

Academic Assessment Plan

(Master of Science in Biomedical Engineering-MSBME)

(May 31, 2015)

An academic program assessment plan will demonstrate educational achievement and improvement through ongoing assessment of student learning. An academic assessment plan reflects specific program goals, measureable student learning outcomes, and a clearly defined timeline for implementation, data collection and analysis, and use of findings to support program-level change and accomplishments.

Background

The Master's degree at the University of Arkansas in Biomedical Engineering (MSBME) was first offered in 2005 and was administered by the Department of Biological and Agricultural Engineering. The program was moved into the new Department of Biomedical Engineering launched in 2012. At the time of formation of the new department in 2012, a stand-alone BS program in Biomedical Engineering and a new concentration in Biomedical Engineering within the PhD degree program in Engineering was also initiated. The MS in Biomedical Engineering was accredited by ABET in 2008 through 2014. The Department has pursued ABET accreditation for its BS program and it was visited by ABET in the fall of 2014. To be consistent with the rest of MS programs in the College of Engineering, ABET accreditation for the MS program in Biomedical Engineering was not pursued beyond 2014.

1. Program Goals

Program goals are broad general statements of what the program intends to accomplish and describes what a student will be able to do after completing the program. The program goals are linked to the mission of the university and college.

Accordingly, the Program goals of the MSBME program at the University of Arkansas, Fayetteville are to produce graduates that are capable of:

1. Succeeding in practice at the interface between life science and engineering, or in other professional activities, or in post-master's studies.
2. Utilizing their advanced engineering education in creating new knowledge or enabling technologies for improvement of human health and healthcare.
3. Continuously upgrading their knowledge in their chosen specialty by initiating self-directed learning.

2. Student Learning Outcomes

Student Learning Outcomes are defined in terms of the knowledge, skills, and abilities that students will know and be able to do as a result of completing a program. These student learning outcomes are directly linked to the accomplishment of the program goals.

The graduates of the MSBME program will either be capable of the following or possess the following attributes:

1. Conceiving, designing, analyzing, and implementing systems, processes and experiments related to improving human health and healthcare.
2. Functioning in multidisciplinary teams to find effective solutions to complex technical problems and/or the design of new products and processes to improve human health and health care.
3. Using modern analytical, simulation, and diagnostic tools and techniques used in healthcare industry.
4. In-depth and up-to-date knowledge within a specialized field in Biomedical Engineering.
5. An understanding of ethical and professional responsibility
6. To effectively communicate their findings/ideas to a technical and non-technical audience

The prescribed outcomes of the MSBME are met through entrance requirements and through the curriculum followed by the students.

a. Admission Requirements

Students in the MSBME program are admitted on the basis of academic transcripts, standardized test scores, three letters of recommendation and a statement of purpose. Students with a non-engineering degree or a non-ABET-accredited engineering degree must demonstrate completion of the Basic Engineering Education Requirements prior to being admitted. The minimum admission requirements are:

- a. A B.S. degree in engineering or engineering equivalent including completion of the Basic Engineering Education Requirements with a GPA of at least 3.0.
- b. A GPA of 3.0 or higher on the last 60 hours of the baccalaureate degree.
- c. A GRE score of 302 or above (verbal and quantitative).
- d. A TOEFL score of at least 213 (computer-based) or 80 (internet based). This requirement is waived for applicants whose native language is English or who earn a bachelor's or master's degree from a U.S. institution.
- e. Three letters of recommendation
- f. Statement of Purpose
- g. A member of the core or affiliated BMEG faculty must agree to serve as the Major Adviser to the prospective student.

b. Curriculum

The MSBME curriculum consists of a minimum of 12 credit hours of required courses below and a minimum of 18 hours of elective courses. These required and elective courses are designed to meet the program outcomes. All students must pass a comprehensive examination at the end of their program or defend a thesis based on independent research. The thesis option students must pass an oral examination on their research findings. The non-thesis option students must pass a comprehensive examination after completing their coursework. In the latter case, the comprehensive examination serves the purpose of an integrating experience. The relationship between specific outcomes and the required courses is illustrated in Table 2. BMEG graduate students must be enrolled in Graduate Seminar every semester. If the student has completed the 5801/5811 sequence, then they are required to enroll in 5800 and 5810 until graduation.

1. BMEG 5103 Design and Analysis of Experiments in Biomedical Research
2. BMEG 5203 Mathematical Modeling of Physiological Systems
3. BMEG 5504 Biomedical Microscopy
4. BMEG 5801 Graduate Seminar I
5. BMEG 5811 Graduate Seminar II

The following Table provides a matrix of how the prescribed learning outcomes are met through the curriculum.

Required courses	OUTCOME 1: CONCEIVE, DESIGN, ANALYZE ...	OUTCOME 2: FUNCTION IN MULTIDISCIPLINARY TEAMS	OUTCOME 3: SKILLED IN ANALYTICAL, SIMULATION AND DIAGNOSTIC TOOLS	OUTCOME 4: IN-DEPTH KNOWLEDGE WITHIN A BIOMEDICAL ENGINEERING FIELD	OUTCOME 5: ETHICAL AND PROFESSIONAL RESPONSIBILITY	OUTCOME 6: EFFECTIVE COMMUNICATION
BMEG 5103- Design and Analysis of Experiments in Biomedical Research	3				2	1
BMEG 5203- Mathematical Modeling of Physiological Systems	3		3			1
BMEG 5504- Biomedical Microscopy	2	3	3			2
BMEG 5801- Graduate Seminar I	1	2			3	3
BMEG 5811- Graduate Seminar II	1	2			3	3
Comprehensive Examination	2			3		
Elective Classes				3		1

1 = addressed to small extent

2 = addressed significantly

3 = major part of course

3. Assessment of Student Learning Outcomes and Time-line

A process must be defined and documented to regularly assess student learning and achievement of student learning outcomes. The results of the assessment must be utilized as input for the improvement of the program.

The MSBME learning outcome will be assessed by using the following outcome measuring tools:

1. Review of syllabi and learning outcomes by the faculty
2. Course Opinion Surveys
3. Performance in MS thesis defense/comprehensive
4. Employment data
5. Exit Questionnaire

These tools will be operationalized in the following manner.

- Each graduate course will have a published syllabus consisting of an outline of topics, textbooks and reference material, grading scheme, and a set of learning objectives that support the outcomes of the degree program. The syllabus will be available online at the beginning of the semester in which the course is offered. The syllabi of all courses will be reviewed by the faculty once every three years.
- Course Opinion Surveys: Every course will be assessed every year. The faculty as a whole at the end of the academic year will assess the student evaluations and recommend changes as necessary in content and rigor and whether the learning objectives for the course are being met
- Performance in MS thesis defense/comprehensive examination: The thesis work of every thesis student will be assessed by a faculty committee consisting of the major advisor as the chair and two additional faculty members with a graduate research status. The assessment will consist of reading and commenting on the written document submitted by the student in advance of the defense. The student will be expected to present the results of his/her research and answer in-depth questions in his/her area of expertise. The result of the examination will be pass/fail.
- The MS comprehensive examination for non-thesis option students will be based on required core courses and will be administered by the Graduate Committee of the department. It will consist of a written examination and an oral examination. The Graduate Committee will appoint a panel of faculty to administer the examination. The examination will be conducted each semester and the result will be pass/fail.
- Employment data for MSBME graduates will be collected each semester and the results will recorded for review at the annual meeting.
- All graduating students will be invited to complete an exit questionnaire and will be scheduled for a 30 minute exit interview with the department head.

4. Use of Results

This phase of assessment planning is often referred to as “closing the loop.” One of the most challenging aspects of assessment is using the data to inform and reflect upon current practice and facilitate program change. Using assessment results is a key element in supporting a program’s continuous, quality improvement processes.

A plan was adopted by the Department of Biomedical Engineering as the process for continuous improvement of the MSBME degree program. The process consists of assessing and evaluating the extent to which the student outcomes are being attained. The results of these assessments and evaluations are subsequently used as the primary inputs for making improvements to the program.

The plan relies heavily on the use of direct measures of outcome attainment embedded in required courses taught by the biomedical engineering faculty and the thesis/comprehensive examination required as part of graduation requirements. In addition to these direct measures, the plan also considers student self-assessments obtained from exit surveys completed by graduates of the program. The plan also includes a process for the review and revision of the program’s educational objectives every three years.

One faculty meeting each year is devoted to the consideration of issues related to attainment of program outcomes.