

Statistics 581
Advanced Theory of Statistical Inference
Autumn Quarter 2007
Course Syllabus

Time and Place

MWF 10:30–11:20 am at Thomson Hall 211

The first class session is on Wednesday, September 26. The last day of instruction in Autumn Quarter is Friday, December 7. There will be no lectures on Monday, November 12 (Veterans Day) and Friday, November 23 (Thanksgiving).

Course Personnel

Instructor: Tilmann Gneiting
Office: Padelford Hall B-301
Office hours: M 2:30–3:20, W 9:30–10:20
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Teaching Assistant: Assaf Oron
Office: Padelford Hall C-17
Office hours: Th 10:30–11:20 and 1:35–2:30
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I will post updated versions of this syllabus at <http://www.stat.washington.edu/tilmann/>, along with problem sets, handouts and any additional materials. Check the website once in a while to see what's new.

Scope and Contents

Statistics 581 is the first part of a three-quarter sequence in theoretical statistics for graduate students in Biostatistics and Statistics (Statistics 581–583). Its intent is to supply key tools and key results of mathematical statistics, and to convey the spirit of theoretical research work, as published in leading statistical journals.

I will be your instructor for Autumn and Winter Quarter. In these two quarters, I intend to cover mathematical foundations (review of measure, integration and conditional expectation: about three weeks); probability theory (special distributions,

characteristic functions and limit theorems: about three weeks); efficient estimation and testing (including Cramér-Rao bound, maximum likelihood, EM algorithm, chi-square and robustness: about nine weeks); and Bayes methods and decision theory (including basic game theory, statistical decision theory and sufficiency: about four weeks).

Prerequisites

Prerequisites for Statistics 581 are Statistics 513, or equivalent prior course work in mathematical statistics, and Mathematics 426/576, or equivalent course work in measure and integration theory. In particular, I will assume familiarity with the contents of Mathematics 426/576 as taught in Spring Quarter 2007. If you did not take this class, please consult the instructor.

Required Text

Ferguson, T. S. (1996), *A Course in Large Sample Theory*, Chapman and Hall.

Supplementary Texts

Breiman, L. (1968), *Probability Theory*, Addison-Wesley.

Ferguson, T. S. (1967), *Mathematical Statistics: A Decision Theoretic Approach*, Academic Press.

Huber, P. J. (1981), *Robust Statistics*, Wiley.

Lehmann, E. L. and Casella, G. (1998), *Theory of Point Estimation*, second edition, Springer.

Lehmann, E. L. and Romano, J.-P. (2005), *Testing Statistical Hypotheses*, third edition, Springer.

Shorack, G. R. (2000), *Probability for Statisticians*, Springer.

Wellner, J. (2000s). Statistics 581–582–583 lecture notes. Available at <http://www.stat.washington.edu/jaw/COURSES/580s/581/lectnotes.html>.

The text books are under reserve at the Mathematics Research Library.

Homework

I will hand out problem sets on Friday, September 28, October 5, October 12, October 19, October 26, November 2, November 16 and November 30. Solutions will be due the following Friday at the beginning of the class session, except for the November 16 assignment, which will be due November 30. No late homework will be accepted.

Feel free to discuss the problems among each other, with the teaching assistant, with other instructors, or with students who already took this course, but *do not copy*, and *acknowledge any references and any help you received from others*. In working on the homework problems, you are encouraged to use symbolic computing (computer algebra) systems, such as Maple, Mathematica or Matlab. If you do so, *please append an annotated copy of any computer-assisted work*. Some problems may require the use of statistical software such as R or Splus. The teaching assistant and the instructor are available for questions.

Exams and Grades

There will be an in-class midterm exam on Wednesday, November 14, which counts 20% of the course grade. The final exam is scheduled for Monday, December 10 at 8:30–10:20 am. It will count 40% of the course grade. The homework will count another 40% of the course grade.