

**United States Naval Academy
Mechanical Engineering Department**

Catalog Description: EM471 Mechanical Engineering Design I **Credit:** 3 (2-2-3)
Listed as EX485M Multidisciplinary Engineering Design I

Designation: Required, engineering design, capstone course (part 1)

The first course in a two-semester capstone design sequence. Topics include the engineering design process, project management, codes and standards, engineering ethics, and computer-aided design. Students form design teams, select a capstone design project and progress through the proposal and preliminary design stages of the project. The capstone design project continues in EM472.

Prerequisites: EM371 Introduction to Design or department chair approval

Corequisites: None

Textbooks: Dieter, G. E., & Schmidt, L. C. (2012). *Engineering Design, 5th Ed.* New York: McGraw-Hill.

Course Director: LCDR E. E. Lust, USN

Course Content:

No.	Topic or Subtopic	hrs.
1	Introduction to the Engineering Design Process	4
2	Designing to Codes and Standards	2
3	Problem Definition and Need Identification	12
4	Team Behavior and Tools including Project Management	4
5	Gathering Information	8
6	Concept Generation	8
7	Decision Making and Concept Selection	4
8	Embodiment Design	12

Assessment Methods:

		YES	NO
A	Quizzes	X	
B	Homework	X	
C	Exams		X
D	Laboratory Reports		X
E	Oral Presentations	X	
F	Design Reports/Notebooks	X	
G	Prototypes/Demonstrations		X
H	Projects		X
I	Other		X

Course Outcomes:

Letters in parenthesis refer to the assessment methods listed in the previous section.

1. Gather (analysis) the information necessary to define the problem including any necessary, solution-neutral modeling and/or analysis. (B,F)
2. Define (synthesis) the problem in terms of customer requirements and engineering characteristics, including design constraints and target values. (A,B,F)
3. Apply (application) appropriate codes as design constraints and standards in the testing and evaluation process. (A,B,F)
4. Generate (synthesis) design concepts that are likely to meet customer requirements. (B,F)
5. Predict (analysis) performance of concepts with regard to the engineering characteristics using modern engineering tools necessary for engineering practice. (B,F)
6. Select (evaluate) from among the design concepts based on objective technical criteria. (B,F)
7. Develop (synthesis) a detail design ready for implementation. (B,F)
8. Develop (synthesis) a detailed testing and evaluation plan related to established engineering characteristics. (B,F)
9. Communicate (comprehension) the process and design detail effectively through oral presentations and written reports. (E,F)
10. Predict (comprehension) and track progress using project management tools. (B,F)
11. Evaluate (evaluation) ethical considerations regarding the design, manufacture, use, and disposal of the design. (A,F)
12. Understand (comprehension) the impact of engineering solutions in a global, economic, environmental, and societal context. (B,F)
13. Work (synthesis) effectively in teams, specifically interdisciplinary teams. (E)
14. Recognize (comprehension) the need to continue to learn beyond the curriculum. (B,F)
15. Demonstrate (comprehension) a knowledge of contemporary issues facing the engineering profession. (B,F)
16. Demonstrate (comprehension) the professionalism required of a professional engineer. (E,F)

	Course Outcomes															
Program Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
(a)	X				X											
(b)					X	X		X						X		
(c)		X	X	X		X	X				X			X		
(d)										X			X			X
(e)	X			X	X	X								X		
(f)									X		X				X	X
(g)									X							X
(h)		X									X	X				
(i)				X			X							X		X
(j)	X	X					X				X				X	X
(k)	X			X	X	X	X			X				X		

Date of Latest Revision: 12 JUL 2017, LCDR E. E. Lust, USN