EK102 Fall 2009
EK102 Section B1 Syllabus

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In this course we are emphasizing computational aspects and applications of linear algebra applied to engineering needs. We did not find a textbook that satisfactorily addresses these issues, and decided to construct the class and lectures as specific engineering applications oriented. The ref. Book of "NUMERICAL RECIPES" is being used as a reference, since most professionals use it very regularly and efficiently. As such, no rigor is being sacrificed. As a matter of fact a higher level of rigor is achieved based on fundamental theorems of linear algebra, introduced and discussed without proofs and illustrated via examples.

One of the key issues is the Cayley-Hamilton theorem stating that a matrix substituted in its characteristic polynomial results in a zero-matrix. The computational aspects of this theorem are multi-fold: It enables a very fast method of calculating any function of a 3d matrix, including its inverse (if exists), its exponent (for solution of differential equations) etc.

Another topic emphasized in this course is SVD (singular value decomposition) used extensively in optimization and estimation applications. To this end, the properties of rectangular matrices are discussed. Examples from current engineering topics are illustrated, and the students are given a project in which they can promote their initiative.

All the regular topics are covered as well: determinants, eigenvalues theory, linear equations and their classifications, LU-decomposition for the inversion of large matrices, vector spaces,, orthogonality etc.

Administration:

1. **Homework will be assigned weekly, graded and returned.**
2. **Two exams will be given in class, dates will be announced later.**
3. **A final project will be assigned to demonstrate computational ability.**
4. **GRADING: Project 40$, each test 20%, homework 20%. Olease note: Late homeworks are NOT accepted without a doctor certification of illness.**