College of Engineering and Engineering Technology

Mechanical Engineering

M.S. in Mechanical Engineering

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Submitted to the University Assessment Panel by:

Tariq Shamim, Chair

1. Introduction

The M.S. in mechanical engineering program is designed to stimulate creativity, to provide an in-depth understanding of the basic physical phenomena involved in mechanical systems, and to provide the student with the ability to use modern techniques in the analysis and design of mechanical components and systems. Graduates of this program are expected to attain the following objectives by the time and within a few years of graduation: become successful professionals; contribute to their professional fields and assume leadership roles in industry or research organizations; assume professional responsibilities and exhibit effective communication skills; collaborate with faculty and conduct research and scholarly activities at the forefront of the field and engage in professional societies by publishing professional papers and attending and presenting papers at professional conferences. The program curriculum involves engaged teaching and learning. 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.

2. Program Student Learning Outcomes (PSLOs)

The graduates of M.S. in mechanical engineering program will be prepared to attain the following outcomes:

1. Apply advanced analytical and computational techniques to engineering problems.
2. Design a system, component, or process to meet desired objectives in one of the specialty areas: applied mechanics, computer-aided design & manufacturing, thermal-fluid systems, vibrations, dynamics & control systems.
3. Identify, formulate, and solve complex engineering problems.
4. Conduct research in one of the specialty areas.
5. Communicate effectively.
6. Demonstrate professional and ethical responsibility.
7. Use modern engineering experimental and computational tools at a level appropriate for advanced analysis and design.

3. Curriculum Map

COURSE	PROGRAM STUDENT LEARNING OUTCOMES						
	1. Advanced Techniques	2.Engineering Design	3. Problem Formulation	4. Research Experience	5. Communication Skills	6. Professional and Ethical Behavior	7. Use of Modern Tools
MEE 510	B		B				
MEE 521	B	B	B				
MEE 522	B	B	B				
MEE 523	B		B				
MEE 524	B		B				
MEE 525	B	D	B				B
MEE 526	B	D	B				B
MEE 527	B	D	B				B
MEE 528	B		B				B
MEE 530	B	B	B				B
MEE 531	B		B				
MEE 532	B	B	B				
MEE 533	D	D	D				D
MEE 534	B	B	B				D
MEE 536	B		B				
MEE 551	B	B	B				
MEE 552	D	D	D				
MEE 553	D		D				
MEE 554	B		B				
MEE 555	B		B				
MEE 556	B		B				
MEE 579	B		B				B
MEE 580	B		B				B
MEE 584	D		D				D
MEE 610	D		D		D		D
MEE 611	P		P				

COURSE	PROGRAM STUDENT LEARNING OUTCOMES						
	1. Advanced Techniques	2.Engineering Design	3. Problem Formulation	4. Research Experience	5. Communication Skills	6. Professional and Ethical Behavior	7. Use of Modern Tools
MEE 612	P		P				
MEE 613	D		D				
MEE 614	D		D				
MEE 615	P		P				D
MEE 616	D		D				
MEE 617	P		P				
MEE 620	P		P				
MEE 621	P		P				
MEE 622	D		D		D	D	D
MEE 623	D		D				P
MEE 624	D	P	D				
MEE 625	P		P				P
MEE 626	P	P	P				P
MEE 627	D		D				P
MEE 628	P		P				P
MEE 629	D	P	D				
MEE 630	D		D				
MEE 631	D	P	D				P
MEE 632	D		D				
MEE 633	D	P	D				P
MEE 634	D		D		D	D	P
MEE 635X	D		D				P
MEE 636	P		P				
MEE 637	P	P	P				P
MEE 640	P		P				
MEE 642	P		P				
MEE 650	P		P				
MEE 652	P		P				

COURSE	PROGRAM STUDENT LEARNING OUTCOMES						
	1. Advanced Techniques	2.Engineering Design	3. Problem Formulation	4. Research Experience	5. Communication Skills	6. Professional and Ethical Behavior	7. Use of Modern Tools
MEE 655	P		P				
MEE 656	P		P				
MEE 657	P		P				
MEE 658	P		P				P
MEE 692	P		P				
MEE 697	P		P	P	P	P	P
MEE 698	P		P	P	P	P	P
MEE 699	P		P	P	P	P	P
Note. Course supports the PSLO at the Beginning (B), Developing (D), or Proficient (P) level							

MEE 510 - Intermediate Mechanics of Materials
MEE 521 - Dynamic Systems and Control II
MEE 522 - Design of Robot Manipulators
MEE 523 - Mechanical Reliability
MEE 524 - Machinery Vibration
MEE 525 - Design of Mobile Robots
MEE 526 - Mechatronics System Design
MEE 527 - PLC-based Robotics in Automated Systems
MEE 528 - Modeling Complex Systems
MEE 530 - Computer-Aided Design and Manufacturing
MEE 531 - Composite Materials
MEE 532 - Laser Materials Processing
MEE 533 - Advanced Manufacturing Processes
MEE 534 - Additive Manufacturing and Applications
MEE 536 - Biomaterials
MEE 551 - Refrigeration and Air Conditioning
MEE 552 - Design of Thermal Systems
MEE 553 - Propulsion
MEE 554 - Alternative and Renewable Energy

MEE 555 - Energy Conservation and Environmental Sustainability
MEE 556 - Electrochemical Energy Conversion and Storage Systems
MEE 579 - Digital Human Modeling and Simulation
MEE 580 - Finite Element Methods
MEE 584 - Advanced Computing in Mechanical Engineering
MEE 610 - Experimental Stress Analysis
MEE 611 - Continuum Mechanics
MEE 612 - Advanced Mechanics of Materials
MEE 613 - Fatigue and Fracture Mechanics
MEE 614 - Theory of Elasticity and Applications
MEE 615 - Advanced Finite Element Methods
MEE 616 - Mechanical Behavior of Composites
MEE 617 - Theory of Plasticity and Applications
MEE 620 - Advanced Dynamics
MEE 621 - Advanced Vibrations
MEE 622 - Experimental Methods in Mechanical Vibrations
MEE 623 - Robot Vision Control
MEE 624 - Robot Dynamics and Control
MEE 625 - Robot Programming and Control
MEE 626 - Advanced Control Systems Design
MEE 627 - Stochastic Estimation and Control
MEE 628 - Advanced Mechanism Synthesis Methods
MEE 629 - Materials Engineering in Mechanical Design
MEE 630 - Structure and Properties of Polymers
MEE 631 - Computer-Aided Design of Mechanical Systems
MEE 632 - Tribology
MEE 633 - Computer-Aided Manufacturing
MEE 634 - Experimental Methods in Materials Science
MEE 635X - Data Analytics for Engineers
MEE 636 - Advanced Biomaterials and Manufacturing
MEE 637 - Advanced Additive Manufacturing
MEE 640 - Advanced Fluid Mechanics
MEE 642 - Dynamics of Viscous Fluids

MEE 650 - Advanced Thermodynamics
MEE 652 - Transport Phenomena in Porous Media
MEE 655 - Conduction Heat Transfer
MEE 656 - Convection Heat Transfer
MEE 657 - Radiative Heat Transfer
MEE 658 - Computational Heat Transfer and Fluid Mechanics
MEE 692 - Advanced Mechanical Engineering Analysis
MEE 697 - Independent Study
MEE 698 - Special Topics in Mechanical Engineering
MEE 699 - Master's Thesis

4. 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 Level Program Outcome Assessment	The instructors conduct assessment of course outcomes based on outcome performance criteria rubrics and using a rating score of 1-4. Homework, examinations, computer assignments and projects will be considered as course embedded measures. Instructors submit a report of the outcome performance in every semester. 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	80% 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
MS Thesis/Project (MEE 699/697)	Each student is required to conduct a project and write a research thesis or project report which is evaluated by an advisor and at least two more graduate faculty members. Written Report: Students are required to submit the thesis /report as written documents for examination by the thesis/report committee.	A student will receive a rubric score of Proficient or better on each performance criteria	80% of students will attain a score of 4&5 in all outcomes.	At the completion of the thesis/project	Thesis/Project Director	1, 3, 4, 5, 6, 7

	Oral presentation: Students are also required to make an oral presentation of the thesis/report in an open seminar in front of the committee members and other students and faculty. Committee members assign a grade of pass or fail based on the thesis/project work. Faculty determined key components of a thesis and developed rubric in an evaluation form (See Table -1) using a rating score of 1-5.					
Exit Survey	Survey form (Table-2) is developed based on program outcomes and using a rating score of 1-5.	Each student will provide a self-evaluated mastery score on a scale of 1 (low) to 5 (high) for each area in the survey	80% of students surveyed will assign themselves a mastery score of 3 or higher in each of the areas addressed by the survey	Survey will be completed after the thesis/project defense or during an exit interview with the chair	Department Coordinator / Program Chair	1, 2, 3, 4, 5, 6, 7
Alumni Survey	Survey is conducted to get the feedback from the program's alumni. Survey form (Table- 3) 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	80% of alumni surveyed will assign themselves a mastery score of 3 or higher in each of the areas addressed by the survey	Coinciding with University-wide survey administration; one, five, & ten years after graduation	CEET/MEE assessment coordinator	1, 2, 3, 4, 5, 6, 7

Employer Survey	Survey is conducted to get the feedback from the employer of the program's graduates. Survey form (Table- 4) is used based on program outcomes.	Each respondent will provide a self-evaluated score on a scale of 1 (low) to 5 (high) for each area in the survey	80% of employer surveyed will give a mastery score of 3 or higher in each of the areas addressed by the survey		CEET/MEE assessment coordinator	1, 2, 3, 4, 5, 6, 7

ASSESSMENT METHODS-BY-OUTCOMES MATRIX

ASSESSMENT METHOD	**PROGRAM STUDENT LEARNING OUTCOMES**						
	1. Advanced Techniques	2.Engineering Design	3. Problem Formulation	4. Research Experience	5. Communication Skills	6. Professional and Ethical Behavior	7. Use of Modern Tools
Course Level Program Outcome Assessment	S, D	S, D	S, D				S, D
MS Thesis/Project (MEE 699/697)	S, D		S, D	S, D	S, D	S, D	S, D
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
Employer 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)							