

Statistics 611 – Theory of Statistics II
(Practical Mathematical Statistics)
Section 602, Spring Term, 2007

This course introduces the issues, approaches and mathematical tools for developing statistical methodology, primarily univariate. In particular, we will investigate how to identify appropriate estimators and to determine their properties and we will consider optimal approaches to performing hypothesis testing. Although we will rely on theoretical results and mathematical theory, the course is more about understanding the development of longstanding practice than it is about developing new methods. In that sense it is a basic introduction to the theory of statistics. Modern practice, however, relies very heavily on the basic methods so a very good grounding in their theory is a requirement both for understanding current methodology and for research.

STAT 611 Course Information

Time and Place:	MWF 9:10am–10:00am, Blocker 156.
Instructor:	Daren Cline.
Office:	Blocker 459D, 845-1443.
E-mail:	dcline@stat.tamu.edu
Office Hours:	MWF 10:15am–11:30am or by appointment.
Grader:	Soutir Bandyopadhyay. hours: MF 2–5pm (questions about homework only). email: soutir@stat.tamu.edu
Course Web Page:	http://stat.tamu.edu/~dcline/611.html Homework will be assigned at this web page.
Text:	G. Casella and R. Berger, <i>Statistical Inference, 2nd ed.</i> , Duxbury.
References:	(On reserve in Evans Library) E.J. Dudewicz and S.N. Mishra, <i>Modern Mathematical Statistics</i> , Wiley. R.V. Hogg, J.W. McKean and A.T. Craig, <i>Introduction to Mathematical Statistics, 6th ed.</i> , Macmillan. I. Miller and M. Miller, <i>John E. Freund's Mathematical Statistics, 7th ed.</i> , Prentice-Hall. A.M. Mood, F.A. Graybill and D.C. Boes, <i>Introduction to the Theory of Statistics, 3rd ed.</i> , McGraw-Hill. V.K. Rohatgi, <i>An Introduction to Probability and Mathematical Statistics, 2nd ed.</i> , Wiley.

STAT 611 Course Information

Prerequisite:	Statistics 610 or equivalent, including <ul style="list-style-type: none">• random variables and their probability distributions• commonly used distributions• probability density and probability mass functions• expectation, variance and other moments• quantiles• multivariate distributions, especially bivariate normal and multinomial• conditional distributions and conditional expectations• random sampling and basic sample statistics• law of large numbers and central limit theorem Statistical or mathematical computing experience is helpful.
Disabilities Help:	The Americans with Disabilities Act ensures that students with disabilities have reasonable accommodation in their learning environment. If you have a disability and need help, please contact me and Disability Services in B118 Cain Hall, 845-1637.
Academic Integrity:	You are expected to maintain the highest integrity in your work for this class. This includes not passing off anyone else's work as your own, even with their permission. Please see the homework and exam policies below for specifics.
Copyright:	All the resources I provide for this course are copyrighted and may not be copied or distributed without my express, written permission.

STAT 611 Grading

Homework:	Homework will be assigned (on the course web page) and collected regularly. Homework is worth 20% of the total term score. <i>Please see the homework policy below.</i>
Exams:	Two midterm exams worth 22.5% each and a final exam worth 35%. <i>Please see the exam policy below.</i>
Exam Dates:	Exam I: TBA. Exam II: TBA. Final Exam: Monday, 7 May, 8:00am–10:00am.
Grading scale:	A: 85%–100%. B: 70%–84%. C: 60%–69%.

STAT 611 Course Policies

Homework Policy: Your homework solutions must be your own work, not from outside sources, consistent with the university rules on academic dishonesty. I expect you to follow this policy scrupulously. Your performance on the exams is much more likely to be better.

You may use:

- Your textbook and notes from class.
- Your notes, homework, etc., from a related class that you took or are taking.
- References listed on the syllabus.
- Discussion with the instructor or grader.
- Voluntary, mutual and cooperative discussion with other students currently taking the class.

You may not use:

- Solutions manuals (printed or electronic) and copies of pages from solutions manuals.
- Solutions from previous classes.
- Solutions, notes, homework, etc., from classes taught elsewhere or at another time.
- Solutions, notes, homework, etc., from students who took the class previously.
- Copying from students in this class, including expecting them to reveal their solutions in “discussion”.

Exam Policy: Each exam will be comprehensive, cumulative and closed book.

- Please bring your own paper. I ask that separate problems be on separate sheets.
- No resources other than pen and paper are acceptable.

I will not expect you to quote theorems and results explicitly but I do expect you to demonstrate that you can make use of them. Specifically, you will need to:

- Show all your work. This does not necessarily mean showing every individual algebraic or calculus step – but it must be clear what those steps are.
- Identify (by name, number or description) any theorems, examples or homework problems you use.
- Clearly identify the solution and/or the end of a proof or derivation.

Copies of my old exams will be available on the course web page.

Makeup Policy: This is based on university policy.

- If you must miss an exam due to illness or circumstances beyond your control, notify me or the Statistics Department *before* the exam. See me immediately after you return (within one day) to schedule a make-up exam.
- Incompletes will be given only in the event that circumstances beyond your control cause prolonged absence from class and the work cannot be made up.

STAT 611 Course Outline

Topic	Section
1. Statistical Models	
1-1. parametric and hierarchical models, exponential families	3.4, 3.5, 4.4
1-2. identifiability	
2. Data Reduction	
2-1. sufficiency, completeness, ancillary statistics	6.1
2-2. likelihood principle	6.2
2-3. invariance principle	6.3
3. Estimation Techniques	
3-1. method of moments, least squares, quantile estimates	7.2
3-2. maximum likelihood	7.2
3-3. M -estimation, estimating equations	10.2
3-4. Bayes and minimax estimation	7.2
4. Estimation Issues	
4-1. bias, sampling error, sampling distribution	5.5, 7.3
4-2. best unbiased estimators	7.3
4-3. lower bounds on variance	7.3
4-4. consistency, large sample properties	10.1
5. Hypothesis Testing	
5-1. likelihood ratio tests, Neyman-Pearson Theorem	8.2
5-2. p -values, power	8.3
5-3. Bayesian tests	8.2
5-4. unbiased and most powerful tests	8.3
5-5. score tests	
5-6. large sample tests, chi-square tests	10.3
6. Interval Estimation	
6-1. pivotal quantities, inversion of tests	9.2
6-2. confidence intervals, Bayes intervals	9.2
6-3. large sample confidence intervals	9.3, 10.4