UTD	**Course**	**STAT 7345.501** **Advanced Probability & Stochastic Processes**
	Professor	Robert Serfling
	Term	Spring 2009
	Class Sessions	MW 5:30-6:45, GR4.208

Professor's Contact Information

Office Phone	972-883-2361
Office Location	ECSN 3.902
Email Address	serfling@utdallas.edu
Website	www.utdallas.edu/~serfling – ***has a section for this course***
Office Hours	To be arranged – check website.
Preferred Method of Contact	I check *email* much more regularly than my telephone. But please *DO NOT* email me on WebCT.

General Course Information

Prerequisites	*STAT 6344 (Probability Theory I)* and *MATH 6301 (Real Analysis I)* are required (**absolutely!**). This course is taught as a continuation of STAT 6344.
Course Description	A. *Completion of Probability Foundations*: Weak Convergence, Slutsky's Thm, Levy Metric, Characteristic Functions, Central Limit Thm for Triangular Arrays, Absolute Continuity of Measures and Distribution Functions, Radon-Nikodym Theorem, Conditional Expectation, Conditional Probability Measures, Infinitely Divisible Distributions, Limit Theorems in Euclidean Spaces, Martingale B. *Introduction to Stochastic Processes*: Bernoulli Trials, Infinite-Dimensional and General Product Spaces Kolmogorov Consistency Thm, Martingale and Submartingale Sequences, Doob Upcrossing Inequality, Maximal Inequalities for Submartingales; Discrete and Continuous Time Markov Chains, Random Walk, Birth and Death Processes, Poisson Processes, Point and Cluster Point Processes, Branching Processes, Renewal Processes, Brownian Motion
Desired Learning Outcomes	An in-depth working knowledge of the concepts and key methods of modern measure-theoretic probability and stochastic processes.
Required Text	none
Suggested Texts, Readings, & Materials	Billingsley, P., *Probability and Measure*, 3rd edition, Wiley, 1995. Chow, Y.S. and Teicher, H., *Probability Theory: Independence, Interchangeability, Martingales*, 3rd edition, Springer, 1997. Leadbetter, M. R., *Measure and Probability Theory: A Basic Course*, Preprint edition, 2009. Karlin, S. and Taylor, H. M., *A First Course in Stochastic Processes*, 2nd edition, Academic Press, 1975. Karlin, S. and Taylor, H. M., *A Second Course on Stochastic Processes*, Academic Press, 1981. Resnick, S., *Adventures in Stochastic Processes*, Birkhaeuser, 1992. (Various other sources will be provided during the course.)

Syllabus (subject to revision)

Date	*Topics*
M 1/12 **W 1/14**	Weak Convergence; Slutsky's Thm Levy Metric; Criteria for Weak Convergence
M 1/19 **W 1/21**	***Martin Luther King Holiday*** – University closed Characteristic Functions; Inversion; DeMoivre-Laplace Central Limit Thm
M 1/26 **W 1/28**	Central Limit Thm for Triangular Arrays Law of Iterated Logarithm; Central Limit Thm for Vectors
M 2/2 **W 2/4**	Infinitely Divisible Laws σ-Algebras, Orbits, Sub-σ-Algebras
M 2/9 **W 2/11**	Sub-σ-Algebras as "Information" Absolute Continuity of Measures; Radon-Nikodym Thm
M 2/16 **W 2/18**	Conditional Expectation Conditional Probability Measures
M 2/23 **W 2/25**	Stochastic Processes: Introduction & Examples Behavior of Sequences of Bernoulli Trials; Reflection Principle
M 3/2 **W 3/4**	Infinite-Dim & General Product Spaces; Kolmogorov Consistency Thm Martingales and Submartingales: Introduction & Examples
M 3/9 **W 3/11**	Doob Upcrossing Inequality; Maximal Inequalities for Submartingales Submartingale Convergence Theory
M-F 3/16-3/20	***Spring Break*** ☺
M 3/23 **W 3/25**	Central Limit Thm for Martingale Differences; Maxima of Random Walks Discrete Time Markov Chains: Introduction
M 3/30 **W 4/1**	Discrete Time Markov Chains: Recurrence; Higher Dim Random Walk Discrete Time Markov Chains: Stationary Distributions; Absorption
M 4/6 **W 4/8**	Continuous Time Markov Chains: Yule Process; Poisson Process Continuous Time Markov Chains: General Birth and Death Process
M 4/13 **W 4/15**	Branching Processes & Extinction Probabilities Renewal Theory
M 4/20 **W 4/22**	Brownian Motion: Basics; Use of Martingale Methods Brownian Motion: The Maximum; Oscillation Theory; Extensions
M 4/27 **W 4/29**	Student Presentations Student Presentations
M 5/4	Student Presentations

Course Policies

Grading Criteria	The course grade will be based on assigned *homework* (50%) and *class presentations* (50%).
Missed or Late Homework	Late homework will not be accepted unless the lateness is excused. Missed homework receives the grade of 0.
Student Conduct and Discipline	The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of university business. It is the responsibility of each student to be knowledgeable about those which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, *A to Z Guide*, provided to all registered students.
Academic Integrity	The faculty expects from students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student, each student must demonstrate a high standard of individual honor in his or her scholastic work. Scholastic dishonesty includes, but is not limited to, statements, acts, or omissions that are related to the submission as one's own work of material that is not one's own. This may include cheating, plagiarism, collusion, and falsifying of academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.
Email and Technical Support	UTD encourages faculty to consider email from students official only if it originates from a UTD student account. This allows UTD to maintain a high degree of confidence in the identity of all individuals corresponding and in the security of the transmitted information. UTD furnishes each student with a free email account and provides a method for students to forward their UTD email to other accounts. Assistance is available via assist@utdallas.edu or the UTD Computer Helpdesk at 972-883-2911.
Withdrawal	Deadlines for withdrawal from courses are published in each semester's course catalog. A faculty member cannot drop or withdraw a student. Rather, it is the student's responsibility to handle withdrawal procedures from any class. The proper paperwork and procedure must be used to avoid receiving a final grade of "F" in a course in which the student remained enrolled but did not participate.
Incomplete Grades	As per university policy, incomplete grades are granted only in the case of work unavoidably missed (and excused) by the semester's and not already covered by the professor's policy on missed work or activities, and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade becomes changed automatically to the grade of F.
Disability Services	Disability Services seeks to provide students with disabilities educational opportunities equivalent to those of their non-disabled peers. The Office of Disability Services is located in room 1.610 in the Student Union, and its hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m. Essentially, the law requires colleges and universities to make reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom

	prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally, an assignment requirement may be modified (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes including students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance. It is the student's responsibility to notify his or her professors of the need for such accommodations. Disability Services provides students with letters to present to faculty members.
Religious Holy Days	The University of Texas at Dallas excuses students from class or other r required activities for the purpose of travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated. In the case of such an absence, the student is encouraged to notify the instructor as soon as possible, preferably in advance. Regarding missed assignments, quizzes, tests, or exams, the student excused for such a purpose will be covered by the professor's policy for missed or late work.
Copyright Notice	The U. S. copyright law (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted materials, including music and software. Copying, displaying, reproducing, or distributing copyrighted works may infringe the copyright owner's rights and is subject to appropriate disciplinary action as well as criminal penalties provided by federal law. Usage of such material is only appropriate when that usage constitutes "fair use" under the Copyright Act. As a UT Dallas student, you are required to follow the institution's copyright policy (Policy Memorandum 84-I.3-46). For more information, see http://www.utsystem.edu/ogc/intellectualproperty/copypol2.htm.