

Electrical and Computer Engineering 6030
Mathematical Methods for Signals and Systems
Syllabus – Spring 2017

Course Title: Mathematical Methods for Signals and Systems

Course location: EL 109

Instructor: Alwaled Aldulaimi

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Class Time: MWF 10:30–11:20 AM

Help Session: Wednesday, 7:30-8:20 am (ENGR 204)

Office Hours: MWF 9:30–10:30. Other hours by prior appointment.

Textbook: *Mathematical Methods and Algorithms for Signal Processing*, T.K. Moon and W.C. Stirling (Prentice-Hall 2000).

Homework: Homework assignments will be given approximately once a week. Some of these will be specifically assigned to be done using a computer.

Working together: Outside of academia, employees are encouraged to team together. At school, working together — “teaming” — is a mixed blessing, since some students may benefit unduly from the efforts and learning of others.

In recognition of both sides of the argument, as a matter of policy, working together and sharing ideas is specifically encouraged on homework. However, each individual *must* turn in their own work: their own writing and their own understanding. Also, sharing ideas and working toward understanding is encouraged on labs and programming exercises, but *all code* that is turned in must be your own! Do not borrow, copy, download, or otherwise crib from others, either students or otherwise. Nor is it sufficient to take another’s code and change the variables and apparent structure and call it your own. Every line of code which is turned in must be written by you. Doing otherwise works to the defeat of your purpose in being here, which is to learn technical skills for yourself. Any justifiable evidence of copying others work will result in a score of zero on the first offense, and a **failing grade for the course** if it happens again.

Naturally, work on any quizzes, midterms, or final examinations must be individual work, and justifiable evidence of cheating on these will result in a failing grade.

Late Policy: Homework can be accepted late only under prior consultation with the instructor. circumstance.

Cheating: Don't do it! The instructor reserves the right to fail any student who can be justifiably accused of cheating.

Academic Calendar: Monday Jan 16th is MLK Day. Monday Feb 20th is Presidents day. Tuesday Feb. 21th is a Monday schedule. March 6-10 is Spring Break.

Tests One midterm and a final will be given.

Final Exam: Wednesday May 3 11:30-1:20, or takehome exam (TBD).

Grading

The homework (including programming) counts 50% of the grade. The midterm counts 20%. The final counts 30%. Grades will be computed according to the following scale:

A	> 93%
A-	> 90%
B+	> 87%
B	> 84%
B-	> 80%
C+	> 77%
C	> 74%
C-	> 70%
D+	> 67%
D	> 64%
D-	> 60%
F	< 60%

Approximate Course Outline

Week	Topics
1	Motivation for the text and course Linear systems models; Gaussian r.v.s
2	Metric spaces Vector spaces
3	Cauchy-Schwartz ineq.; Hilbert spaces Orthog. subspaces
4	Linear transformations The approx. problem and the orthogonality thm.
5	Matrix representations; minimum error Applications (2 lect) Dual approx. problem; underdetermined syst.
6	Compressive sensing (?) Underdetermined systems
7	Sets of complete orthogonal functions; wavelet transforms (2 lect) Linear operators and functionals
8	Operator norms Adjoint; geometry
9	LU, Cholesky Matrix condition number Householder; Givens; Least squares
10	Householder; Givens; Least squares RLS (2 lect) Fast RLS
11	Eigendecompositions Applications of eigendecompositions
12	SVD (2 lect)
13	SVD
14	TLS, PTLs (2 lect)
15	SVD applications Review