



OFFICE OF ACADEMIC ASSESSMENT  
*The* UNIVERSITY of OKLAHOMA

# Program Assessment Report

2022 - 2023

COE - Biomedical Engineering (BS)

### General Information

**Mission**

The mission of the Stephenson School is to educate the next generation of biomedical engineers and to create new technologies that advance human health.

**College**

Engineering

**Department/School/Division**

Biomedical Engineering

**Assessment Liaison**

Dr. Rebecca Scott

## ABET SO 1

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### Student Learning Outcome (SLO)

an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

### Outcome Status

Active

#### Direct - Examination

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##### Assessment Method Description

BME 3143 Biomechanics

- 1) Problems #5 and #6 on Midterm Exam #1 (33% of assessment weight) – These problems collectively represent a complex problem on rigid body mechanics to determine muscle force and joint reaction forces at the elbow.
- 2) Problem #3 on the Final Exam (33% of assessment weight) – This is a complex problem requiring two steps in employing the equations for  $E'$  and  $E''$ , which are then leveraged in the equation for  $E^*$ . A conceptual understanding of dynamic response of a mechanical circuit for the standard linear solid is reinforced in this problem.
- 3) Problem #10 on the Final Exam (33% of assessment weight) – This is a complex problem on stress transformations that was solved with both a 2D (scalar) and 3D (eigenvalue and eigenvector) method, each of which verifies the other.

##### Performance Target

90% of students achieve satisfactory or exceptional performance.

##### Related Documents

[BME 3143 Biomechanics FA21 CAR.pdf](#)

#### Assessment Results and Use of Results

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##### Reporting Period

2022 - 2023

##### Assessment Results Entry Date

08/21/2023

##### Assessment Results

86% scored in the satisfactory and exceptional categories which is below the target.

##### Results Status

Target Not Met

##### Number of Students Assessed

52

##### Related Documents

[BME 3143 Biomechanics FA22 CAR.pdf](#)

#### USE OF ASSESSMENT RESULTS

##### Curriculum

Continued efforts to incorporate MATLAB content in the Numerical Methods course is supported.

#### Direct - Examination

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##### Assessment Method Description

BME 2433 Signals and Systems

Average of scores on the course outcomes #3 and #4

##### Performance Target

90% of students achieve satisfactory or exceptional performance

##### Related Documents

[BME 2433 Signals and Systems SP22 CAR.docx](#)

#### Assessment Results and Use of Results

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##### Reporting Period

2022 - 2023

**Assessment Results Entry Date**

08/21/2023

**Assessment Results**

100% of students scored in the satisfactory and exceptional category. Performance was very good, with an overall score of 2.58.

**Results Status**

Target Met

**Number of Students Assessed**

52

**Related Documents**

[BME 2433 Signals and Systems SP23 CAR.pdf](#)

**USE OF ASSESSMENT RESULTS**

**Curriculum**

In Spring 2023, 98% of students were taking the ECE 2723 concurrently instead of as a prerequisite. In future years, students may improve if being advised to take the circuit course ECE 2723 as a prerequisite. Also, the circuit course ECE 2723 did not include any lab component. Future students may benefit from more examples of AC circuits. Additional in-class examples may also be useful.

**Direct - Examination**

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**Assessment Method Description**

BME 3123 Biotransport Final exam routine (#1a-c, #2a-b) and challenge problem (cryolipolysis).

**Performance Target**

90% of students achieve satisfactory or exceptional performance.

**Assessment Results and Use of Results**

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**Reporting Period**

2022 - 2023

**Assessment Results Entry Date**

08/21/2023

**Assessment Results**

96% of students scored in the satisfactory or exceptional categories. Performance was excellent overall, with an overall score of 2.51.

**Results Status**

Target Met

**Number of Students Assessed**

50

**Related Documents**

[BME 3123 Biotransport SP23 CAR.pdf](#)

**USE OF ASSESSMENT RESULTS**

**Curriculum**

Questions that allow students to quickly diagnose a wide range of real-world scenarios and solving differential equations with appropriate boundary conditions.

**Direct - Examination**

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**Assessment Method Description**

BME 3533 Bioinstrumentation Average scores on the following problems (mid-term exam 2 - problem 6, final exam - problem 2, final exam - problem 5)

**Performance Target**

90% of students achieve satisfactory or exceptional performance.

**Assessment Results and Use of Results**

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**Reporting Period**

2022 - 2023

**Assessment Results Entry Date**

08/22/2023

**Assessment Results**

90.73% of students scored in the satisfactory or exceptional categories. Performance for this assessment is with an overall score of 2.42

**Results Status**

Target Met

**Number of Students Assessed**

51

**Related Documents**

[BME 3533 Biomedical Instrumentation FA22 CAR.pdf](#)

**USE OF ASSESSMENT RESULTS**

**Curriculum**

Instructor recommends a conversation with the Undergraduate Studies Committee to take systematic and comprehensive actions on improving students' quantitative skills via changes in a train of courses on the degree pathway.

**Faculty Development**

Instructor practicing more examples of calculations.

**ABET SO 2**

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**Student Learning Outcome (SLO)**

an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

**Outcome Status**

Active

**Direct - Project**

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**Assessment Method Description**

BME 4713 Design I

Average of scores on the following (see Appendix for detailed problem statements):

- " Engineering Report (33% of Assessment)
- " Phase 3A Worksheet: Final Design (33% of Assessment)
- " End-of-Semester Presentation: Design Details, Broader Impacts (34% of Assessment)

**Performance Target**

90% of students achieve satisfactory or exceptional performance.

**Related Documents**

[BME 4713 Design I FA21 CAR.docx](#)

**Assessment Results and Use of Results**

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**Reporting Period**

2022 - 2023

**Assessment Results Entry Date**

08/22/2023

**Assessment Results**

100% of students scored in the satisfactory or exceptional categories. Performance was good overall, with an overall score of 2.55.

**Results Status**

Target Met

**Number of Students Assessed**

47

**Related Documents**

[BME 4713 Design I FA22 CAR.pdf](#)

## **USE OF ASSESSMENT RESULTS**

### **Curriculum**

Continuing discussion with in-class examples of how to approach quantitative and/or systematic evaluation of design decisions, as well as incorporating short in-class team exercises/break-out sessions into lectures to allow teams to practice making detained justifications for design decisions and relating the decisions to design criteria could be beneficial.

### **Direct - Project**

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#### **Assessment Method Description**

BME 4823 Design II

Average of scores on the following (see Appendix for detailed problem statements):

- " Final Individual Report (25% of Assessment)
- " Final Engineering Report (25% of Assessment)
- " Final Pitch (25% of Assessment)
- " Poster Presentation (25% of Assessment)

#### **Performance Target**

90% of students achieve satisfactory or exceptional performance.

#### **Related Documents**

[BME 4823 Design II SP22 CAR.docx](#)

#### **Assessment Results and Use of Results**

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##### **Reporting Period**

2022 - 2023

##### **Assessment Results Entry Date**

08/22/2023

##### **Assessment Results**

100% of students scored in the satisfactory or exceptional categories. Performance was excellent, with an overall score of 2.7.

##### **Results Status**

Target Met

##### **Number of Students Assessed**

47

##### **Related Documents**

[BME 4823 Design II SP23 CAR.pdf](#)

## **USE OF ASSESSMENT RESULTS**

### **No Changes Needed**

No recommended actions.

## **ABET SO 3**

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### **Student Learning Outcome (SLO)**

an ability to communicate effectively with a range of audiences

### **Outcome Status**

Active

### **Direct - Presentation**

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#### **Assessment Method Description**

## BME 4823 Design II

Average of scores on the following (see Appendix for detailed problem statements):

- " Final Individual Report (25% of Assessment)
- " Mid-Semester Pitch (25% of Assessment)
- " Final Pitch (25% of Assessment)
- " Poster Presentation (25% of Assessment)

### Performance Target

90% of the class achieves satisfactory or exceptional performance.

### Related Documents

[BME 4823 Design II SP22 CAR.docx](#)

#### Assessment Results and Use of Results

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##### Reporting Period

2022 - 2023

##### Assessment Results Entry Date

08/22/2023

##### Assessment Results

100% of students scored in the satisfactory or exceptional categories. Performance was excellent with an overall score of 2.8.

##### Results Status

Target Met

##### Number of Students Assessed

47

##### Related Documents

[BME 4823 Design II SP23 CAR.pdf](#)

#### USE OF ASSESSMENT RESULTS

##### No Changes Needed

No recommended actions.

### Direct - Presentation

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#### Assessment Method Description

BME 3141 Biomechanics Lab

Average score of final lab report (Lab Report Rubric). and the final project presentation (Final Presentation Rubric). Only the final project lab report is used because this report would best show the students' ability to communicate a procedure they wrote themselves rather than a pre-existing procedure (like in Lab Reports 1-5).

#### Performance Target

90% of the class achieves satisfactory or exceptional performance.

#### Related Documents

[BME 3141 Biomechanics Lab FA21 CAR.docx](#)

### Direct - Presentation

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#### Assessment Method Description

BME 3171 Lab 1.

Score of the final project presentation. (See Final Presentation Rubric)

#### Performance Target

90 % of the class achieves satisfactory or exceptional performance.

#### Related Documents

[BME 3171 Lab 1 FA22 CAR.pdf](#)

#### Assessment Results and Use of Results

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##### Reporting Period

2022 - 2023

**Assessment Results Entry Date**

08/22/2023

**Assessment Results**

100% of students scored in the satisfactory or exceptional categories. Performance was very good, with an overall score of 2.76.

**Results Status**

Target Met

**Number of Students Assessed**

65

**Related Documents**

[BME 3171 Lab 1 FA22 CAR.pdf](#)

**USE OF ASSESSMENT RESULTS****Curriculum**

More deliberate lab questions and activities throughout the semester to scaffold student learning in these areas.

**ABET SO 4**

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**Student Learning Outcome (SLO)**

an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

**Outcome Status**

Active

**Direct - Examination**

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**Assessment Method Description**

BME 3533 Biomedical Instrumentation

Average of scores on the following problems (see Appendix for detailed problem statements):

- " Final exam, problem 1.a
- " Final exam, problem 1.b
- " Final exam, problem 1.c

**Performance Target**

90% of students achieve satisfactory or exceptional performance.

**Related Documents**

[BME 3533 Biomedical Instrumentation FA21 CAR.docx](#)

**Direct - Project**

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**Assessment Method Description**

BME 4713 Design I

Average of scores on the following (see Appendix for detailed problem statements):

- " NSPE Code of Ethics Quiz (33% of Assessment)
- " Ethics Case Study (33% of Assessment)
- " Phase 3A Worksheet: Design Ethics, Broad Impacts (34% of Assessment)

**Performance Target**

90% of students achieve satisfactory or exceptional performance.

**Related Documents**

[BME 4713 Design I FA21 CAR.docx](#)

**Assessment Results and Use of Results**

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**Reporting Period**

2022 - 2023



**Assessment Results Entry Date**

08/22/2023

**Assessment Results**

100% of students scored in the satisfactory or exceptional categories. Performance was good, with an overall score of 2.94.

**Results Status**

Target Met

**Number of Students Assessed**

47

**Related Documents**

[BME 4713 Design I FA22 CAR.pdf](#)

**USE OF ASSESSMENT RESULTS****Faculty Development**

It is recommended that the instructor continue to emphasize to students that they need to use the engineering codes of ethics to directly support their analysis.

**Direct - Examination**

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**Assessment Method Description**

BME 4823 Design II Average of scores on the following (Design Ethics Section of Phase 3B Worksheet - 33% of Assessment, Broader Impacts Section of Phase 3B Worksheet - 33% of Assessment, Final Engineering Report - 34% of Assessment).

**Performance Target**

90% of students achieve satisfactory or exceptional performance.

**Assessment Results and Use of Results**

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**Reporting Period**

2022 - 2023

**Assessment Results Entry Date**

08/21/2023

**Assessment Results**

100% of students scored in the satisfactory or exceptional categories.

**Results Status**

Target Met

**Number of Students Assessed**

47

**Related Documents**

[BME 4823 Design II SP23 CAR.pdf](#)

**USE OF ASSESSMENT RESULTS****Other**

Increased discussion and in-class exercises about global, cultural, social, environmental, economic factors is needed. In addition, examples regarding the relationship between global, cultural, social, environmental, and economic contexts engineering design decisions should be provided in class.

**ABET SO 5**

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**Student Learning Outcome (SLO)**

an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

**Outcome Status**

Active

**Direct - Course Embedded Assessment**

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**Assessment Method Description**

## BME 3141 Biomechanics Lab

Scores from the peer evaluations (Peer Evaluation Form), done by lab groups that worked on the final project together. Comments from the students in these evaluations were considered and observations by the instructors were also used for confirmation.

### Performance Target

90% of students achieve satisfactory or exceptional performance

### Related Documents

[BME 3141 Biomechanics Lab FA21 CAR.docx](#)

### Direct - Project

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#### Assessment Method Description

BME 4823 Design II

Average of scores on the following (see Appendix for detailed problem statements):

- " Phase 3B CATME Peer Evaluations – Team Adjusted Factor Score (17% of Assessment)
- " Phase 3B CATME Teamwork Score (16% of Assessment)
- " Phase 4A CATME Peer Evaluations – Team Adjusted Factor Score (17% of Assessment)
- " Phase 4A CATME Teamwork Score (16% of Assessment)
- " Phase 4B CATME Peer Evaluations – Team Adjusted Factor Score (18% of Assessment)
- " Phase 4B CATME Teamwork Score (16% of Assessment)

### Performance Target

90% of students achieve satisfactory or exceptional performance

### Related Documents

[BME 4823 Design II SP22 CAR.docx](#)

#### Assessment Results and Use of Results

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##### Reporting Period

2022 - 2023

##### Assessment Results Entry Date

08/22/2023

##### Assessment Results

100% of students scored in the satisfactory or exceptional categories. Performance was excellent, with an overall score of 3.

##### Results Status

Target Met

##### Number of Students Assessed

47

##### Related Documents

[BME 4823 Design II SP23 CAR.pdf](#)

##### USE OF ASSESSMENT RESULTS

##### No Changes Needed

No recommended actions.

### Direct - Presentation

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#### Assessment Method Description

BME 3171 Lab 1

Scores from the peer evaluation CATME survey (CATME Survey), done by lab groups that worked on the final project together. Comments from the students in these evaluations were considered and observations by the instructors were also used for confirmation.

### Performance Target

90% of students score in the satisfactory or exceptional categories.

### Related Documents

[BME 3171 Lab 1 FA22 CAR.pdf](#)

### Assessment Results and Use of Results

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#### Reporting Period

2022 - 2023

#### Assessment Results Entry Date

08/22/2023

#### Assessment Results

98% of students scored in the satisfactory or exceptional categories. Performance was good overall, with a score of 2.88.

#### Results Status

Target Met

#### Number of Students Assessed

65

#### Related Documents

[BME 3171 Lab 1 FA22 CAR.pdf](#)

### USE OF ASSESSMENT RESULTS

#### Methods of Assessment

Teamwork should be formally assessed, using CATME, at several timepoints throughout the semester. Students should receive feedback on their teamwork performance at least twice in the semester to support improvement in group dynamics and work distributions.

## ABET SO 6

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### Student Learning Outcome (SLO)

an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

#### Outcome Status

Active

### Direct - Project

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#### Assessment Method Description

BME 3161 MicroNano Technology Lab  
Average of Course Outcomes #3, #4, and #5.

#### Performance Target

90% of students achieve satisfactory or exceptional performance.

#### Related Documents

[BME 3161 Micro Nano Technology Lab SP22 CAR.docx](#)

### Direct - Project

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#### Assessment Method Description

BME 3151 MCT Engineering Lab  
Average of scores on the course outcomes #1, #2, #3 and #5

#### Performance Target

90% of students achieve satisfactory or exceptional performance.

#### Related Documents

[BME 3151 MCT Engineering Lab FA21 CAR.docx](#)

### Direct - Presentation

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#### Assessment Method Description

BME 3181 Lab II  
Average of the score of the final project paper (Lab Report Rubric) and poster presentation (Final Presentation Rubric).

#### Performance Target

90% of students score in the satisfactory or exceptional performance.

## Related Documents

[BME 3181 BME Lab II SP23 CAR.pdf](#)

### Assessment Results and Use of Results

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#### Reporting Period

2022 - 2023

#### Assessment Results Entry Date

08/22/2023

#### Assessment Results

100% of students scored in the satisfactory or exceptional categories. Performance was very good, with an overall score of 2.86.

#### Results Status

Target Met

#### Number of Students Assessed

65

#### Related Documents

[BME 3181 BME Lab II SP23 CAR.pdf](#)

### USE OF ASSESSMENT RESULTS

#### No Changes Needed

No recommendations.

## Direct - Examination

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### Assessment Method Description

BME 4823 Design II

Average scores on the following (see Appendix for detailed problem statements):

Testing Protocols Section of Phase 4A Worksheet (33% of Assessment)

Verification & Validation Results Section of Phase 4A Worksheet (33% of Assessment)

Final Engineering Report (34% of Assessment)

#### Performance Target

90% of the students score in the satisfactory or exceptional categories.

#### Related Documents

[BME 4823 Design II SP23 CAR.pdf](#)

### Assessment Results and Use of Results

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#### Reporting Period

2022 - 2023

#### Assessment Results Entry Date

08/22/2023

#### Assessment Results

100% of students scored in the satisfactory or exceptional categories. Performance was good, with an overall score of 2.2.

#### Results Status

Target Met

#### Number of Students Assessed

47

#### Related Documents

[BME 4823 Design II SP23 CAR.pdf](#)

### USE OF ASSESSMENT RESULTS

#### Curriculum

Increased discussion and in-class exercises about crafting/adapting robust testing protocols is needed. In addition, emphasis on evidence of support for anticipated results and in-class discussion about drawing conclusions from evidence (e.g. determining functionality from testing results) should be emphasized.

## ABET SO 7

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### Student Learning Outcome (SLO)

an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

### Outcome Status

Active

#### Direct - Project

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##### Assessment Method Description

BME 3151 MCT Engineering Lab

Average of scores for the literature review for the lab report (Final Report Rubric), establishing the gap in knowledge of the literature.

##### Performance Target

90% of students achieve satisfactory or exceptional performance.

##### Related Documents

[BME 3151 MCT Engineering Lab FA21 CAR.docx](#)

#### Direct - Examination

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##### Assessment Method Description

BME 3233 Biomaterials

Average of the following assessments:

Project 1, Project 2, Project 3, Project 4

Term Paper 1, Term Paper 2, Term Paper 3, Term Paper 4

Final Exam

##### Performance Target

90% of students achieve satisfactory or exceptional performance.

##### Related Documents

[BME 3233 Biomaterials FA21 CAR.pdf](#)

[BME 3233 Biomaterials SP22 CAR.pdf](#)

#### Assessment Results and Use of Results

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##### Reporting Period

2022 - 2023

##### Assessment Results Entry Date

08/22/2023

##### Assessment Results

100% of students scored in the satisfactory or exceptional categories. Overall performance score of a 2.9.

##### Results Status

Target Met

##### Number of Students Assessed

53

##### Related Documents

[BME 3233 Biomaterials SP23 CAR.pdf](#)

#### USE OF ASSESSMENT RESULTS

##### No Changes Needed

Continuation of the practices in this semester.

#### Direct - Presentation

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##### Assessment Method Description

## BME 3181 Lab II

Students were assessed on this outcome with two independent learning tasks. [1] Students were asked to develop their own method to calculate cell confluence and to detail and critique their chosen method. Scores for cell confluence calculations of the fluorescence post lab (Question 1) were used to assess this outcome. [2] Students were tasked with using a new software (Graphpad Prism) to create a data visualization for a post lab assignment. Scores for the data presentation component of live-dead post lab (Question 1) were used to assess this outcome.

### Performance Target

90% of classes scores in the satisfactory or exceptional categories.

### Related Documents

[BME 3181 BME Lab II SP23 CAR.pdf](#)

#### Assessment Results and Use of Results

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##### Reporting Period

2022 - 2023

##### Assessment Results Entry Date

08/22/2023

##### Assessment Results

95% of students scored in the satisfactory or exceptional categories. Performance was very good with a score of 2.73.

##### Results Status

Target Met

##### Number of Students Assessed

65

##### Related Documents

[BME 3181 BME Lab II SP23 CAR.pdf](#)

#### USE OF ASSESSMENT RESULTS

##### Other

Students should be made aware and encouraged to use lab laptops with all the needed software downloaded, for analysis work during class, office hours, and whenever needed.

## Direct - Examination

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### Assessment Method Description

BME 4713 Design I

Average of scores on the following (see Appendix for detailed problem statements):

Engineering report

### Performance Target

90% of students score in the satisfactory or exceptional categories.

### Related Documents

[BME 4713 Design I FA22 CAR.pdf](#)

#### Assessment Results and Use of Results

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##### Reporting Period

2022 - 2023

##### Assessment Results Entry Date

08/22/2023

##### Assessment Results

100% of students scored in the satisfactory or exceptional categories. Performance was good overall, with a score of 2.91.

##### Results Status

Target Met

##### Number of Students Assessed

47

##### Related Documents

[BME 4713 Design I FA22 CAR.pdf](#)

## **USE OF ASSESSMENT RESULTS**

### **Curriculum**

Some students still struggled with understanding how much detail to incorporate into their responses and that they needed to use high quality references to support statements made, particularly when defining the population being designed, statistics related to the big picture and focused problems, and benchmarked products. However, after being provided feedback, students were typically able to find the necessary information and demonstrated continuous improvement. Additional in-class discussion and exercises for identifying these parameters within examples and for finding evidence of support (references) might be beneficial.