Fall 2025 Prof. A. D. Rosato

Office: ME 320

ME 616: Matrix and Tensor Method (Syllabus)

Students are expected to have completed the usual sequence of calculus courses as well as differential equations, and to have a sound knowledge of these subjects. In addition, an understanding of basic linear algebra is also required.

Required Text: *Advanced Calculus for Applications* by F. R. Hildebrand, 2nd Edition (Prentice-Hall)
Mechanics Lecture Notes Part III: Foundations of Continuum Mechanics, Chapter 1: Vector and Tensors
(http://homepages.engineering.auckland.ac.nz/~pkel015/SolidMechanicsBooks/Part_III/index.html)

Course Grade: Based on the midterms and the final exam. Solutions to assigned problems will be done in class upon request. The course grade $\bar{A}$ is computed as the weighted average of the Midterm and Final Exams. The passing criterion is $\bar{A} \geq 50\%$.

Relevance: The material covered in this course provides background to the following courses: ME611 (Dynamics of Incompressible Fluids), ME614 (Continuum Mechanics), ME620 (Mechanics of Materials), ME712 (Mechanics of Viscous Fluids)

Office Hours: By appointment. Send e-mail to rosato@njit.edu to schedule a meeting.

Week	Topic	Reading	Homework[1]
1-2	Linear Spaces	Canvas: Lecture 1	
3-5	Vector and Tensors Orthogonal curvilinear coordinate systems	Canvas: Lecture 2 Kelly (1.3, 1.5, 1.6, 1.8) Canvas: Lecture 3	To be E-mailed to Class Selected problems from Kelly's book
		Hildebrand (6.17, 6,18)	Ch. 6 (103, 104)
4,6	Tensor Algebra / Tensor Calculus	Canvas: Lectures 4 & 5 + Kelly (1.8, 1.9, 1.10)	Problems from Kelly's book
7	**Midterm 1 Exam (Closed Book/Notes)**	Format: *Canvas*	
8	Eigenvalues & Eigenvectors	Canvas: Lecture 6	
9	Series Solutions of Differential Equations	Hildebrand 4.1 – 4.3	Pg. 169: 5, 7, 11
10 - 11	Method of Frobenius	Hildebrand 4.4	Pg. 171: 16, 17; Pg. 170: 11, 12, 14, 16, 17
12-13	Frobenius: Exceptional Cases + Special Equations	Hildebrand: 4.5, 4.6, 4.7, 4.8, 4.12	Pg. 173: 24, 25; Pg. 182: 63, 64
14	**Midterm 2 Exam (Closed Book/Notes)**	Format: *Canvas*	
15	**Final Exam**	Format: *Canvas*	

All violations of the NJIT Honor Code will be referred to the Office of the Dean of Students without exception.

[1] These are the suggested problems for the course. Students are encouraged to work on other problems in the text.