge and skill in specialization specific objectives

These objectives are specific to the specializations of the electrical and computer engineering disciplines. A prospective graduate is expected to have competency of one of the following specializations.

4.2.1. Computer engineering competency

The target group specializing in computer engineering should be able to analyze, design and implement computer hardware and software systems and applications.

4.2.2. Electronic Communication engineering competency

The target group specializing in electronic communication engineering should be able to analyze, design and implement modern communication equipment and systems.

4.2.3. Electronic and Communication engineering competency

The target group specializing in Electronic and Communication Engineering should be able to analyze, design and implement electronic and communication equipment and systems

4.2.4. Electronics engineering competency

The target group specializing in electronics engineering should be able to analyze, design, develop, produce and test electronic systems for various applications.

4.2.5. Electrical power and control engineering competency

The target group specializing in Electrical Power and Control Engineering should be able to analyze, design and implement electric power and control systems.

4.2.6. Industrial control engineering competency

The target group specializing in industrial control engineering should be able to analyze, design and implement modern industrial control system, equipment and instrumentation.

4.2.7. Electrical power engineering competency

The target group specializing in electrical power engineering should be able to analyze, design and implement electric power systems.

5. Themes and list of courses

Electrical and Computer Engineering students take 60 – 65 courses and it is unrealistic to try and evaluate the student competency of all these courses by just one university exit examination. Therefore, only 12 courses are selected that can evaluate the competency of the student in key skills and knowledge.

The questions set from these courses should focus on long term knowledge and transferrable skills by taking into account the open book theme of professional practice.

In this document, core courses that are common to all and specialization (thematic area) that are supposed to evaluate the competencies set are selected. To this end, the entire target group shall sit to examinations of six (6) common core courses. In addition, to account for all the specializations and programs, six (6) courses from student's thematic area are identified.

5.1. Core courses common to all specializations

Courses to evaluate the core electrical and computer engineering competencies are:

- Fundamental of Electrical Engineering (Circuit) – 5 ECTS
- Computer programming (Introduction to Computing) – 5 ECTS
- Applied Electronics I (Electronic circuit I) – 5 ECTS
- Signals and System Analysis – 5 ECTS
- Digital logic design – 5 ECTS
- Network analysis and synthesis – 5 ECTS

5.2. Specialization specific courses

The courses specific to each of the specializations a prospective graduate is expected to have competency are.

5.2.1. Computer engineering specialization

- Object oriented programming – 5 ECTS
- Computer architecture and organization – 5 ECTS
- Microcomputers and Interfacing – 5 ECTS
- Data Communication and Computer Networks – 5 ECTS
- Embedded Systems – 5 ECTS
- Data structure – 5 ECTS

5.2.2. Electronic Communication engineering

- Introduction to Communication Systems – 5 ECTS
- Communication systems (Digital communication)– 5 ECTS
- Data Communication and Computer Networks – 5 ECTS
- Microwave Devices and Systems – 5 ECTS
- Antennas and Radio Wave Propagation – 5 ECTS
- Wireless and Mobile Communication – 5 ECTS

5.2.3. Electronics and communication engineering (ASTU)

- Introduction to Communication Systems – 5 ECTS
- Communication systems (Digital communication)– 5 ECTS
- Computer architecture and organization - 5
- Antennas and Radio Wave Propagation – 5 ECTS
- Wireless and Mobile Communication – 5 ECTS
- Microcomputers and Interfacing – 5 ECTS

5.2.4. Electronics engineering specialization

- Computer architecture and organization – 5 ECTS
- Principles of Electronic Design – 5 ECTS
- Microelectronic Devices and Circuits – 5 ECTS
- Microcomputers and Interfacing – 5 ECTS
- VLSI Design – 5 ECTS
- Analog System Design – 5 ECTS

5.2.5. Electrical power and control engineering (ASTU)

- Introduction to Electrical Machines – 5 ECTS
- Introduction to Power Systems – 5 ECTS
- Power System Analysis – 5 ECTS
- Intelligent Controller – 5 ECTS
- Introduction to Control Engineering – 5 ECTS
- Modern Control Systems – 5 ECTS

5.2.6. Industrial control engineering specialization

- Introduction to Control Engineering – 5 ECTS
- Introduction to Instrumentation (Electrical Measurement and Instrumentation) – 5 ECTS
- Electrical Machines – 5 ECTS
- Modern Control Systems – 5 ECTS
- Electrical Installation – 5 ECTS
- Power Electronics and Drives – 5 ECTS

5.2.7. Power engineering specialization

- Introduction to Power Systems – 5 ECTS
- Electrical Machines – 5 ECTS
- Power Electronics – 5 ECTS
- Electrical Installation – 5 ECTS
- Energy Conversion and Rural Electrification – 5 ECTS
- Power System Protection and Control – 5 ECTS

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

The percentage share of the themes and courses are the following.

6.1. Core courses common to all specializations: 50%

The following courses were selected to evaluate the core electrical and computer engineering competency.

- Fundamental of Electrical Engineering (Circuit) – 18%
- Computer programming (Introduction to Computing) – 16%
- Applied Electronics I (Electronic circuit I) – 18%
- Signals and System Analysis – 16%
- Digital logic design – 16%

- Network analysis and synthesis – 16%

6.2. Specialization specific courses

These courses are specific to each of the five specializations and a prospective graduate is expected to have competency in one of these specializations.

6.2.1. Computer engineering specialization (50%)

- Object oriented programming – 16%
- Computer architecture and organization – 18%
- Microcomputers and Interfacing – 16%
- Data Communication and Computer Networks –18%
- Embedded Systems – 16%
- Data structure – 16%

6.2.2. Electronic communication engineering specialization (50%)

- Introduction to Communication Systems – 18%
- Communication systems (Digital communication)– 16%
- Data Communication and Computer Networks – 16%
- Microwave Devices and Systems – 18%
- Antennas and Radio Wave Propagation – 16%
- Wireless and Mobile Communication – 16%

6.2.3. Electronics and communication engineering (ASTU)

- Introduction to Communication Systems – 18%
- Communication systems (Digital communication)– 16%
- Computer architecture and organization - 18%
- Antennas and Radio Wave Propagation – 16%
- Wireless and Mobile Communication – 16%
- Microcomputers and Interfacing – 16%

6.2.4. Electronics engineering specialization (50%)

- Computer architecture and organization – 18%
- Principles of Electronic Design – 16%
- Microelectronic Devices and Circuits – 16%
- Microcomputers and Interfacing – 18%
- VLSI Design – 16%
- Analog System Design – 16%

6.2.5. Electrical power and control engineering (50%)

- Introduction to Electrical Machines – 18%
- Introduction to Power Systems – 16%
- Power System Analysis – 18%
- Intelligent Controller – 16%
- Introduction to Control Engineering – 16%
- Modern Control Systems – 16%

6.2.6. Industrial control engineering specialization (50%)

- Introduction to Control Engineering – 18%
- Introduction to Instrumentation – 16%
- Electrical Machines – 18%
- Modern Control Systems – 16%
- Electrical Installation – 16%
- Power Electronics and Drives – 16%

6.2.7. Electrical power engineering specialization (50%)

- Introduction to Power Systems – 18%
- Electrical Machines – 18%
- Power Electronics – 16%
- Electrical Installation – 16%
- Energy Conversion and Rural Electrification – 16%
- Power System Protection and Control – 16%

7. Learning outcomes in terms of the three domains (Knowledge, Skill and Attitude)

The courses are categorized according to the expected competencies of a prospective graduate of Electrical and Computer Engineering.

Table 1: Learning outcomes

S/N	***Course name***	***ECTS***	***Knowledge***	***Skill***	***Attitude***	***Theme***
1.	Fundamental of Electrical Engineering (Circuit)	5	✓	✓	✓	Core Electrical Engineering
2.	Computer programming (Introduction to Computing)	5	✓	✓	✓	Core Electrical Engineering

S/N	*Course name*	*ECTS*	*Knowledge*	*Skill*	*Attitude*	*Theme*
3.	Applied Electronics I (Electronic circuit I)	5	✓	✓	✓	Core Electrical Engineering
4.	Signals and System Analysis	5	✓	✓		Core Electrical Engineering
5.	Digital logic design	5	✓	✓		Core Electrical Engineering
6.	Network analysis and synthesis	5	✓	✓		Core Electrical Engineering
7.	Object oriented programming	5	✓	✓		Computer Engineering
8.	Computer architecture and organization	5	✓	✓		Computer Engineering
9.	Microcomputers and Interfacing	5	✓	✓		Computer Engineering
10.	Data Communication and Computer Networks	5	✓	✓	✓	Computer Engineering
11.	Embedded Systems	5	✓	✓	✓	Computer Engineering
12.	Data structure	5	✓	✓		Computer Engineering
13.	Introduction to Power Systems	5	✓	✓	✓	Electrical Power Engineering
14.	Electrical Machines	5	✓	✓	✓	Electrical Power Engineering
15.	Power Electronics	5	✓	✓	✓	Electrical Power Engineering
16.	Electrical Installation	5	✓	✓	✓	Electrical Power Engineering
17.	Energy Conversion and Rural Electrification	5	✓	✓	✓	Electrical Power Engineering
18.	Power System Protection and Control	5	✓	✓	✓	Electrical Power Engineering
19.	Introduction to Communication Systems	5	✓	✓		Communication Engineering
20.	Communication systems (Digital communication)	5	✓	✓		Communication Engineering
21.	Microwave Devices and Systems	5	✓	✓	✓	Communication Engineering
22.	Antennas and Radio Wave Propagation	5	✓	✓		Communication Engineering
23.	Wireless and Mobile Communication	5	✓	✓	✓	Communication Engineering
24.	Introduction to Control Engineering (Systems)	5	✓	✓		Industrial Control Engineering
25.	Introduction to Instrumentation	5	✓	✓		Industrial Control Engineering

S/N	Course name	ECTS	Knowledge	Skill	Attitude	Theme
	(Electrical measurement and instrumentation)					
26.	Modern Control Systems	5	✓	✓		Industrial Control Engineering
27.	Power Electronics and Drives	5	✓	✓	✓	Electrical Power Engineering
28.	Principles of Electronic Design	5	✓	✓		Electronics Engineering
29.	Microelectronic Devices and Circuits	5	✓	✓		Electronics Engineering
30.	VLSI Design	5	✓	✓		Electronics Engineering
31.	Analog System Design	5	✓	✓		Electronics Engineering
32.	Power System Analysis	5	✓	✓	✓	Electrical Power Engineering
33.	Intelligent Controller	5	✓	✓		Industrial Control Engineering
34.	Introduction to Electrical Machines	5	✓	✓		Electrical Power and Control Engineering

8. Test Blueprint (Table Specification)

The table of specification of the test blueprint for the different specializations of the Electrical and Computer Engineering are shown in the following pages as follows.

- Table 2: Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Computer Engineering)
- Table 3: Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Electronic Communication Engineering)
- Table 4: Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Electronics & Communication Engineering)
- Table 5: Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Electronics Engineering)
- Table 6: Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Electrical Power and Control Engineering)
- Table 7: Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Industrial Control Engineering)
- Table 8: Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Power Engineering)

Ministry of Education (Table 2)
Higher Education Sub-sector

Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Computer Engineering)

Themes	Name of Courses	ECTS	Weight of course or proportion	Number of test items from each course	Learning outcome	Learning outcomes								Total
						Cognitive						Affective	Psychomotor	
						Remembering	Understanding	Application	Analysis	Evaluation	Creation/Synthesis			
Core Share = 50 items from the total	Fundamental of Electrical Engineering	5	5/30≈0.17	0.17*50≈9	➢ To enable students to understand the basic electromagnetic phenomenon, circuit variables and parameters	1	1	-	-	-	-	1	-	9
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of dc circuits	-	-	1	2	1	-		-	
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of steady state poly-phase ac circuits;	-	-	-	1	1	-	-	-	
	Computer programming (Introduction to computing)	5	5/30≈0.17	0.17*50≈8	➢ Familiarize students with components of computers	1	-	-	-	-	-	1	-	8
					➢ Define common terminologies used in programming	-	1	-	-	-	-	-	-	
					➢ Explain the steps, tools and technical approaches involved in program design	-	1	-	1	-	-	-	-	
					➢ Use the techniques of program design to develop programs that solve real life problems	-	-	-	-	1	1	-	-	
					➢ Utilize advanced concepts of programming to provide better solutions	-	-	1	-	-	-	-	-	

	Applied Electronics (I)	5	5/30≈0.17	0.17*50≈9	➢ To equip students with the basics of Semiconductor technology in the application of electronics equipment	1	1	-	-	-	-	-	-	9
					➢ To train students the operational principle of Semiconductor devices (Diodes, BJT and FET) and the analysis, design and application of electronic circuits, such as amplifiers	-	1	1	1	1	-	-	-	
					➢ To introduce sample applications and design guidelines of electronic circuits	-	-	-	1	1	-	-	-	
					➢ To initiate the students' understanding of the concepts, know-how and tools of Electronic Design Automation (EDA) for circuit analysis and design	-	-	-	-	-	-	1	-	
	Signals and system analysis	5	5/30≈0.17	0.17*50≈8	➢ Enable student to understand and apply the representation, classification, characterization and analysis of signals and systems in time and frequency domains	2	1	1	2	1	-	1	-	8
	Digital Logic Design	5	5/30≈0.17	0.17*50≈8	➢ To introduce students with principles of Digital Systems	1	1	-	-	-	-	-	-	8
					➢ To study property and realization of the various logic gates	-	-	1	1	1	-	-	-	
					➢ To make the student able to design Combinational and Sequential Systems	-	-	-	-	1	1	1	-	
	Network analysis and synthesis	5	5/30≈0.17	0.17*50≈8	➢ Understand and apply the techniques of modelling, analysis, design and synthesis of 1- and 2- port passive and active electric networks and filters in a classical and a modern approach.	1	1	1	1	1	2	1	-	8
	Core Total ECTS	30												
Computer Engineering Specialization Share = 50 items from the total	Object oriented programming	5	5/30≈0.17	0.17*50≈8	➢ Understand major concepts of object-oriented programming	1							-	8
					➢ Gain knowledge and skills in OO design and program development using Java		1			1	1			
					➢ Understand the advantages of object-oriented design techniques including encapsulation, abstraction, inheritance, polymorphism, and reusability.				2			1		

					➢ Understand the concept of object-oriented programing based networking			1						
	Computer architecture and organization	5	5/30≈0.17	0.17*50≈9	➢ To introduce the architecture and organization of a computer system and its components	1	1	1	1	1			-	9
					➢ To design and simulate a basic computer system				1	1	1	1		
	Microcomputers and Interfacing	5	5/30≈0.17	0.17*50≈8	➢ To familiarize the basics of microcomputers: register level organization, instruction set and peripheral devices interfacing.	1	1	-	1	1	-	-	-	8
					➢ To interface hardware to microcomputers and design microcomputer based systems	-	-	1		1	1	1	-	
	Data Communication and Computer Networks	5	5/30≈0.17	0.17*50≈9	➢ To introduce students to networking concepts, technologies and terminologies.	1	1	-	1	1	-	-	-	9
					➢ To provide basic computer communication and networking knowledge and lay the foundations for further courses dealing with different aspects of networking.	-	-	-	1	1	1	1	-	
	Embedded Systems	5	5/30≈0.17	0.17*50≈8	➢ Clear understanding of Embedded Systems.	1	1	-	1	1	-	-	-	8
					➢ Capability to specify, design and develop Embedded Systems for a specific purpose capability to program, test and verify software for Embedded Systems.	-	-	1	1	1	-	1	-	
	Data structure	5	5/30≈0.17	0.17*50≈8	➢ To provide profound knowledge of the various data structures together with their implementation and associated operations.	1	1	-	1	1	-	-	-	8
					➢ To make the student able to use existing data structures and to create a new one.			1	2		-	1	-	
	Core Total ECTS	30												

Ministry of Education (Table 3)

Higher Education Sub-sector

Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Electronic Communication Engineering)

Themes	Name of Courses	ECTS	Weight of course or proportion	Number of test items from each course	Learning outcome	Learning outcomes								Total
						Cognitive						Affective	Psychomotor	
						Remembering	Understanding	Application	Analysis	Evaluation	Creation/Synthesi			
Core Share = 50 items from the total	Fundamental of Electrical Engineering	5	5/30≈0.17	0.17*50≈9	➢ To enable students to understand the basic electromagnetic phenomenon, circuit variables and parameters	1	1	-	-	-	-	1	-	9
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of dc circuits	-	-	1	2	1	-		-	
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of steady state poly-phase ac circuits;	-	-	-	1	1	-	-	-	
	Computer programming (Introduction to computing)	5	5/30≈0.17	0.17*50≈8	➢ Familiarize students with components of computers	1	-	-	-	-	-	1	-	8
					➢ Define common terminologies used in programming	-	1	-	-	-	-	-	-	
					➢ Explain the steps, tools and technical approaches involved in program design	-	1	-	1	-	-	-	-	
					➢ Use the techniques of program design to develop programs that solve real life problems	-	-	-	-	1	1	-	-	
					➢ Utilize advanced concepts of programming to provide better solutions	-	-	1	-	-	-	-	-	

Themes	Name of Courses	ECTS	Weight of course or proportion	Number of test items from each course	Learning outcome	Learning outcomes								Total
						Cognitive						Affective	Psychomotor	
						Remembering	Understanding	Application	Analysis	Evaluation	Creation/Synthesi			
	Applied Electronics (I)	5	5/30≈0.17	0.17*50≈9	➢ To equip students with the basics of Semiconductor technology in the application of electronics equipment	1	1	-	-	-	-	-	-	9
					➢ To train students the operational principle of Semiconductor devices (Diodes, BJT and FET) and the analysis, design and application of electronic circuits, such as amplifiers	-	1	1	1	1	-	-	-	
					➢ To introduce sample applications and design guidelines of electronic circuits	-	-	-	1	1	-	-	-	
					➢ To initiate the students' understanding of the concepts, know-how and tools of Electronic Design Automation (EDA) for circuit analysis and design	-	-	-	-	-	-	1	-	
	Signals and system analysis	5	5/30≈0.17	0.17*50≈8	➢ Enable student to understand and apply the representation, classification, characterization and analysis of signals and systems in time and frequency domains	2	1	1	2	1	-	1	-	8
	Digital Logic Design	5	5/30≈0.17	0.17*50≈8	➢ To introduce students with principles of Digital Systems	1	1	-	-	-	-	-	-	8
					➢ To study property and realization of the various logic gates	-	-	1	1	1	-	-	-	
					➢ To make the student able to design Combinational and Sequential Systems	-	-	-	-	1	1	1	-	
	Network analysis and synthesis	5	5/30≈0.17	0.17*50≈8	➢ Understand and apply the techniques of modelling, analysis, design and synthesis of 1- and 2- port passive and active electric networks and	1	1	1	1	1	2	1	-	8

Themes	Name of Courses	ECTS	Weight of course or proportion	Number of test items from each course	Learning outcome	Learning outcomes								Total
						Cognitive						Affective	Psychomotor	
						Remembering	Understanding	Application	Analysis	Evaluation	Creation/Synthesi			
					filters in a classical and a modern approach.									
	Core Total ECTS	30												
Electronic Communication Engineering Specialization Share = 50 items from the total	Introduction to Communication Systems	5	5/30≈0.17	0.17*50≈9	➢ To give a strong background in communication systems engineering.	1	1	-	-	-	-	1	-	9
					➢ To teach the different analogue and digital linear and non-linear modulation and demodulation techniques those are common to many communication systems	-	1	1	2	1	1	-	-	
					➢ To provide concrete understanding on analogue and digital communication system components	1	-	-	-	-	-	1	-	
	Communication systems (Digital communication	5	5/30≈0.17	0.17*50≈8	➢ To present understanding on noise and its impact in communication systems	-	1	-	-	-	-	-	-	8
					➢ To deliver understanding on performance metrics, performance and performance comparison of communications systems and their components	-	-	1	1	-	1	-	-	
					➢ To provide understanding on information theory and communication channel capacity	-	-	-	1	1	-	-	-	
					➢ To introduce students to networking concepts, technologies and terminologies.	1	1	-	-	-	-	1	-	
	Data Communication	5	5/30≈0.17	0.17*50≈8	➢ To provide basic computer communication and networking knowledge and lay the foundations	-	-	1	1	2	1	-	-	8

Themes	Name of Courses	ECTS	Weight of course or proportion	Number of test items from each course	Learning outcome	Learning outcomes								Total
						Cognitive						Affective	Psychomotor	
						Remembering	Understanding	Application	Analysis	Evaluation	Creation/Synthesi			
	and Computer Networks				for further courses dealing with different aspects of networking.									
					➢ Appreciate the use of microwave devices and systems that they come across in their carriers and daily life.	1	-	-	-	-	-	1	-	
	Microwave Devices and Systems	5	5/30≈0.17	0.17*50≈9	➢ Gain knowledge and understanding of the working principles of different types of waveguides	-	1	-	2	-	-	-	-	9
					Understand and use the basic microwave devices and systems (both classical and modern)	-	-	2	-	1	1	-	-	
					➢ Understand and quantify how antennas launch electromagnetic waves into the surrounding medium.	1	-	-	-	-	-	1	-	
					➢ Understand how to characterize antennas	-	1	-	-	-	-	-	-	
	Antennas and Radio Wave Propagation	5	5/30≈0.17	0.17*50≈8	➢ Understand types of antennas and describe their radiation characteristics.	-	-	1	-	-	-	-	-	8
					➢ Familiarize with basic antenna and electromagnetic simulation	-	-	-	1	1	-	-	-	
					➢ Have gained insight into how radio waves (Ground waves, Sky waves, Line of Sight waves, etc.) propagate into space	-	-	-	1		1	-	-	
					➢ Gain knowledge and understanding of the working principles of different types of Wireless Mobile communication systems	1	1	-	-	-	-	-	-	

Themes	Name of Courses	ECTS	Weight of course or proportion	Number of test items from each course	Learning outcome	Learning outcomes								Total
						Cognitive						Affective	Psychomotor	
						Remembering	Understanding	Application	Analysis	Evaluation	Creation/Synthesi			
					➢ Understand the application of frequency reuse and efficient spectral use.	-	-	1	-	-	-	-	-	
	Wireless and Mobile Communication	5	5/30≈0.17	0.17*50≈8	➢ Understand the concept of channel modelling in wireless communication systems ➢	-	-	1	-	1	-	-	-	8
					➢ Understand the concept of modulation with regard to wireless applications	-	-	1	-	-	-	-	-	
					➢ Understand the concept of mitigation techniques to avoid channel impairments	-	-	-	1	-	-	-	-	
					➢ The course will serve students as background for an advanced study in wireless communications	-	-	-	-	-	-	1	-	
	Core Total ECTS	30												

Ministry of Education (Table 4)

Higher Education Sub-sector

Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Electronics & Communication Engineering)

Themes	Name of Courses	ECTS	Weight of course or proportion	Number of test items from each course	Learning outcome	Learning outcomes								Total
						Cognitive						Affective	Psychomotor	
						Remembering	Understanding	Application	Analysis	Evaluation	Creation/Synthesis			
Core Share = 50 items from the total	Fundamental of Electrical Engineering	5	5/30≈0.17	0.17*50≈9	➢ To enable students to understand the basic electromagnetic phenomenon, circuit variables and parameters	1	1	-	-	-	-	1	-	9
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of dc circuits	-	-	1	2	1	-		-	
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of steady state poly-phase ac circuits;	-	-	-	1	1	-	-	-	
	Computer programming (Introduction to computing)	5	5/30≈0.17	0.17*50≈8	➢ Familiarize students with components of computers	1	-	-	-	-	-	1	-	8
					➢ Define common terminologies used in programming	-	1	-	-	-	-	-	-	
					➢ Explain the steps, tools and technical approaches involved in program design	-	1	-	1	-	-	-	-	
					➢ Use the techniques of program design to develop programs that solve real life problems	-	-	-	-	1	1	-	-	
					➢ Utilize advanced concepts of programming to provide better solutions	-	-	1	-	-	-	-	-	

	Applied Electronics (I)	5	5/30≈0.17	0.17*50≈9	➢ To equip students with the basics of Semiconductor technology in the application of electronics equipment	1	1	-	-	-	-	-	-	9
					➢ To train students the operational principle of Semiconductor devices (Diodes, BJT and FET) and the analysis, design and application of electronic circuits, such as amplifiers	-	1	1	1	1	-	-	-	
					➢ To introduce sample applications and design guidelines of electronic circuits	-	-	-	1	1	-	-	-	
					➢ To initiate the students' understanding of the concepts, know-how and tools of Electronic Design Automation (EDA) for circuit analysis and design	-	-	-	-	-	-	1	-	
	Signals and system analysis	5	5/30≈0.17	0.17*50≈8	➢ Enable student to understand and apply the representation, classification, characterization and analysis of signals and systems in time and frequency domains	2	1	1	2	1	-	1	-	8
	Digital Logic Design	5	5/30≈0.17	0.17*50≈8	➢ To introduce students with principles of Digital Systems	1	1	-	-	-	-	-	-	8
					➢ To study property and realization of the various logic gates	-	-	1	1	1	-	-	-	
					➢ To make the student able to design Combinational and Sequential Systems	-	-	-	-	1	1	1	-	
	Network analysis and synthesis	5	5/30≈0.17	0.17*50≈8	➢ Understand and apply the techniques of modelling, analysis, design and synthesis of 1- and 2- port passive and active electric networks and filters in a classical and a modern approach.	1	1	1	1	1	2	1	-	8
	Core Total ECTS	30												
Electronics & Communication	Introduction to Communication Systems	5	5/30≈0.17	0.17*50≈9	➢ To give a strong background in communication systems engineering.	1	1	-	-	-	-	1	-	9
					➢ To teach the different analogue and									

Engineering Specialization Share = 50 items from the total					➢ digital linear and non-linear modulation and demodulation techniques those are common to many communication systems	-	1	1	2	1	1	-	-	
	Communication systems (Digital communication)	5	5/30≈0.17	0.17*50≈8	➢ To provide concrete understanding on analogue and digital communication system components	1	-	-	-	-	-	1	-	8
					➢ To present understanding on noise and its impact in communication systems	-	1	-	-	-	-	-	-	
					➢ To deliver understanding on performance metrics, performance and performance comparison of communications systems and their components	-	-	1	1	-	1	-	-	
					➢ To provide understanding on information theory and communication channel capacity	-	-	-	1	1	-	-	-	
	Computer architecture and organization	5	5/30≈0.17	0.17*50≈9	➢ To introduce the architecture and organization of a computer system and its components	1	1	-	-	-	-	1	-	9
					➢ To design and simulate a basic computer system	-	-	1	2	2	1	-	-	
	Antennas and Radio Wave Propagation	5	5/30≈0.17	0.17*50≈8	➢ Understand and quantify how antennas launch electromagnetic waves into the surrounding medium.	1	-	-	-	-	-	1	-	8
					➢ Understand how to characterize antennas	-	1	-	-	-	-	-	-	
					➢ Understand types of antennas and describe their radiation characteristics.	-	-	1	-	-	-	-	-	
					➢ Familiarize with basic antenna and electromagnetic simulation	-	-	-	1	1	1	-	-	

					➢ Have gained insight into how radio waves (Ground waves, Sky waves, of Sight waves, etc.) propagate into space	-	-	-	1	-	-	-	-	
	Wireless and Mobile Communication	5	5/30≈0.17	0.17*50≈8	➢ Gain knowledge and understanding of the working principles of different types of Wireless Mobile communication systems	1	1	-	-	-	-	1	-	8
					➢ Understand and the application of frequency reuse and efficient spectral use.	-	-	1	-	-	-	-	-	
					➢ Understand the concept of channel modelling in wireless communication systems	-	-	1	-	-	-	-	-	
					➢ Understand the concept of modulation with regard to wireless applications	-	-	-	1	-	-	-	-	
					➢ Understand the concept of mitigation techniques to avoid channel impairments	-	-	-	1	1	-	-	-	
	Microcomputers and Interfacing	5	5/30≈0.17	0.17*50≈8	➢ To familiarize the basics of microcomputers: register level organization, instruction set and peripheral devices interfacing.	1	1	-	-	-	-	1	-	8
					➢ To interface hardware to microcomputers and design microcomputer based systems	-	-	2	1	1	1	-	-	
	Core Total ECTS	30												

Ministry of Education (Table 5)

Higher Education Sub-sector

Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Electronics Engineering)

Themes	**Name of Courses**	**ECTS**	**Weight of course or proportion**	**Number of test items from each course**	**Learning outcome**	**Learning outcomes**								**Total**
						Cognitive						**Affective**	**Psychomotor**	
						Remembering	Understanding	Application	Analysis	Evaluation	Creation/Synthesi			
Core Share = 50 items from the total	Fundamental of Electrical Engineering	5	5/30≈0.17	0.17*50≈9	➢ To enable students to understand the basic electromagnetic phenomenon, circuit variables and parameters	1	1	-	-	-	-	1	-	9
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of dc circuits	-	-	1	2	1	-		-	
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of steady state poly-phase ac circuits;	-	-	-	1	1	-	-	-	
	Computer programming (Introduction to computing)	5	5/30≈0.17	0.17*50≈8	➢ Familiarize students with components of computers	1	-	-	-	-	-	1	-	8
					➢ Define common terminologies used in programming	-	1	-	-	-	-	-	-	
					➢ Explain the steps, tools and technical approaches involved in program design	-	1	-	1	-	-	-	-	
					➢ Use the techniques of program design to develop programs that solve real life problems	-	-	-	-	1	1	-	-	
					➢ Utilize advanced concepts of programming to provide better solutions	-	-	1	-	-	-	-	-	

	Applied Electronics (I)	5	5/30≈0.17	0.17*50≈9	➢ To equip students with the basics of Semiconductor technology in the application of electronics equipment	1	1	-	-	-	-	-	-	9
					➢ To train students the operational principle of Semiconductor devices (Diodes, BJT and FET) and the analysis, design and application of electronic circuits, such as amplifiers	-	1	1	1	1	-	-	-	
					➢ To introduce sample applications and design guidelines of electronic circuits	-	-	-	1	1	-	-	-	
					➢ To initiate the students' understanding of the concepts, know-how and tools of Electronic Design Automation (EDA) for circuit analysis and design	-	-	-	-	-	-	1	-	
	Signals and system analysis	5	5/30≈0.17	0.17*50≈8	➢ Enable student to understand and apply the representation, classification, characterization and analysis of signals and systems in time and frequency domains	2	1	1	2	1	-	1	-	8
	Digital Logic Design	5	5/30≈0.17	0.17*50≈8	➢ To introduce students with principles of Digital Systems	1	1	-	-	-	-	-	-	8
					➢ To study property and realization of the various logic gates	-	-	1	1	1	-	-	-	
					➢ To make the student able to design Combinational and Sequential Systems	-	-	-	-	1	1	1	-	
	Network analysis and synthesis	5	5/30≈0.17	0.17*50≈8	➢ Understand and apply the techniques of modelling, analysis, design and synthesis of 1- and 2-port passive and active electric networks and filters in a classical and a modern approach.	1	1	1	1	1	2	1	-	8
	Core Total ECTS	30												
Electronics Engineering	Computer architecture	5	5/30≈0.17	0.17*50≈9	➢ To introduce the architecture and organization of a computer system and its components	1	1	-	-	-	-	1	-	9

Specialization Share = 50 items from the total	and organization				➢ To design and simulate a basic computer system	-	-	1	2	2	1	-	-	
	Principles of Electronic Design	5	5/30≈0.17	0.17*50≈8	➢ To model, describe and understand the electrical and physical properties of electronic components	1	1	-	-	-	-	1	-	8
					➢ To develop hands on experience on ECAD tools	-	-	1	1	1	-	-	-	
					➢ To appreciate time to market problems and get acquaintance with ECAD front end tools	-	-	-	1	1	-	-	-	
	Microelectronic Devices and Circuits	5	5/30≈0.17	0.17*50≈9	➢ Understand the basic concepts realization of microelectronic devices and circuits;	1	1	-	-	-	-	1	-	9
					➢ Study cases of microelectronic systems; ➢	-	-	-	1	-	-	-	-	
					➢ Be able to effectively participate in microelectronic applications, selection, modification, purchase and production to meet the market / social demands	-	-	1	1	2	1	-	-	
	Microcomputers and Interfacing	5	5/30≈0.17	0.17*50≈8	➢ To familiarize the basics of microcomputers: Register level organization, instruction set and peripheral devices interfacing.	1	1	-	-	-	-	1	-	8
					➢ To interface hardware to microcomputers and design microcomputer-based systems	-	-	2	1	1	1	-	-	
	VLSI Design	5	5/30≈0.17	0.17*50≈8	➢ To acquaint the student with VLSI concepts, use hardware design languages such as VHDL.	-	-	-	–	-	-	1	-	8
					➢ To enable the student design, simulate and test ASICs	-	-	-	–	-	1	-	-	

					➢ To acquaint the student with hardware description language and Be able to use mathematical methods and circuit analysis	-	1	-	-	-	-	-	-	
					➢ models in analysis of CMOS digital electronics circuits, including logic components and their interconnects.	-	-	1	-	-	-	-	-	
					➢ Be able to create models of moderately sized CMOS circuits that realize specified digital functions.	-	-	-	–	-	1	-	-	
					➢ Integrate VLSI chip designs into larger complex system designs.	-	-	1	-	-	-	-	-	
					➢ Use automated layout tools to produce geometric descriptions of complex integrated circuit designs.	-	-	1	-	-	-	-	-	
					➢ Design structured system building blocks for use in testable designs such as BIST	-	-	-	–	-	1	-	-	
	Analog System Design	5	5/30≈0.17	0.17*50≈8	➢ The students will be able to understand details of MOS amplifiers, current mirrors, frequency generators and high speed techniques.	1	1	-	-	-	-	1	-	8
					➢ The students will have a sound understanding of the design and analysis of advanced analog electronic circuits and systems	-	-	2	1	1	1	-	-	
	Core Total ECTS	30												

Ministry of Education (Table 6)

Higher Education Sub-sector

Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Electrical Power and Control Engineering)

Themes	Name of Courses	ECTS	Weight of course or proportion	Number of test items from each course	Learning outcome	Learning outcomes								Total
						Cognitive						Affective	Psychomotor	
						Remembering	Understanding	Application	Analysis	Evaluation	Creation/Synthesis			
Core Share = 50 items from the total	Fundamental of Electrical Engineering	5	5/30≈0.17	0.17*50≈9	➢ To enable students to understand the basic electromagnetic phenomenon, circuit variables and parameters	1	1	-	-	-	-	1	-	9
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of dc circuits	-	-	1	2	1	-		-	
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of steady state poly-phase ac circuits;	-	-	-	1	1	-	-	-	
	Computer programming (Introduction to computing)	5	5/30≈0.17	0.17*50≈8	➢ Familiarize students with components of computers	1	-	-	-	-	-	1	-	8
					➢ Define common terminologies used in programming	-	1	-	-	-	-	-	-	
					➢ Explain the steps, tools and technical approaches involved in program design	-	1	-	1	-	-	-	-	
					➢ Use the techniques of program design to develop programs that solve real life problems	-	-	-	-	1	1	-	-	
					➢ Utilize advanced concepts of programming to provide better solutions	–	-	1	-	-	-	-	-	

	Applied Electronics (I)	5	5/30≈0.17	0.17*50≈9	➢ To equip students with the basics of Semiconductor technology in the application of electronics equipment	1	1	-	-	-	-	-	-	9
					➢ To train students the operational principle of Semiconductor devices (Diodes, BJT and FET) and the analysis, design and application of electronic circuits, such as amplifiers	-	1	1	1	1	-	-	-	
					➢ To introduce sample applications and design guidelines of electronic circuits	-	-	-	1	1	-	-	-	
					➢ To initiate the students' understanding of the concepts, know-how and tools of Electronic Design Automation (EDA) for circuit analysis and design	-	-	-	-	-	-	1	-	
	Signals and system analysis	5	5/30≈0.17	0.17*50≈8	➢ Enable student to understand and apply the representation, classification, characterization and analysis of signals and systems in time and frequency domains	2	1	1	2	1	-	1	-	8
	Digital Logic Design	5	5/30≈0.17	0.17*50≈8	➢ To introduce students with principles of Digital Systems	1	1	-	-	-	-	-	-	8
					➢ To study property and realization of the various logic gates	-	-	1	1	1	-	-	-	
					➢ To make the student able to design Combinational and Sequential Systems	-	-	-	-	1	1	1	-	
	Network analysis and synthesis	5	5/30≈0.17	0.17*50≈8	➢ Understand and apply the techniques of modelling, analysis, design and synthesis of 1- and 2-port passive and active electric networks and filters in a classical and a modern approach.	1	1	1	1	1	2	1	-	8
	Core Total ECTS	30												

Electrical Power and Control Engineering Specialization Share = 50 items from the total	Introduction to Electrical Machines	5	5/30≈0.17	0.17*50≈8	➢ Explain basic concepts of electromagnetic circuits as they relate to voltages, currents, and physical forces induced in conductors.	1	1	-	-	-	-	-	-	9
					➢ Explain principles of operation & construction of transformer, induction machines, D.C. machines, and synchronous machines.	–	–	1	1	1	-	-	-	
					➢ Develops analytical models for transformers and electrical rotating machines.	–	–	–	1	1	-	-	-	
					➢ Identify and establish power requirements, power capability, efficiency and operating characteristics	–	–	–	–	–	1	1	-	
	Introduction to Power Systems	5	5/30≈0.17	0.17*50≈8	➢ To introduce the basic analytical methods for calculation of line parameters.	1	1	-	-	-	-	-	-	8
					➢ To have a sound understanding of fundamentals of power systems and modeling its components for power transmission.	–	–	–	1	–	-	-	-	
					➢ To have a sound understanding of performance analysis of transmission lines, cables and overhead line insulators.	–	–	–	1	1	1	-	-	
					➢ To achieve a good understanding of the mechanical design considerations and installation of overhead transmission lines.	–	–	1	–	–	-	-	-	
					➢ To develop a basic understanding of high voltage engineering components	–	–	–	–	–	-	1	-	
	Power System Analysis	5	5/30≈0.17	0.17*50≈8	➢ To understand the analytical techniques of fault analysis and stability analysis.	1	1	-	-	-	-	-	-	9
					➢ To understand and analyze power system transients.	–	–	–	1	1	-	1	-	

					➢ To have a sound understanding of load flow studies.	–	–	–	1	–	1	-	-	
					➢ To understand economic load dispatch.	–	–	1	–	1	-	-	-	
	Intelligent Controller	5	5/30≈0.17	0.17*50≈9	➢ Overview and fundamentals of intelligent control systems (Neural networks and fuzzy logic)	1	1	-	1	-	-	-	-	8
					➢ Intelligent auto tuning of auto controller with evolutionary techniques.	–	–	1	–	1	1	1	-	
					➢ ANFIS system.	–	–	1	–	–	-	-	-	
	Introduction to Control Engineering	5	5/30≈0.17	0.17*50≈8	➢ Acquiring solid foundation in mathematical modeling of Physical Systems	1	1	-	-	-	-	-	-	8
					➢ Add knowledge base in the fundamentals of electrical engineering modeling and design	–	–	–	1	1	-	-	-	
					➢ Develop basic skills of utilizing mathematical tools needed to analyze and design classical linear dynamic control systems	–	–	–	1	1	-	-	-	
					➢ Get real world experience in control systems problems, design, and implementation	–	–	–	–	–	-	1	-	
					➢ Use and understand the application of software tools in control system analysis and design	–	–	1	–	–	-	-	-	
	Modern Control Systems	5	5/30≈0.17	0.17*50≈8	➢ Understanding and developing State space representation of control systems	1	1	-	-	-	-	1	-	8
					➢ Analyzing system models in state space model	–	–	–	2	–	-	-	-	
					➢ Design and synthesize controllers in state space	–	–	1	–	1	1	-	-	
	Core Total ECTS	30												

Ministry of Education (Table 7)

Higher Education Sub-sector

Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Industrial Control Engineering)

Themes	Name of Courses	ECTS	Weight of course or proportion	Number of test items from each course	Learning outcome	Learning outcomes								Total
						Cognitive						Affective	Psychomotor	
						Remembering	Understanding	Application	Analysis	Evaluation	Creation/Synthesi			
Core Share = 50 items from the total	Fundamental of Electrical Engineering	5	5/30≈0.17	0.17*50≈9	➢ To enable students to understand the basic electromagnetic phenomenon, circuit variables and parameters	1	1	-	-	-	-	1	-	9
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of dc circuits	-	-	1	2	1	-		-	
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of steady state poly-phase ac circuits;	-	-	-	1	1	-	-	-	
	Computer programming (Introduction to computing)	5	5/30≈0.17	0.17*50≈8	➢ Familiarize students with components of computers	1	-	-	-	-	-	1	-	8
					➢ Define common terminologies used in programming	-	1	-	-	-	-	-	-	
					➢ Explain the steps, tools and technical approaches involved in program design	-	1	-	1	-	-	-	-	
					➢ Use the techniques of program design to develop programs that solve real life problems	-	-	-	-	1	1	-	-	
					➢ Utilize advanced concepts of programming to provide better solutions	–	-	1	-	-	-	-	-	

	Applied Electronics (I)	5	5/30≈0.17	0.17*50≈9	➢ To equip students with the basics of Semiconductor technology in the application of electronics equipment	1	1	-	-	-	-	-	-	9
					➢ To train students the operational principle of Semiconductor devices (Diodes, BJT and FET) and the analysis, design and application of electronic circuits, such as amplifiers	-	1	1	1	1	-	-	-	
					➢ To introduce sample applications and design guidelines of electronic circuits	-	-	-	1	1	-	-	-	
					➢ To initiate the students' understanding of the concepts, know-how and tools of Electronic Design Automation (EDA) for circuit analysis and design	-	-	-	-	-	-	1	-	
	Signals and system analysis	5	5/30≈0.17	0.17*50≈8	➢ Enable student to understand and apply the representation, classification, characterization and analysis of signals and systems in time and frequency domains	2	1	1	2	1	-	1	-	8
	Digital Logic Design	5	5/30≈0.17	0.17*50≈8	➢ To introduce students with principles of Digital Systems	1	1	-	-	-	-	-	-	8
					➢ To study property and realization of the various logic gates	-	-	1	1	1	-	-	-	
					➢ To make the student able to design Combinational and Sequential Systems	-	-	-	-	1	1	1	-	
	Network analysis and synthesis	5	5/30≈0.17	0.17*50≈8	➢ Understand and apply the techniques of modelling, analysis, design and synthesis of 1- and 2-port passive and active electric networks and filters in a classical and a modern approach.	1	1	1	1	1	2	1	-	8
	Core Total ECTS	30												
Industrial Control Engineering	Introduction to Control Engineering	5	5/30≈0.17	0.17*50≈8	➢ Acquiring solid foundation in mathematical modelling of Physical Systems	1	1	-	-	-	-	1	-	9

Specialization Share = 50 items from the total					➢ Add knowledge base in the fundamentals of electrical engineering modelling and design	-	-	-	1	-	-	-	-	
					➢ Develop basic skills of utilizing mathematical tools needed to analyse and design classical linear dynamic control systems	-	-	-	-	-	1	-	-	
					➢ Get real world experience in control systems problems, design, and implementation	-	-	1	-	1	-	-	-	
					➢ Use and understand the application of software tools in Control system analysis and design	-	-	1	1	-	-	-	-	
	Introduction to Instrumentation	5	5/30≈0.17	0.17*50≈9	➢ Understanding the major elements of a measurement system	1	-	-	-	-	-	1	-	8
					➢ Understanding the principle of operation and behaviour of typical sensing devices used in instrumentation applications	-	1	-	1	1	-	-	-	
					➢ Using and designing moderate instrumentation system using the sensors	-	-	1	1	1	-	-	-	
	Electrical Machines	5	5/30≈0.17	0.17*50≈8	➢ Explaining the different types of transformers with their connection	1	-	1	-	-	-	-	-	9
					➢ Developing D.C. armature winding & A.C. windings with their design aspect.	–	1	–	1	–	-	-	-	
					➢ Explaining dynamic equations and control aspect of D.C machines	–	–	–	1	–	-	-	-	
					➢ Explaining salient pole synchronous machine features, reference frame transformation, dq axis theory, power/load angle relationship and carry out transient analysis	–	–	–	1	–	1	1	-	
					➢ Explaining the principle of operation and construction of fractional horsepower motors**.**	-	-	-	-	1	-	-	-	
	Modern Control Systems	5	5/30≈0.17	0.17*50≈9	➢ Understanding and developing State space representation of control systems	1	1	-	-	-	-	1	-	8

					➢ Analysing system models in state space model	–	–	–	2	–	-	-	-	
					➢ Design and synthesize controllers in state space	–	–	1	–	1	1	-	-	
	Electrical Installation	5	5/30≈0.17	0.17*50≈8	➢ Study the science and art of internal and external illumination of buildings	-	1	-	-	-	-	-	-	8
					➢ Introduce themselves to new developments in lighting technology, principles of energy efficient lighting and economics of lighting.	-	-	1	1	-	1	-	-	
					➢ Understand how to improve lighting efficiency with design, maintenance, lighting levels, de-lamping, daylighting and control strategies.	-	-	-	1	1	-	-	-	
					➢ Learn electrical regulations and standards for consumer premises wiring design and construction.	1	-	-	-	-	-	-	-	
					➢ Learn contracting documentations and design and construction drawings.	-	-	-	-	-	-	1		
	Power Electronics and Drives	5	5/30≈0.17	0.17*50≈8	➢ The students will be able to understand elements and characteristics, and operation principles of electric drives.	1	-	-	1	-	-	-	-	8
					➢ The students will have a sound understanding of understanding of the desired operating characteristics of various industrial driven units.	–	1	–	1	1	-	-	-	
					➢ The students will be able to select drive elements and develop drive system for common industrial driven units.	–	–	1	–	1	-	1	-	
	Core Total ECTS	30												

Ministry of Education (Table 8)

Higher Education Sub-sector

Test Blueprint (Table Specification) for BSC in Electrical and Computer Engineering (Power Engineering)

Themes	Name of Courses	ECTS	Weight of course or proportion	Number of test items from each course	Learning outcome	Learning outcomes								Total
						Cognitive						Affective	Psychomotor	
						Remembering	Understanding	Application	Analysis	Evaluation	Creation/Synthesis			
Core Share = 50 items from the total	Fundamental of Electrical Engineering	5	5/30≈0.17	0.17*50≈9	➢ To enable students to understand the basic electromagnetic phenomenon, circuit variables and parameters	1	1	-	-	-	-	1	-	9
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of dc circuits	-	-	1	2	1	-		-	
					➢ To enable students to understand and apply the fundamental and derived circuit laws and theorems to the analysis of steady state poly-phase ac circuits;	-	-	-	1	1	-	-	-	
	Computer programming (Introduction to computing)	5	5/30≈0.17	0.17*50≈8	➢ Familiarize students with components of computers	1	-	-	-	-	-	1	-	8
					➢ Define common terminologies used in programming	-	1	-	-	-	-	-	-	
					➢ Explain the steps, tools and technical approaches involved in program design	-	1	-	1	-	-	-	-	
					➢ Use the techniques of program design to develop programs that solve real life problems	-	-	-	-	1	1	-	-	
					➢ Utilize advanced concepts of programming to provide better solutions	–	-	1	-	-	-	-	-	

	Applied Electronics (I)	5	5/30≈0.17	0.17*50≈9	➢ To equip students with the basics of Semiconductor technology in the application of electronics equipment	1	1	-	-	-	-	-	-	9
					➢ To train students the operational principle of Semiconductor devices (Diodes, BJT and FET) and the analysis, design and application of electronic circuits, such as amplifiers	-	1	1	1	1	-	-	-	
					➢ To introduce sample applications and design guidelines of electronic circuits	-	-	-	1	1	-	-	-	
					➢ To initiate the students' understanding of the concepts, know-how and tools of Electronic Design Automation (EDA) for circuit analysis and design	-	-	-	-	-	-	1	-	
	Signals and system analysis	5	5/30≈0.17	0.17*50≈8	➢ Enable student to understand and apply the representation, classification, characterization and analysis of signals and systems in time and frequency domains	2	1	1	2	1	-	1	-	8
	Digital Logic Design	5	5/30≈0.17	0.17*50≈8	➢ To introduce students with principles of Digital Systems	1	1	-	-	-	-	-	-	8
					➢ To study property and realization of the various logic gates	-	-	1	1	1	-	-	-	
					➢ To make the student able to design Combinational and Sequential Systems	-	-	-	-	1	1	1	-	
	Network analysis and synthesis	5	5/30≈0.17	0.17*50≈8	➢ Understand and apply the techniques of modelling, analysis, design and synthesis of 1- and 2- port passive and active electric networks and filters in a classical and a modern approach.	1	1	1	1	1	2	1	-	8
	Core Total ECTS	30												
Power Engineering	Introduction to Power Systems	5	5/30≈0.17	0.17*50≈9	➢ To introduce the basic analytical methods for calculation of line parameters.	1	-	-	-	-	-	-	-	9

Specialization Share =50 items from the total					➢ To have a sound understanding of fundamentals of power systems and modelling its components for power transmission.	-	1	-	1	-	-	-	-	
					➢ To have a sound understanding of performance analysis of transmission lines, cables and overhead line insulators.	-	-	1	1	-	-	-	-	
					➢ To achieve a good understanding of the mechanical design considerations and installation of overhead transmission lines.	-	-	-	-	1	-	-	-	
					➢ To develop a basic understanding of high voltage engineering components.	-	-	-	-	1	1	-	-	
	Electrical Machines	5	5/30≈0.17	0.17*50≈9	➢ Explain basic concepts of electromagnetic circuits as they relate to voltages, currents, and physical forces induced in conductors.	1	1	-	-	-	-	-	-	9
					➢ Explain principles of operation & construction of transformer, induction machines, D.C. machines, and synchronous machines.	-	-	-	1	-	1	-	-	
					➢ Develops analytical models for transformers and electrical rotating machines.	-	-	-	1	1	-	-	-	
					➢ Identify and establish power requirements, power capability, efficiency, and operating characteristics.	-	-	1	-	1	-	1	-	
	Power Electronics	5	5/30≈0.17	0.17*50≈8	➢ To study and understand the characteristics of solid-state switching devices	1	1	-	-	-	-	-	-	8
					➢ To study and understand basic power electronic converter topologies	-	-	-	1	1	1	-	-	
					➢ To study and understand auxiliary parts of the power converter like gate drivers, filters, snubber circuits	-	-	1	-	1	-	1	-	
	Electrical Installation	5	5/30≈0.17	0.17*50≈8	➢ Study the science and art of internal and external illumination of buildings	-	1	-	-	-	-	-	-	8

					➢ Introduce themselves to new developments in lighting technology, principles of energy efficient lighting and economics of lighting.	-	-	1	1	-	1	-	-	
					➢ Understand how to improve lighting efficiency with design, maintenance, lighting levels, de-lamping, daylighting and control strategies.	-	-	-	1	1	-	-	-	
					➢ Learn electrical regulations and standards for consumer premises wiring design and construction.	1	-	-	-	-	-	-	-	
					➢ Learn contracting documentations and design and construction drawings.	-	-	-	-	-	-	1		
	Energy Conversion and Rural Electrification	5	5/30≈0.17	0.17*50≈8	➢ To introduce technologies of conventional and non-conventional power plants	1	1	-	-	-	-	-	-	8
					➢ To provide an overview of renewable energy resources and technologies	-	-	1	1	-	-	1		
					➢ To give an insight into planning and design of small scale and off-grid electrical power systems	-	-	-	1	-	-	-	-	
					➢ To introduce techniques and methods for planning and designing rural electrification	-	-	-	-	1	1	-	-	
	Power System Protection and Control	5	5/30≈0.17	0.17*50≈8	➢ Learn and understand basic design and operational concepts of generating stations, switchyards and transmission lines.	1	-	-	-	-	-	-	-	8
					➢ Study the various types of system structure configurations and appreciate the direct linkage with service reliability.	-	-	-	-	1	-	-	-	
					➢ Have a sound understanding of fundamentals of load forecasting techniques.	-	1	-	-	-	-	-	-	
					➢ Acquire sound understanding about optimal operation of power systems, unit commitment, economic dispatching, etc.	-	-	-	1	1	-	-	-	

					➢ Carry-out cost analysis of generation systems	-	-	-	1	-	-	-	-	
					➢ Study and appreciate about HVDC technology,	-	-	1	-	-	-	-	-	
					➢ Analyse and design HVDC transmission.	-	-	-	-	-	1	-	-	
	Core Total ECTS	30												

9. Conclusion

Exit examination can have a vital role in producing knowledgeable, skillful and attitudinally matured graduates. 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.

Based on identified graduate profiles, competencies and learning outcomes twelve (12) courses were selected to evaluate the competency of the target group through exit examination. The draft exit exam test blueprint is prepared 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. This draft exit exam test blueprint should be reviewed and discussed with all the other universities and stakeholders. Accordingly, the list of courses may be updated based on curriculum revision if there is an addition or removal from the identified set.

For successful competency evaluation of the students the following key points should be taken into account.

- The examination questions should focus on key knowledge of each specific course instead of detailed assessment that has already been undertaken in their course work.
- The examination questions should focus on long-term knowledge and transferrable skill. It should also take into account the student ECTS load during graduation time.
- The timing and administration of the competency examination should not be a hindrance for timely graduation.