FACULTY **C**OURSE **A**SSESSMENT **R**EPORT

Department of Biomedical Engineering

Academic Year: **2011-2012**
Term: **Fall 2011, Winter 2011, Spring 2012**

Course Code and Title: **BME180A-B-C Biomedical Engineering Design**

Instructor: **Michelle Khine, PhD**

Background: Please review the *ABET background* document.

Instructions: For each student outcome performance indicator, identify (1) the assignment (which quiz, quiz problem, exam problem, or project) was used to assess that indicator, (2) the maximum score possible on that assignment, (3) the performance standard for that assignment expressed in points and also as a percentage of max, (4) the number of students who were assessed on that assignment, (5) the average score achieved by them expressed in points and percentage of max, and (6) the number and percentage of BME students who achieved the performance standard.

Performance Indicators (PIs): This course assesses the following Performance Indicators (please consult the *Proposed Remapping of BME courses to Student Outcomes* document): **a1-3, b1-3, c1, d1-4, e1-2, g1-2, h1, j1, k2-3**

a1 — Students can apply knowledge of mathematics to problems in Biomedical Engineering.
a2 — Students can apply knowledge of science to problems in Biomedical Engineering.
a3 — Students can apply knowledge of engineering to problems in Biomedical Engineering.
b1 — Students can design biomedically relevant experiments.
b2 — Students can conduct biomedically relevant experiments.
b3 — Students can analyze and interpret data from biomedically relevant experiments (including living systems).
c1 — Students can design a biomedical system to meet desired needs within realistic constraints.
d1 — Students understand team and project objectives.
d2 — Students combine skills and methods from different disciplines.
d3 — Students participates in team activities.
d4 — Students complete assigned duties.
e1 — Students can identify and formulate biomedical engineering problems.
e2 — Students can develop a solution to biomedical engineering problems.
g1 — Students can communicate orally technical issues related to biomedical engineering.
g2 — Students can communicate in writing technical issues related to biomedical engineering.
h1 — Students understand the impact of biomedical engineering solutions in economic, environmental, and societal context, both locally and globally.
j1 — Students understand contemporary biomedical issues in economic, environmental, and societal context.
k2 — Use software tools to model biomedical systems, and analyze and interpret biomedical data.
k3 — Students are proficient in using computer-aided design tools for biomedical applications.

PIs	Assignment used for assessment	Max. score	PI standard and % of maximum	Number of students tested	Average score and % of maximum	Number and % of BME students who met the standard
a1	MATLAB HW#1	47	31.3 (66.7%)	74	35.4 (75.3%)	47 (64.3%)
	MATLAB HW#2	55	33.3 (66.7%)	74	41.2 (82.5%)	70 (94.6%)
	Average:					**58.5 (79.5%)**
a2	MATLAB HW#1,	47	31.3 (66.7%)	74	35.4 (75.3%)	47 (64.3%)
	MATLAB HW#2,	55	33.3 (66.7%)	74	41.2 (82.5%)	70 (94.6%)
	Writing Assignment#1 (Need Assessment)	10	8.0 (80.0%)	74	8.5 (85.0%)	74 (100%)
	Assignment#2 (Pugh Matrix)	10	8.0 (80.0%)	74	?	74 (100%)
	Average:					**66.3 (89.72%)**
a3	MATLAB HW#1	47	31.3 (66.7%)	74	35.4 (75.3%)	47 (64.3%)
	MATLAB HW#2	55	33.3 (66.7%)	74	41.2 (82.5%)	70 (94.6%)
	Writing Assignment#1 (Need Assessment)	10	8.0 (80.0%)	74	8.5 (85.0%)	74 (100%)
	Assignment#2 (Pugh Matrix)	10	8.0 (80.0%)	74	?	74 (100%)
	Average:					**66.3 (89.72%)**
b1	Prototypes, Testing Protocol, Data Presentat.	25	20.0 (80.0%)	74	?	74 (100%)
b2	Prototypes, Testing Protocol, Data Presentat.	25	20.0 (80.0%)	74	?	74 (100%)
b3	Prototypes, Testing Protocol, Data Presentat.	25	20.0 (80.0%)	74	?	74 (100%)
c1	Engineering Scope & Specs. Document	20	18.0 (80.0%)	74	16.6 (83.0%)	74 (100%)
	10-min. videos, In-class presentations I,II, III	25	20.0 (80.0%)	74	22.5 (90.0%)	74 (100%)
	Progress Report	25	20.0 (80.0%)	74	21.4 (86.0%)	74 (100%)
	Final Report	25	20.0 (80.0%)	74	?	74 (100%)
	Average:					**74 (100%)**
d1	10-min. videos, In-class presentations I,II, III	25	20.0 (80.0%)	74	22.5 (90.0%)	74 (100%)
d2	10-min. videos, In-class presentations I,II, III	25	20.0 (80.0%)	74	22.5 (90.0%)	74 (100%)
d3	10-min. videos, In-class presentations I,II, III	25	20.0 (80.0%)	74	22.5 (90.0%)	74 (100%)
d4	10-min. videos, In-class presentations I,II, III	25	20.0 (80.0%)	74	22.5 (90.0%)	74 (100%)
e1	Writing Assignment#1 (Need Assessment)	10	8.0 (80.0%)	74	8.5 (85.0%)	74 (100%)
	Assignment#2 (Pugh Matrix)	10	8.0 (80.0%)	74	?	74 (100%)
	Average:					**74 (100%)**
e2	Engineering Scope & Specs. Document	20	18.0 (80.0%)	74	16.6 (83.0%)	74 (100%)
g1	10-min. videos, In-class presentations I,II, III	25	20.0 (80.0%)	74	22.5 (90.0%)	74 (100%)
g2	Writing Assignment#1 (Need Assessment)	10	8.0 (80.0%)	74	8.5 (85.0%)	74 (100%)
	Assignment#2 (Pugh Matrix)	10	8.0 (80.0%)	74	?	74 (100%)
	Progress Report	25	20.0 (80.0%)	74	21.4 (86.0%)	74 (100%)
	Final Report	25	20.0 (80.0%)	74	?	74 (100%)
	Average:					**74 (100%)**
h1	Engineering Scope & Specs. Document	20	18.0 (80.0%)	74	16.6 (83.0%)	74 (100%)
j1	Writing Assignment#1 (Need Assessment)	10	8.0 (80.0%)	74	8.5 (85.0%)	74 (100%)
	Assignment#2 (Pugh Matrix)	10	8.0 (80.0%)	74	?	74 (100%)
	10-min. videos, In-class presentations I,II, III	25	20.0 (80.0%)	74	22.5 (90.0%)	74 (100%)
	Average:					**74 (100%)**
k2	MATLAB HW#1	47	31.3 (66.7%)	74	35.4 (75.3%)	47 (64.3%)
	MATLAB HW#2	55	33.3 (66.7%)	74	41.2 (82.5%)	70 (94.6%)
	Average:					**58.5 (79.5%)**

k3	MATLAB HW#1	47	31.3 (66.7%)	74	35.4 (75.3%)	47 (64.3%)
	MATLAB HW#2	55	33.3 (66.7%)	74	41.2 (82.5%)	70 (94.6%)
	Solidworks HW#1	10	8.0 (80.0%)	74	8.5 (85.0%)	74 (100%)
	Solidworks HW#2	10	8.0 (80.0%)	74	8.5 (85.0%)	74 (100%)
	Progress Report	25	20.0 (80.0%)	74	21.4 (86.0%)	74 (100%)
	Final Report	25	20.0 (80.0%)	74	?	74 (100%)
	Prototypes, Testing Protocol, Data Presentat.	25	20.0 (80.0%)	74	?	74 (100%)
	Average:					**69.6 (94.1%)**

Course Learning Outcomes: This course assesses the following Course Learning Outcomes (please consult your *Course Outline* document):

1. Demonstrate leadership and teamwork skills in a project team environment
2. List and define the various steps in bringing a biomedical product from concept to market
3. Identify the realistic constraints of the team project
4. Identify the assess challenges in each of the steps
5. Incorporate regulatory and ethical aspects in the team project.
6. Articulate the impacts of the project in a global, economic, environmental, and societal context.
7. Use knowledge in mathematics, statistics, biological sciences, physical sciences, and engineering to solve the problems at the interface of engineering and biology whenever required
8. Use the appropriate computer tools to design, model, simulate, and/or operate the team projects
9. Apply engineering principles and practices to meet the challenges
10. Demonstrate oral communication skills in presenting team projects.
11. Demonstrate written communication skills in documenting team projects
12. Establish initial contacts with major local and national BME companies
13. Demonstrate knowledge of contemporary issues related to biomedical engineering
14. Identify relevant technical conferences, workshops, biomedical trade shows, and professional societies to engage in life-long learning

CLOs	Assignment used for assessment	Performance standard	Number of students tested	Average score (%)	Number and % of BME students who met the standard
7, 8, 9	MATLAB Hw#1, MATLAB Hw#2	66.67%	74	79.88%	58.5 (79%)
8, 9	Solidworks Hw 1,2	80%	74	85%	74 (100%)
1,2,3,4, 5,6,7,10	Presentations I, II, III	80%	74	88%	74 (100%
11,13	Writing Assignments	75%	74	80%	74 (100%
12,14	Prototype Designing and building	80%	74	90%	74 (100%

What changes did you make in this course based on previous assessment results?

Added more skills development components
More building
A greater emphasis on team allocated grades

What recommendations do you have for improving the course the next time it is taught?

Have several discussion/lectures for those students who do not know how to program. Two lectures may not have been enough for those who did not have basic programming skills to learn MATLAB.

What recommendations do you have, if any, regarding prerequisite courses or other ways to improve student preparation for this course?

Make sure we teach Matlab and Solidworks earlier in their curriculum so they come into this Senior Design class with some prior experience with it.

Any other recommendations or comments?

Half of the class knew how to program in MATLAB while the other half were missing fundamental programming skills. More programming skill building lectures/discussion for those unfamiliar with MATLAB and Solidworks should be offered. More access to prototyping and building facilities would also be helpful.