



**Northern Illinois  
University**

College of Engineering and Engineering Technology

Mechatronics Engineering Program

B.S. in Mechatronics Engineering

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Submitted to the University Assessment Panel by:

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## 1. Introduction

Mechatronics Engineering Program began its first cohort in Fall, 2019, and is anticipated to have graduates with B.S. in Mechatronics Engineering degree in Spring, 2022. As a relatively new degree program, Mechatronics Engineering Program seeks to provide students with fundamental knowledge and skills needed to excel at the integration of engineering, computer science, and machine intelligence to solve electromechanical and automation problems, improve quality of life, and become future mechatronics engineering leaders. Graduates of this program are expected to have a solid background in mathematics, computing, and engineering fundamentals as well as core physical 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 the advancement of the electromechanical field in and out of the industry. 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 mechatronics 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) Problem Formulation: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- (2) Engineering Design: 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) Communication: An ability to communicate effectively with a range of audiences
- (4) Ethics: 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) Teamwork: 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) Experimentation and Data Analysis: An ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions

(7) Learning and Applying New Knowledge: 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 Outcome	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. <u>Problem Formulation</u>	M	M	M	S	M	M	S	S
2. <u>Engineering Design</u>	M	M	M	S	S	S	M	S
3. <u>Communication</u>	M	M	S	S	S	M	M	M
4. <u>Ethics</u>	M	S	S	S	M	M	M	M
5. <u>Teamwork</u>	M	S	M	M	S	M	S	S
6. <u>Experimentation and Data Analysis</u>	M	M	S	S	M	M	S	S
7. <u>Learning and Applying New Knowledge</u>	M	M	S	S	S	S	S	S
Overall	MS	M	S	S	S	M	S	S
<i>Note.</i> Gauge whether each program outcome strongly supports (S), moderately supports (M), or doesn't support (leave blank) each baccalaureate learning outcome								

#### 4. Curriculum Map

Course	Program Student Learning Outcomes						
	1. Problem Formulation	2. Engineering Design	3. Communication Skills	4. Ethics	5. Teamwork	6. Experimentation and data Analysis	7. Learning and Applying New Knowledge
MCTR 210	B		B		B	B	B
MCTR 320	D	B	D		D	D	D
MCTR 420	D	D	D				D
MCTR 440	P	P	P		P		P
MCTR 481	P	P	P	P	P	P	P
MCTR 482	P	P	P	P	P	P	P

*Note.* Course supports the outcome at the B=beginning, D=developing, or P=proficient level.

MCTR 210 – Programming for Mechatronics (3 SCH)

MCTR 320 – Fundamentals of Mechatronics (3 SCH)

MCTR 420 – Introduction to Robotics and Automation (3 SCH) .

MCTR 440 – Design of Mechatronics Systems (3 SCH)

MCTR 481 - Mechatronics Engineering Senior Design I (3 SCH)

MCTR 482 - Mechatronics Engineering Senior Design II (3 SCH)

## 5. Assessment Methods

Assessment Method	Explanation					
	Description	Student-Level Achievement <sup>a</sup>	Program-Level Target <sup>b</sup>	When Data Will be Collected	Person Responsible	SLOs Covered
MCTR 210 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 mechatronics 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	1,3,5,6,7

Assessment Method	Explanation					
	Description	Student-Level Achievement <sup>a</sup>	Program-Level Target <sup>b</sup>	When Data Will be Collected	Person Responsible	SLOs Covered
MCTR 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 mechatronics 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

Assessment Method	Explanation					
	Description	Student-Level Achievement <sup>a</sup>	Program-Level Target <sup>b</sup>	When Data Will be Collected	Person Responsible	SLOs Covered
MCTR 420 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 mechatronics 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



Assessment Method	Explanation					
	Description	Student-Level Achievement <sup>a</sup>	Program-Level Target <sup>b</sup>	When Data Will be Collected	Person Responsible	SLOs Covered
MCTR 440 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 mechatronics 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	1,3,5,6,7

Assessment Method	Explanation					
	Description	Student-Level Achievement <sup>a</sup>	Program-Level Target <sup>b</sup>	When Data Will be Collected	Person Responsible	SLOs Covered
MCTR 481 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 mechatronics 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

Assessment Method	Explanation					
	Description	Student-Level Achievement <sup>a</sup>	Program-Level Target <sup>b</sup>	When Data Will be Collected	Person Responsible	SLOs Covered
MCTR 482 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 mechatronics 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

Assessment Method	Explanation					
	Description	Student-Level Achievement <sup>a</sup>	Program-Level Target <sup>b</sup>	When Data Will be Collected	Person Responsible	SLOs Covered
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
<p><i>Note.</i> <sup>a</sup> Student-level target is the score or performance an individual student must demonstrate to say the student met the student learning outcome.</p> <p><sup>b</sup> Program-level target is the percent of all students that must demonstrate they meet the student learning outcome.</p>						

### ASSESSMENT METHODS-BY-OUTCOMES MATRIX

Assessment Method	Program Student Learning Outcome						
	1. Problem Formulation	2. Engineering Design	3. Communication Skills	4. Ethics	5. Teamwork	6. Data Gathering and Analysis	7. Learning and Applying Knowledge
MCTR 210 Assessment Question	S, D		S, D		S, D	S, D	S, D

Assessment Method	Program Student Learning Outcome						
	1. Problem Formulation	2. Engineering Design	3. Communication Skills	4. Ethics	5. Teamwork	6. Data Gathering and Analysis	7. Learning and Applying Knowledge
MCTR 320 Assessment Question	S, D	S, D	S, D		S, D	S, D	S, D
MCTR 420 Assessment Question	S, D	S, D	S, D				S, D
MCTR 440 Assessment Question	S, D	S, D	S, D		S, D		S, D
MCTR 481 Assessment Question	S, D	S, D	S, D	S, D	S, D	S, D	S, D
MCTR 482 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
<i>Note.</i> F=formative assessment, S=summative assessment, D=direct assessment, and I=indirect assessment. See the paragraph above for an explanation of each type of assessment.							