

Ministry of Education

Identified Competency Focus Areas and Core Courses for Ethiopian Higher Education Institutions' Exit Examination

Program: - Biomedical Engineering in BSc.

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A. 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, 14 courses selected and categorized into 5 course themes and have been recommended to be covered the program major courses and competencies in the proposed exit exam to start by the end of 2022/23 academic year.

B. Expected Graduate Profile

- Understand the basic scientific basis and principles of biomedical equipment's 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

C. Courses to be included in the exam

1) Bio-physics

2) *Biomedical Optics*
3) *Biomaterials*
4) *Biomechanics*
5) *Bio-fluid Mechanics*
6) *Biomedical Signal Processing*
7) *Biomedical Instrumentation*
8) *Biomedical Workshop Practice*
9) *Biomedical Imaging Systems*
10) *Biomedical Image Processing*
11) *Biomedical Design*
12) *Healthcare Technology Management*
13) *Hospital Engineering*
14) *Engineering and Medical Ethics*

D. Categorizing courses into themes

1. Basic Biomedical Engineering
   - *Bio-physics*
   - *Biomedical Optics*
   - *Biomaterials*
   - *Biomechanics*
   - *Bio-fluid Mechanics*
2. Biomedical Instrumentation and Processing
   - *Biomedical Signal Processing*
   - *Biomedical Instrumentation*
   - *Biomedical Workshop Practice*
3. Biomedical Imaging

- *Biomedical Imaging Systems*
- *Biomedical Image Processing*

4. Biomedical System Design
    - *Biomedical Design*
5. Healthcare Technology Management and Hospital Engineering
    - *Healthcare Technology Management*
    - *Engineering and Medical Ethics*
    - *Hospital Engineering*

E. Competencies and 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.

F. Conclusion

One of the tools to maintain quality of graduates in an environment where differences in resources 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.

Biomedical Instrumentation and Imaging, Biomedical computing, and Biomedical Rehabilitation are considered in order of importance with the first area of concentration being the current priority. The 14 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.