

United States Naval Academy
Mechanical Engineering Department

Catalog Description: EM424 Analytical Methods of Mechanics Credit: 3 (3-0-3)

Designation: Major Elective

Review of solution methods to frequently encountered engineering problems such as cylindrical and spherical heat conduction, wave dynamics, boundary layers and vibrations. The solutions methods focus on problems encountered in solid mechanics, fluids mechanics and heat transfer. Includes both analytical and numerical problem solving techniques.

Prerequisites: SM212 Differential Equations

Co-requisites: None

Textbook: Advanced Engineering Mathematics, Zill and Wright, Jones and Bartlett (2014)

Course Director: Associate Professor John Burkhardt

Course Content:

No.	Topic or Subtopic	hrs.
1.	Orthogonal Functions and Fourier Series	8
2.	Boundary Value Problems in Rectangular Coordinates	8
3.	Boundary Value Problems in Cylindrical-Polar Coordinates	8
4.	Boundary Value Problems in Spherical Coordinates	8
5.	Probability and Statistics	8

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. Students will be able to expand given function in terms of Fourier-Trigonometric, Fourier-Bessel and Fourier-Legendre expansions.
2. Students will be able to apply the separation of variables method for the solution of linear, constant coefficient partial differential equations.
2. Students will be able to solve the heat equation and Laplace's equation in rectangular coordinates.
3. Students will be able to solve the heat equation and Laplace's equation in cylindrical-polar coordinates.
4. Students will be able to solve the heat equation and Laplace's equation in spherical coordinates.

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

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

Date of Latest Revision: October 2017, Associate Professor John Burkhardt