Statistics 614-600 – Probability for Statistics
Section 600, Fall Term, 2008

Course Information

Time and Place:	MWF 9:10am–10:00am, Blocker 411.
Instructor:	Daren Cline.
Office:	Blocker 459D, 845-1443.
E-mail:	dcline@stat.tamu.edu
Office Hours:	MW 1:00pm–2:30pm or by appointment.
Course Web Page:	http://stat.tamu.edu/~dcline/614.html Homework assignments and lecture notes will be provided on this web page.
Text:	S.I. Resnick, *A Probability Path*, Birkhäuser.
References:	(On reserve in Evans Library) R.B. Ash, *Probability and Measure Theory*, Academic Press. K.B. Athreya and S.N. Lahiri, *Measure Theory and Probability Theory*, Springer. P. Billingsley, *Probability and Measure, 3rd ed.*, Wiley. R. Durrett, *Probability: Theory and Examples, 2nd ed.*, Duxbury. E. Lukacs, *Characteristic Functions*, Griffin. A.N. Shiryayev, *Probability*, Springer.
Prerequisite:	Statistics 610 or equivalent, and advanced calculus. In particular, students should be familiar with random variables and their distributions at a practical level and with the theory of functions, integration, limits, etc., and they should be prepared to understand and to provide careful, rigorous proofs. A course in measure theory *is not* required since the necessary material will be presented in this course.
Homework:	Homework will be assigned (on the course web page) and collected regularly. Homework is worth 30% of the total term score. *Please see the homework policy below.*
Exams:	A midterm exam worth 30% each and a final exam worth 40%. *Please see the exam policy below.*
Exam Dates:	Midterm Exam: TBA. Final Exam: TBA.
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:	

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 me.
- 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 and cumulative.

- Please bring your own paper. I ask that separate problems be on separate sheets.
- Bring resources (such as notes) only if I explicitly allow them.

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, in writing or by email (before, if feasible, otherwise within two working days after you return). See me as soon as possible to schedule a make-up exam.
- Incomplete grades will be given only in the event that circumstances beyond your control cause prolonged absence from class and the work cannot be made up.

Course Outline

Topic	Text Section
1. Events and Classes of Events	
outcomes, events, review of set theory	1.2
limits of events	1.3, 1.4
π-classes, fields and σ-fields	1.5, 1.6
Borel σ-fields	1.7, 1.8
Dynkin's π-λ class theorem	2.2
2. Probability Measures and Measures	
probability measures and general measures	2.1–2.3
properties of measures, probability distributions, uniqueness	2.1
distribution functions, Lebesgue-Stieltjes measures	
extension and existence theorems	2.4, 2.5
3. Random Variables and Measurability	
random variables and measurable functions, σ-field generated by a r.v.	3.1–3.3
induced measures, distribution of a random variable	3.2
conditions for measurability	3.2, 5.1
4. Expectation and Integration	
definitions, consistency of definitions	5.1, 5.2, 5.4
properties of expectation and integrals	5.2
Lebesgue-Stieltjes integration, absolute continuity, Riemann integrals	5.6
monotone and dominated convergence theorems, extensions	5.2, 5.3
5. Advanced Integration	
equating differently defined integrals	5.5, 5.6
moments and inequalities, finiteness of moments	5.2
product spaces, multiple integration, Tonelli-Fubini theorems	5.7, 5.8, 5.9
characteristic functions, inversion formulas	9.1–9.5
6. Independence	
independence of finitely many events or random variables	4.1, 4.2
infinite collections of independent events or random variables	4.3, 4.4
Borel-Cantelli lemmas, tail events, Kolmogorov's 0-1 law	4.5
7. Convergence of Sequences of Random Variables	
modes of convergence, relationships	6.1–6.3, 6.5
moment inequalities, Jensen's inequality	6.5
uniform integrability, convergence in mean	6.5, 6.6
8. The Law of Large Numbers and Convergence of Random Series	
strong law of large numbers	7.1, 7.4
Glivenko-Cantelli theorem	7.5
convergence of series	7.3, 7.6
9. Convergence of Distributions	
weak convergence, Scheffé's theorem	8.1, 8.2, 8.5
Slutsky's theorem, delta method, Skorohod's lemma, continuous mapping	8.3, 8.6
tightness, Prohorov's theorem and the continuity theorem	9.5, 9.6
portmanteau theorem, multivariate convergence	8.4

Course Outline (continued)

10. Weak Convergence for Sums and Maxima	
central limit theorem, Lindeberg-Feller and Lyapounov theorems	9.7, 9.8
convergence to types, infinitely divisible and stable distributions	8.7
extreme value distributions	8.7
11. Absolute Continuity and Conditional Expectation	
absolute continuity, Radon-Nikodym theorem, Lebesgue decomposition	10.1
conditional expectation	10.2, 10.3
regular conditional distributions	