ME 616: Matrix and Tensor Methods 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 is computed as the weighted average of the Midterm and Final Exams. The passing criterion is that this average must be not less than 50%.

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 Hildebrand (6.17, 6,18)	To be E-mailed to Class Selected problems from Kelly's book Ch. 6 (103, 104)
4,6	Tensor Algebra	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	4.1 – 4.3	Pg. 169: 5, 7, 11
10 - 11	Method of Frobenius	4.4	Pg. 171: 16, 17; Pg. 170: 11, 12, 14, 16, 17
12-13	Frobenius: Exceptional Cases + Special Equations	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*	

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

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)