



**Identified competency Focus areas and core courses for National
Exit Examination**

Program: Bachelor of Science in Biomedical Engineering

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

1. Introduction

Undergraduate programs in Biomedical Engineering are currently run in four universities, namely Addis Ababa University, University of Gondar, Jimma University, and Hawassa University.

In line with the Government's direction to implement exit examination for all undergraduate programs, a team with members from the University of Gondar and Addis Ababa University has been assigned to develop a brief guideline including expected graduate profile, competencies and learning outcome including the list of core program themes and courses.

Accordingly, 10 courses categorized into 5 program themes have been recommended to be covered in the proposed exit exam to start by the end of 2022/23 academic year. The currently identified competency areas are valid for 2022/23 academic year only. The document will be revised for the 2023/24 academic year due to implemented Harmonized curriculum for all universities.

1.1 Objectives

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 view to encouraging them to give due attention to the national standards

1.2 Significance

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 of 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 in the exit exam;

2. Expected Graduate Profile

- ✚ Understand the basic scientific basis and principles of biomedical equipments including the application of diagnostic and therapeutic biomedical equipment in the health care delivery.
- ✚ Design, develop and manufacture medical devices and systems or processes to meet desired needs within economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability constraints.
- ✚ Apply knowledge of healthcare technology management and assessment of medical devices starting from planning, technology assessment, specification, procurement, installation, training, operation, maintenance to decommissioning and disposal to improve quality of healthcare service provision in the healthcare facilities.
- ✚ Develop and ensure implementation of standards, regulatory frameworks and requirements relevant to medical devices function
- ✚ Develop the attitude and mind-set up to apply medical and engineering ethics to provide the necessary professional services.

- ✚ Support the Government in the development of guidelines, directives, and policies relevant to biomedical engineering and technology.
- ✚ Train and mentor healthcare staff on operational, proper handling of biomedical equipment.
- ✚ Undertake innovation through research to adopt and adapt simple and appropriate biomedical technologies for efficient and effective healthcare services
- ✚ Have the interpersonal skills that help work as a team of healthcare staff and interaction with clients and other stakeholders
- ✚ Become entrepreneurs in the areas of specification, design, installation, operation, and maintenance of biomedical equipment

3. Competencies and learning outcomes

3.1 Competencies

3.1.1 Knowledge

- Understand the basic concepts in bio-materials, bio-mechanics, and bio-fluid mechanics apply to biomedical engineering applications.
- Understand standard biomedical instrumentation hardware required for reliable diagnosis and treatment of patients in the healthcare system.
- Understand and operate standard medical imaging technologies including image processing software required for reliable diagnosis and treatment of patients in the healthcare system
- Understand and operate standard medical imaging technologies including image processing software required for reliable diagnosis and treatment of patients in the healthcare system,
- Acquire the knowledge to carry out research for design and implementation of biomedical systems in any healthcare environment including hospitals, clinics, and health centers

- Acquire the knowledge to specify, procure, inventory, install, operate, maintain calibration, dispose appropriate healthcare technologies required for hospitals, clinics, and health centers and familiarize with engineering and medical ethics accepted by the professional community to effectively manage hospital engineering functions.
- Understand the concept of biomedical signal processing.

3.1.2 Skill

- Design, prototype and develop Biomedical devices
- Develop, configure, Install, operate, adjust, maintain and calibrate healthcare technologies
- Evaluate the safety and efficiency of medical devices
- Provide technical and end user training on healthcare technologies
- Skill to carry out research for design and implementation of biomedical systems in any healthcare environment including hospitals, clinics, and health centers
- Skill to develop medical equipment specification, procurement, inventory, install dispose appropriate healthcare technologies required for hospitals, clinics, and health centers and familiarize with engineering and medical ethics accepted by the professional community to effectively manage hospital engineering functions.

3.1.3 Attitude

- strong interest in engineering and medicine
- willingness to apply standards and regulations
- interpersonal integrity, confidentiality
- an attitude for science and mathematics
- ability to recognize ethical and professional responsibilities
- demonstrate professional and social responsibilities
- Attitude to carry out research for design and implementation of biomedical systems in any healthcare environment including hospitals, clinics, and health centers

3.2 Learning outcomes

1. Basic Biomedical Engineering

Understand the basic concepts in bio-physics, bio-optics, bio-materials, bio-mechanics, and bio-fluid mechanics to be utilized in major biomedical engineering tracks including biomedical instrumentation and imaging systems, healthcare technologies.

2. Biomedical Instrumentation and Processing

Understand, develop, install, configure, and operate standard biomedical instrumentation hardware with relevant signal processing software required for reliable diagnosis and treatment of patients in the healthcare system

3. Biomedical Imaging

Understand, develop, install, configure, maintain and operate standard medical imaging technologies including image processing software required for reliable diagnosis and treatment of patients in the healthcare system,

4. Biomedical System Design

Acquire the knowledge, skill, and attitude to carry out research for design and implementation of biomedical systems in any healthcare environment including hospitals, clinics, and health centers

5. Healthcare Technology Management and Hospital Engineering

Acquire the knowledge, skill, and attitude to specify, procure, inventory, install, operate, maintain, calibration, dispose appropriate healthcare technologies required for hospitals, clinics, and health centers and familiarize with engineering and medical ethics accepted by the professional community to effectively manage hospital engineering functions.

4. Courses to be included in the exam

1. *Biomaterials*
2. *Biomechanics*
3. *Bio-fluid Mechanics*
4. *Biomedical Signal Processing/ BioSignal Processing*

5. *Biomedical Instrumentation*
6. *Biomedical Workshop Practice / Bioinstrumentation Lab*
7. *Biomedical Imaging Systems/Medical imaging Modality*
8. *Biomedical Design/ BME Computer Application+ BME prototype*
9. *Healthcare Technology Management*
10. *Hospital Engineering*

4.1 Categorizing courses into themes

1. Basic Biomedical Engineering
 - *Biomaterials*
 - *Biomechanics*
 - *Bio-fluid Mechanics*
2. Biomedical Instrumentation and Processing
 - *Biomedical Signal Processing/ BioSignal Processing*
 - *Biomedical Instrumentation*
 - *Biomedical Workshop Practice / Bioinstrumentation Lab*
3. Biomedical Imaging
 - *Biomedical Imaging Systems/Medical imaging Modality*
4. Biomedical System Design
 - *Biomedical Design/ BME Computer Application+ BME prototype*
5. Healthcare Technology Management and Hospital Engineering
 - *Healthcare Technology Management*
 - *Hospital Engineering*

Remark: ECTS or credit hour is not included for selected courses due to the difference in curriculum in different universities.

5. Conclusion and Recommendation

One of the tools to maintain quality of graduates in an environment where differences in resources differ is administering exit examination in which the core knowledge, skills, and attitude can be tested.

Although there is a wide variation of concentration of biomedical engineering programs, only the most relevant areas are considered in the designing the curricula and hence the exit examinations.

The 10 core courses selected for the exit examination are believed to measure the competence of the graduates and the list can be updated in the future based on new concentration areas and programs.

It is recommended that all the four universities running the program look into it and to prepare their graduate students and engage their faculties for the successful implementation of the exam. Furthermore, the exit exam is better scheduled after one month from the date of last regular internal exam, if possible in the 2022/23 A.Y, to allow the students prepare themselves comfortably.

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