Tu, Th 4:00 – 5:30

Instructor: Heinz Schättler,
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Office Hours: Tu Th, 3:00-4:00, and by appointment

Prerequisites:

1. familiarity with calculus (series, integrals, change of variables, …);

2. familiarity with matrix calculations and fundamental results about positive semi-definite matrices (covariance matrices);

3. a standard undergraduate course on probability, e.g., ESE 326 or any similar calculus based undergraduate course; we shall go over some of this material, but in a mathematically more sophisticated and abstract way, and at a (really) fast pace.

If you want to understand all the proofs (but this is not really necessary to do well in the course), familiarity with the more fundamental concepts from “advanced” calculus is required, such as topological notions like open and closed sets in \( \mathbb{R}^n \), compactness, etc.

Grading:

There will be two exams given on Thursday, October 5 and Thursday, December 7. Exams will be closed book, but you will be allowed to bring in a cheat-sheet. Classroom notes or use of the textbook will not be allowed. Your grade will be based to 40% each on these two exams and to 20% on graded solutions to homework problems that will be assigned throughout the semester. There will be 6 homework sets due on Thursdays (September 14, 28, October 19, November 2, 16 and 30). You are allowed to collaborate on the homework problems, but each student has to make an independent write-up of the solution.
Web page:
There is a mini web page for this course accessible through my ancient (and out-dated, but still under my own control) homepage at

www.ese.wustl.edu/~heinz/Fall17_ese520.html

I will only post handouts and other pertinent information such as homework assignments there and make an effort to keep the information up-to-date.

e-mail:
Please keep e-mails to essential communications. If you want to discuss course material or have questions about class, you can see me any time I am in.

Textbook: Probability and Random Processes for Electrical and Computer Engineers by John A. Gubner,

Syllabus and Other References:
The first half of the course gives a (graduate course style) introduction to probability theory, the second part introduces fundamental concepts from stochastic processes. Statistical methods are not covered in this course. For this we have a separate course, ESE 524, that will be offered in the spring.

Throughout the course the emphasis is on introducing concepts and ideas that are important to engineers (e.g., covariance functions, spectral density, white noise, etc.), but also with some of the necessary mathematical rigor. The textbook contains much more material than can be covered in a one-semester course and, naturally, I will make selections and I also prefer to rearrange the material according to my taste. A detailed syllabus where I marked sections of the textbook that relate to these topics is given separately. Essentially, everything we do in the course is also covered in the textbook. I highly recommend the wealth of worked out examples that I simply cannot cover in class for lack of time.

Finally, the course has a theoretical flavor, but all the material we discuss is inherently related to real world practical applications, e.g., spectral densities and white noise representations play a big role in your cell phones, Poisson processes have a lot to do with medical imaging techniques. But this is an introductory course and it would lead us too far astray to get into those directions. I will try to mention some of these connections, but these topics can only be developed in depth in more advanced and specialized courses.