Masters of Science in Biomedical Engineering: Academic Assessment Plan

College of Engineering
David Hintenlang
dhinten@ufl.edu

Office of the Provost

University of Florida

Institutional Assessment

Continuous Quality Enhancement

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Academic Assessment Plan for Masters of Science in Biomedical Engineering

College of Engineering

A. Mission

Intellectually rigorous undergraduate education;

- Emphasizes fundamental engineering and life sciences
- Prepare students for:
  - further education in medicine or bioengineering
  - successful careers in businesses related to medicine and biology

Graduate education of highest quality

- Fully integrated with research from molecular to system levels
- Graduates to have distinguished careers in academe or business

Research admired by peers and deemed important by the employers of our students.

Service in the biomedical engineering related fields to state, national and international entities

Promotion of our faculty, staff, and students to excellence

B. Student Learning Outcomes and Assessment Measures

Students Learning Outcomes:

Knowledge:

A. an ability to develop a broad-based knowledge of Biomedical Engineering problems

B. an ability to critically read Biomedical Engineering literature

Skills:

C. an ability to use apply fundamental engineering principles to identify, analyze and solve biomedical engineering problems

D. an ability to design and conduct scientific and engineering experiments, and to analyze and interpret the resulting data

Professional Experience:

E. an understanding of professional and ethical responsibility and the impact of clinically significant engineering solutions

F. an ability to communicate effectively and work collaboratively

Assessment Measures

Student learning outcomes are taught and assessed according to the following matrix

		MS Thesis	MS Non-thesis
A	Instruction	Core+Core elective courses[1] BME6971[4]	Core+Core elective courses[1] BME6XXX[i]
	Assessment	Thesis defense	Final project report
B	Instruction	BME6010[3]	BME6010[3]
	Assessment	Thesis defense	Final project report
C	Instruction	BME5401[4] BME6010[3] BME6971	BME5401[4] BME6010[3] BME6XXX[2]
	Assessment	Thesis defense	Final project report
D	Instruction	BME6971[5]	BME6XXX[2]
	Assessment	Thesis defense	Final project report
E	Instruction	BME6010[3] Lecture in BME6936	BME6010[3] Lecture in BME6936
	Assessment	Report in BME6010[3]	Report in BME6010[3]
F	Instruction	BME6010[3] BME6971[5]	BME6010[3] BME6XXX[2]
	Assessment	Thesis defense	Final project report

[1] General BME material is tested in midterm and final exam questions of the Core and Core Elective courses

[2]BME6XXX: BME project. Final project formalized in a course. Non-thesis MS only

[3] BME6010: Clinical preceptorship. In this course, students work in the clinic with a clinician. The goal is to identify a clinical problem which has an engineering solution. An NIH-style proposal containing literature review, problem description, proposed solution with aims, is developed and evaluated. HIPAA training is provided to all enrolled students

[4] BME5401 Physiology. In-class collaborative exercises to develop models of human physiology are performed. Reports are evaluated by the instructor.

[5] Research course

C. Research

Graduates of the Biomedical Engineering program are expected to make research contributions in both academe and industry in order to improve human health. It is expected that research contributions at the MS level will pave the way for further development of those research themes or may lead to the commercial development of devices or procedures that improve human health and the quality of health care. Masters students complete a curriculum that provides them with the tools to succeed in the various areas of biomedical research. The clinical preceptorship (BME 6010) introduces students to the clinic where they have the opportunity to observe and identify clinical problems, and propose research concepts that address these issues. MS students subsequently complete either a MS Thesis or a non-thesis project report that allows them to learn to perform more independent and in-depth research, and is subsequently reviewed by their supervisory committee.

D. Assessment Timeline

Program: MS in Biomedical Engineering College of Engineering

Assessment SLOs	Assessment 1
Knowledge	
A. Broad-based knowledge	Thesis Defense or Final Project Report
B. Critically read literature	Thesis Defense or Final Project Report
Skills	
C. Analyze and solve biomedical problems	Thesis Defense or Final Project Report
D. Conduct experiments, analyze & interpret data	Thesis Defense or Final Project Report
Professional Behavior	
E. Ethical responsibility and engineering solutions	Completion of Clinical Preceptorship & Report
F. Effective Communication	Thesis Defense or Final Project Report

E. Assessment Cycle

Assessment Cycle for:
Program: MS in Biomedical Engineering College of Engineering

Analysis and Interpretation: May-June
Program Modifications: Completed by August 31
Dissemination: Completed by September 30

Year SLOs	10-11	11-12	12-13	13-14	14-15	15-16
Content Knowledge						
A. Broad-based knowledge			X	X	X	X
B. Critically read literature			X	X	X	X
Skills						
C. Analyze and solve biomedical problems			X	X	X	X
D. Conduct experiments, analyze & interpret data			X	X	X	X
Professional Behavior						
E. Ethical responsibility and engineering solutions			X	X	X	X
F. Effective Communication			X	X	X	X

F. Measurement Tools

Assessments are measured using multiple tools. Core and Core-elective courses permit faculty to assess student performance throughout the Masters program. These courses lay a foundation for the knowledge outcomes and the development of fundamental skills outcomes. A key component of SLO's C,E, & F is the clinical preceptorship experience (BME 6010). This involves clinical observation and identification of clinical problems that may be addressed through engineering design or analysis. Students produce a final paper for this course and assessments of the relevant SLO's are made using the rubric illustrated in Appendix A. Student research abilities are further developed through their independent work through a Master's thesis or a non-thesis final project. The knowledge and skills learning objectives are also assessed through evaluation of the knowledge and skills demonstrated in the Thesis defense by the supervisory committee. Non-Thesis final projects are similarly assessed by the supervisory committee. The rubrics for these assessments are included in Appendix A.

G. Assessment Oversight

Name	Department Affiliation	Email Address	Phone Number
David Hintenlang	Graduate Coordinator, BME	dhinten@ufl.edu	273-0301
Christine Schmidt	Chair, BME	schmidt@bme.ufl.edu	273-9222
Mark Law	COE Associate Dean	mlaw@ufl.edu	392-0943

Appendix A: Assessment Rubrics

Rubric for Oral Qualifying Examinations for the MS Thesis & Non-Thesis Final Project Report in Biomedical Engineering

Criteria	**Assessment : 1(poor) - 5 (superior)***
A. Demonstrates a breadth of knowledge relevant to biomedical engineering.	
B. Demonstrates the ability to read and critique relevant literature.	
C. Identifies, analyzes and solves BME problems.	
D. Designs and conducts experiments and analyzes and interprets data.	
F. Demonstrates the ability to communicate effectively and work collaboratively.	

Rubric for Final Project Report for BME 6010 Clinical Preceptorship Professional Experience (SLO-E)

Criteria	**Assessment : 1(poor) - 5 (superior)***
1. Develops an appreciation for clinical constraints through observation of clinical faculty and staff	
2. Identifies a clinical need that can be improved through biomedical engineering principles.	
3. Proposes a device, procedure, or study to support engineering analysis of a clinical problem.	

*Assessment shall be based on an objective evaluation of the students performance based on past faculty experience relative to student performances over the past 10 years, or the maximum of a faculty members experience using the following criteria:

1 : Poor, Performance is unsatisfactory
2 Subpar, less than 30th percentile
3 Average, 30-60 percentile
4 Good, 60-80 percentile
5 Superior, 80-100 percentile