STAT 7301 — Autumn 2016

Advanced Statistical Theory I

meetings:	MWF 9:10–10:05 in Derby Hall 062 (map)
instructor:	Vincent Q. Vu (vqv at stat osu edu)
office hours:	MW 11:30–12:25 in Cockins Hall 325
web:	www.vince.vu/courses/7301

1 Overview

Statistics 7301 is a course on the fundamentals of statistical theory and is intended for second-year Ph.D. students in statistics. The course is based on chapters 1, 2 and 6 of the required book *Theory of Point Estimation*, chapters 2 and 6 of the required book *All of Nonparametric Statistics*, and notes provided by the instructor. The topics of the course include:

1. Fundamentals
    - Statistics, sufficiency, and completeness
    - Exponential families
    - Rao-Blackwell theorem
    - Fisher information
2. Methods of estimation
    - Unbiased estimation
    - Maximum likelihood
    - Minimum contrast estimation
3. Asymptotic approximations (a.k.a. large sample theory)
    - Consistency
    - Delta method
    - Asymptotic normality and efficiency
4. Nonparametric estimation
    - Estimating the CDF and statistical functionals
    - Influence functions and nonparametric Delta method
    - Density estimation

2 Textbook

The required books for this course are

- Lehman, E. L. and Casella, G.: *Theory of Point Estimation*, second edition. (errata)
- Wasserman, L.: *All of Nonparametric Statistics* (This book is available electronically here: on-campus or off-campus)

The following books are recommended for supplemental reading:

- Bickel, P. J. and Doksum, K. A.: *Mathematical Statistics: Basic Ideas and Selected Topics, Vol. 1*. CRC Press
- van der Vaart, A. W.: *Asymptotic Statistics*. Cambridge University Press.

3 Prerequisites

Statistics 6802, or permission of the instructor, and concurrent enrollment in Statistics 7201. Mathematical analysis and probability theory are the primary tools of statistical theory. Students are expected to be able to read and write mathematical proofs.

4 Coursework & Grading

There will be homework, three in-class exams, a final exam, and scribing.

- 15% Homework
- 15% Exam 1 (September 23)
- 15% Exam 2 (October 21)
- 15% Exam 3 (November 11)
- 40% Final exam
- Mandatory scribing of $\max(2, \text{floor}(36/n))$ lectures (where n is the number of students and floor(x) is the largest integer less than or equal x)

Inform the instructor of any scheduling conflicts at least two weeks in advance.

4.1 Homework

Homeworks will generally be assigned on a weekly basis and are due in class on the due date. If you cannot attend class on the due date of the homework, then either ask a classmate to submit the homework for you or place the homework under my office door in advance. Late homework will not be accepted and returned without grading.

4.2 Exams

All exams are closed book. Each of exams 1–3 covers the material presented since the previous exam (approximately 3–4 weeks worth). The final exam is cumulative.

4.3 Scribing

Students will be required to scribe $\max(2, \text{floor}(36/n))$ lectures using LaTeX and the provided template.

4.4 Fine print

4.4.1 Academic Misconduct

Students are encouraged to work with others on the homework, however final solutions must be written on your own. Academic misconduct **will not be tolerated** and will be dealt with procedurally in accordance with university policy.

4.4.2 Accommodations for Students with Disabilities

If you have a documented disability, please register with the Office for Disability Services (ODS). After registration, make arrangements with me as soon as possible to discuss your accommodations so that they can be implemented in a timely fashion. If you have any questions about this process please contact ODS at (614) 292-3307.

4.4.3 Disclaimer

This syllabus is a approximate guide to the course content and dates, however the instructor reserves the right to deviate from the syllabus. An updated version of the syllabus will be maintained on the course webpage.