

## **MSE 4420: Capstone Engineering Design II**

**Credit hours and contact hours:** 1-0-6-3

**Instructor:** Mary Lynn Realff

**Textbook:** K.T. Ulrich and S.D. Eppinger, *Product Design and Development*, McGraw-Hill, 6<sup>th</sup> Edition, 2016.

### **Specific course information**

**Catalog description:** A team problem-solving approach is used to work on a project developed in cooperation with industry. Weekly communications, both oral and written, are required.

**Prerequisites:** MSE 4420 - Capstone Engineering Design I

**Course:** Required

### **Specific goals for the course**

#### **Outcomes of instruction:**

1. Effectively communicate technical information in written and oral formats.
2. Collaborate with a team of peers to undertake a design project.
3. Recognize the professional and ethical responsibilities of a materials engineer.
4. Identify and formulate a materials engineering design problem.
5. Define and prioritize realistic constraints for a materials engineering design problem.
6. Critically analyze the results of processing and/or characterization experiments.
7. Apply integrated knowledge of the structure, properties, processing, and performance of materials to solve a design problem.

#### **Student 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 for 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.

**Topics covered:**

1. Engineering design methodology
2. Technical communication
3. Decision making strategies
4. Experimental design
5. Data analysis

**Correlation between Outcomes of Instruction and Student Outcomes:**

Outcomes of Instruction	Student Outcomes						
	1	2	3	4	5	6	7
1. Effectively communicate technical information in written and oral formats.			X		X		
2. Collaborate with a team of peers to undertake a design project.			X	X	X		
3. Recognize the professional and ethical responsibilities of a materials engineer.				X			
4. Identify and formulate a materials engineering design problem.	X	X					
5. Define and prioritize realistic constraints for a materials engineering problem		X					
6. Critically analyze the results of processing and/or characterization experiments.	X				X	X	
7. Apply integrated knowledge of the structure, properties, processing, and performance of materials to solve a design problem.	X	X		X		X	

**School of Materials Science and Engineering Student 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 for 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.