United States Naval Academy
Mechanical Engineering Department

Catalog Description: EM433 Computer-Aided Manufacturing **Credit:** 3 (2-2-3)
Designation: Elective, engineering major

This course examines how computers and automation are used in modern manufacturing processes. Topics include machining and other manufacturing processes, direct manufacturing, rapid prototyping, CNC programming, process planning, dimensioning, and tolerancing. Students participate in a manufacturing project which utilizes CAD/CAM software to design and manufacture a component using CNC machining equipment.

Prerequisites: 1/C engineering major

Textbooks: Groover, M.P., *Introduction to Manufacturing Processes*, Wiley, 2012 *Required*

Course Director: Prof. R.E. Link

Course Content:

No.	Topic or Subtopic	hrs.
1.	Engineering Drawings	3
2.	Dimensioning and Tolerancing, Geometric Tolerancing	4
3.	Metal Cutting	2
4.	Machine Tools and Machining	3
5.	CNC Machining	9
6.	Cutting Tools	1
7.	Production Lines & Automation	3
8.	Rapid Prototyping	3
9.	Non traditional Processes	1
10.	Process Planning, Production Planning & Control	2
11.	Quality Control	1
12.	Lean Manufacturing	1
13.	Manufacturing Project	16
14.	Special Topics	5

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[1]:

1. Students will demonstrate an understanding of how computers are used for various aspects of the manufacturing enterprise (A,B,C,H)
2. Students will demonstrate an understanding of typical metal removal processes (A,B,C)
3. Students will select and specify processes and parameters for machining simple metallic parts (F,G,H).
4. Students will demonstrate the ability to specify tolerances and finish requirements for proper functioning of parts in an assembly (A,B,C,G,H)
5. Students will participate in site visits to actual manufacturing operations to witness mass production and assembly operations (A,B)
6. Students will visit manufacturing plants to discuss the various roles a manufacturing engineer plays in a typical manufacturing plant (A,B)
7. Students will demonstrate the ability to develop detailed manufacturing process plans, including the necessary CNC programs for the machine tools, to produce a series of related parts for an assembly (B,F,G,H).
8. Students will witness their process plans being employed in a machine shop environment to produce actual prototypes of their parts (G,H).

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

	Course Outcomes									
Program Outcomes	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		
(a)		X	X	X	X	X				
(b)										
(c)			X	X			X	X		
(d)						X				
(e)	X	X	X				X			
(f)						X				
(g)							X			
(h)										
(i)						X				
(j)					X	X				
(k)	X						X	X		

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