College of Engineering and Engineering Technology

Biomedical Engineering

B.S. in Biomedical Engineering

January 8, 2021

1. Introduction

As a relatively newly established degree program, Biomedical Engineering Program seeks to provide students with fundamental knowledge and skills needed to excel at the integration of engineering, science, and medicine to solve biological and medical problems, improve quality of life, and become future biomedical engineering leaders. Graduates of this program are expected to have a solid background in mathematics, sciences, and engineering fundamentals as well as core biological sciences. Successful completion of this program should enable the graduates with the ability to seamlessly transition between fields in identifying and solving problems pertinent to life sciences and medicine. The program curriculum will involve engaged teaching and learning as well as design experience through establishing a synergy between classroom and hands-on laboratory activities. This curriculum has an emphasis on creating, transmitting, expanding, and applying knowledge in the practice of biomedical engineering in a professional and ethical way, while preparing our graduates to succeed in the industry as well as preparing them for graduate education.

2. Program Student Learning Outcomes (PSLOs)

(1) <u>Problem Formulation</u>: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

(2) <u>Engineering Design</u>: 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

(3) <u>Communication</u>: An ability to communicate effectively with a range of audiences

(4) <u>Ethics</u>: 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

(5) <u>Teamwork</u>: 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

(6) <u>Experimentation and Data Analysis</u>: An ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions

(7) <u>Learning and Applying New Knowledge</u>: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

3. Program-by-Baccalaureate Student Learning Outcomes Matrix

PROGRAM STUDENT LEARNING OUTCOMES	BACCALAUREATE STUDENT LEARNING OUTCOMES							
	A. Global inter-connections and inter-dependencies	B. Intercultural competencies	C. Analyze human life and natural world inter-connections	D. Critical, creative, and independent thought	E. Communicate clearly and effectively	F. Collaborate with others	G. Quantitative and qualitative reasoning	H. Apply knowledge/ skills creatively
1. Problem Formulation	M	M	M	S	M	M	S	S
2. Engineering Design	M	M	M	S	S	M	S	S
3. Communication Skills	M	M	S	S	S	M	M	M
4. Ethics	M	S	S	S	M	M	M	M
5. Data Gathering and Analysis	M	M	S	S	M	M	S	S
6. Teamwork	M	S	M	M	S	M	S	S
7. Learning and Applying New Knowledge	M	M	S	S	S	S	S	S
OVERALL	M	M	S	S	S	M	S	S
Note. Program Student Learning Outcome strongly supports (S), moderately supports (M), or does not support (blank) the respective Baccalaureate Student Learning Outcome								

4. Curriculum Map

COURSE	PROGRAM STUDENT LEARNING OUTCOMES						
	1. Problem Formulation	2.Engineering Design	3. Communication Skills	4. Ethics	5. Data Gathering and Analysis	6. Teamwork	7. Learning and Applying Knowledge
BME 201	B	B	B	B	B	B	B
BME 320	D	D	D	D	D	D	D
BME 330	D	D	D	D	D	D	D
BME 336	D	D	D	D	D	D	D
BME 395	P	P	P	P	P	P	P
BME 495	P	P	P	P	P	P	P
BME 496	P	P	P	P	P	P	P
Note. Course supports the PSLO at the Beginning (B), Developing (D), or Proficient (P) level							

BME 201 - Introduction to Biomedical Engineering (3 SCH)
BME 320 - Biomedical Engineering Measurements (4 SCH)
BME 330 - Biomechanics (3 SCH)
BME 336 - Biomaterials (3 SCH)
BME 395 - Biomedical Engineering Junior Design (1 SCH)
BME 495 - Senior Biomedical Engineering Design I (3 SCH)
BME 496 - Senior Biomedical Engineering Design II (3 SCH)

5. Assessment Methods

EXPLANATION OF ASSESSMENT METHODS

ASSESSMENT METHOD	EXPLANATION					
	Description	Student-Level Achievement	Program-Level Target	When Data Will be Collected	Person Responsible	PSLO
BME 201 Assessment Question	Students are assigned a question on a homework assignment or an exam, or to address within a project report, in which they are to: (1) formulate a given real-world application within biomedical engineering framework; (2) use data given to obtain the proper calculations and conclusions; and (3) communicate the conclusions appropriately	A student will receive a rubric score of Proficient or better on each performance criteria	75% of all students will meet the student-level target (i.e., receive a rubric score of Proficient or better on each of the performance criteria)	At the completion of the assignment or by the completion of the course	Course Instructor	1, 2, 3, 4
BME 320 Assessment Question	Students are assigned a question on a homework assignment or an exam, or to address within a project report, in which they are to: (1) formulate a given real-world application within biomedical engineering framework; (2) use data given to obtain the proper calculations and conclusions; and (3) communicate the conclusions appropriately	A student will receive a rubric score of Proficient or better on each performance criteria	75% of all students will meet the student-level target (i.e., receive a rubric score of Proficient or better on each of the performance criteria)	At the completion of the assignment or by the completion of the course	Course Instructor	1, 2, 3, 7

BME 330 Assessment Question	Students are assigned a question on a homework assignment or an exam, or to address within a project report, in which they are to: (1) formulate a given real-world application within biomedical engineering framework; (2) use data given to obtain the proper calculations and conclusions; and (3) communicate the conclusions appropriately	A student will receive a rubric score of Proficient or better on each performance criteria	75% of all students will meet the student-level target (i.e., receive a rubric score of Proficient or better on each of the performance criteria)	At the completion of the assignment or by the completion of the course	Course Instructor	1, 2, 3, 7
BME 336 Assessment Question	Students are assigned a question on a homework assignment or an exam, or to address within a project report, in which they are to: (1) formulate a given real-world application within biomedical engineering framework; (2) use data given to obtain the proper calculations and conclusions; and (3) communicate the conclusions appropriately	A student will receive a rubric score of Proficient or better on each performance criteria	75% of all students will meet the student-level target (i.e., receive a rubric score of Proficient or better on each of the performance criteria)	At the completion of the assignment or by the completion of the course	Course Instructor	1, 2, 3, 4, 7
BME 395 Assessment Question	Students are assigned a question on a homework assignment or an exam, or to address within a project report, in which they are to: (1) formulate a given real-world application within biomedical engineering framework; (2) use data given to obtain the proper calculations and conclusions; and (3) communicate the conclusions appropriately	A student will receive a rubric score of Proficient or better on each performance criteria	75% of all students will meet the student-level target (i.e., receive a rubric score of Proficient or better on each of the performance criteria)	At the completion of the assignment or by the completion of the course	Course Instructor	2, 3, 4, 5

BME 495 Assessment Question	Students are assigned a question on a homework assignment or an exam, or to address within a project report, in which they are to: (1) formulate a given real-world application within biomedical engineering framework; (2) use data given to obtain the proper calculations and conclusions; and (3) communicate the conclusions appropriately	A student will receive a rubric score of Proficient or better on each performance criteria	75% of all students will meet the student-level target (i.e., receive a rubric score of Proficient or better on each of the performance criteria)	At the completion of the assignment or by the completion of the course	Course Instructor	1, 2, 3, 4, 5, 6, 7
BME 496 Assessment Question	Students are assigned a question on a homework assignment or an exam, or to address within a project report, in which they are to: (1) formulate a given real-world application within biomedical engineering framework; (2) use data given to obtain the proper calculations and conclusions; and (3) communicate the conclusions appropriately	A student will receive a rubric score of Proficient or better on each performance criteria	75% of all students will meet the student-level target (i.e., receive a rubric score of Proficient or better on each of the performance criteria)	At the completion of the assignment or by the completion of the course	Course Instructor	1, 2, 3, 4, 5, 6, 7
Entry into Graduate Programs/ Professional Employment	Admission into a graduate program or employment in a profession-related job	Students obtain admission into a graduate program or obtain a profession-related job in the next six months following graduation	90% of graduating students will have entered a graduate program or entered professional employment	Six months following graduation	NIU Career Services / Program Chair	1, 2, 3, 4, 5, 6

| Exit Survey | Each student is encouraged to fill out a survey on their experiences in the program, where the survey specifically addresses the exposure of students to different topics in the program as well as their self-scored mastery in each | Each student will provide a self-evaluated mastery score on a scale of 1 (low) to 5 (high) for each area in the survey | 85% of students surveyed will assign themselves a mastery score of 3 or higher in each of the areas addressed by the survey | End of each semester | Program Chair | 1, 2, 3, 4, 5, 6, 7 |

ASSESSMENT METHODS-BY-OUTCOMES MATRIX

ASSESSMENT METHOD	PROGRAM STUDENT LEARNING OUTCOMES						
	1. Problem Formulation	2. Engineering Design	3. Communication Skills	4. Ethics	5. Data Gathering and Analysis	6. Teamwork	7. Learning and Applying Knowledge
BME 201 Assessment Question	S, D	S, D	S, D		S, D		
BME 320 Assessment Question	S, D	S, D	S, D				S, D
BME 330 Assessment Question	S, D	S, D	S, D				S, D
BME 336 Assessment Question	S, D	S, D	S, D	S, D			S, D
BME 395 Assessment Question		S, D	S, D	S, D	S, D		
BME 495 Assessment Question	S, D	S, D	S, D	S, D	S, D	S, D	S, D
BME 496 Assessment Question	S, D	S, D	S, D	S, D	S, D	S, D	S, D
Entry into Graduate Programs/ Professional Employment	S, I	S, I	S, I	S, I	S, I	S, I	
Exit Survey	S, I	S, I	S, I	S, I	S, I	S, I	S, I
Note. Formative Assessment (F), Summative Assessment (S), Direct Assessment (D), and Indirect Assessment (I)							