College of Engineering and Engineering Technology

Mechanical Engineering

B.S. in Mechanical Engineering

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Submitted to the University Assessment Panel by:

Tariq Shamim, Chair

1. Introduction

As a well-established degree program, BS in Mechanical Engineering Program seeks to provide a high-quality, visionary engineering education and prepares students to become engineers and leaders capable of solving current and future technical challenges of the industry and society. Graduates of this program are expected to have a balanced education in mechanical engineering fields; a foundational knowledge in mathematics and physical sciences; a broad general education in the humanities/arts, social sciences and interdisciplinary studies; training for effective communication and team work; and an understanding and commitment of an engineer's professional and ethical responsibilities. The program curriculum involves engaged teaching and learning as well as design experience through establishing a synergy between classroom and hands-on laboratory activities. The program contributes significantly to the work force and economic development of the northern Illinois region. The program is very responsive to the changing demands of the industry and society, and closely monitor the quality of the program through regular review and continuous improvement of the curriculum, course contents, instructions and assessment methods.

2. Program Student Learning Outcomes (PSLOs)

The graduates of undergraduate mechanical engineering program will be prepared to attain the following outcomes:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. 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. An ability to communicate effectively with a range of audiences.
4. 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. 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. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. 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			S	S	M	M	S	S
2. Engineering Design	M	M	S	S	S	S	S	S
3. Communication Skills	M	M	S	S	S	S	M	M
4. Ethics	M	S	S	M	M		M	M
5. Teamwork	M	S	M	M	S	S	M	M
6. Data Gathering and Analysis		M	S	S	S	M	S	S
7. Learning and Applying New Knowledge	M	M	S	S	M		S	S
OVERALL	M	M	S	S	S	S	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. Teamwork	6. Data Gathering and Analysis	7. Learning and Applying Knowledge
UEET 101			B	B	B		
MEE 270		B	B				B
MEE 210	B					B	B
MEE 211	B		B				
MEE 212	B	B		B			
MEE 320	D	D			D		D
MEE 321	D		D	B	D	B	D
MME 330	D	D	D	B	D	B	D
MEE 340	D						D
MEE 350	D						D
MEE 383	D		D			B	D
MEE 322	P	D					D
MEE 331	D	D					D
MEE 352	P	D					D
MEE 380/ 381	D					D	D
MEE 390	P		D	D	D	D	D
MEE 470	P	D	D				P
MEE 485	P	P	P	P	P	P	P
MEE 430	P	P					P
MEE 486	P	P	P	P	P	P	P
Note. Course supports the PSLO at the Beginning (B), Developing (D), or Proficient (P) level							

UEET 101 - Introduction to Engineering
MEE 210 - Engineering Mechanics

MEE 211 - Engineering Mechanics II
MEE 212 - Mechanics of Materials
MEE 270 - Engineering Graphics
MEE 320 - Mechanism Design and Analysis
MEE 321 - Mechanical Vibrations I
MEE 322 - Dynamic Systems and Control I
MEE 330 - Materials Science
MEE 331 - Manufacturing Processes
MEE 340 - Fluid Mechanics
MEE 350 - Engineering Thermodynamics
MEE 352 - Heat Transfer
MEE 380 - Computational Methods in Engineering Design
MEE 381 - Computational Methods and Programming in Engineering Design
MEE 383 - Engineering Analysis
MEE 390 - Experimental Methods in Mechanical Engineering I
MEE 430 - Computer-Aided Design and Manufacturing
MEE 470 - Design of Machine Elements
MEE 485 - Senior Mechanical Engineering Design I
MEE 486 - Senior Mechanical Engineering Design II

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
Course and Program Outcome Assessment	The instructors conduct assessment of course outcomes based on outcome performance criteria rubrics and using a rating score of 1-4. Instructors submit a report of the student outcome in every semester. Homework, examinations and projects are considered as course embedded measures. Based on the analysis of these reports, the department conducts outcome assessment in the program level.	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
Capstone Design Project (MEE 485 & MEE 486)	Each student is required to participate in senior design project and write a report which is evaluated by an instructor/advisor and a group of judges including faculty members. Written Report: Students are required to submit the report as written documents for examination by the instructor/advisor Oral presentation: Students are also required to make an oral	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

	presentation of the project on senior design day in an open seminar in front of the instructors/advisors, judges and other students and faculty. Senior design projects are evaluated every semester to measure the student outcomes using an evaluation form					
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, 7
Exit Survey	Survey is conducted for all seniors on Senor design day. Survey form is used based on program outcomes.	Each student will provide a self-evaluated mastery score on a scale of 1 (low) to 5 (high) for each area in the survey	75% 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	Senior design instructor	1, 2, 3, 4, 5, 6, 7
Alumni Survey	Survey is conducted to get the feedback from the program's alumni. Survey form is used based on program outcomes.	Each respondent will provide a self-evaluated mastery score on a scale of 1 (low) to 5 (high) for each area in the survey	75% of alumni surveyed will assign themselves a mastery score of 3 or higher in each of the areas addressed by the survey	Each Fall semester	Distinguished department faculty	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. Teamwork	6. Data Gathering and Analysis	7. Learning and Applying Knowledge
Course and Program Outcome Assessment	S, D	S, D	S, D	S, D	S, D	S, D	S, D
Capstone Design Project (MEE 485 & MEE 486)	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	S, I
Exit Survey	S, I	S, I	S, I	S, I	S, I	S, I	S, I
Alumni 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)							