Course	**CS 3341 – 501: Probability & Statistics in CS/SE**
Professor	Pankaj Choudhary
Term	Spring 2008
Meetings	MW 5:30 – 6:45 pm (ECSS 2.311)

Professor's Contact Information

Office Phone	972-883-4436
Other Phone	
Office Location	ECSN 3.908
Email Address	pankaj@utdallas.edu
Office Hours	MW 4:00 – 5:00 pm or by appointment
Other Information	• Check WebCT for announcements, skeleton lecture notes, homework assignments, quizzes, exams and their solutions. • *Please bring a printout of the relevant lecture notes to every class*. • Use WebCT http://webct.utdallas.edu/ to check your performance, and enjoy its discussion and chat features.

General Course Information

Pre-requisites, Co-requisites, & other restrictions	MATH 1326 or MATH 2419, and CS 2305
Course Description	Basic concepts of probability and statistics useful in computer science.
Learning Outcomes	• Ability to understand basic properties of probability theory. • Ability to understand concepts of conditional probability, Bayes theorem, independence. • Ability to understand basic concepts, properties of discrete random variables. • Ability to understand expectations, functions of discrete random variables. • Ability to understand basic concepts, properties of continuous random variables. • Ability to understand expectations, functions of continuous random variables. • Ability to understand applications of the central limit theorem. • Ability to understand and perform estimation of model parameters. • Ability to understand and use confidence intervals. • Ability to understand and apply regression. • Ability to understand Bernoulli, Poisson, renewal processes. • Ability to understand and use Markov chains.
Required Texts & Materials	*Probability and Statistics with Reliability, Queuing and Computer Science Applications*, 2nd edition, K. Trivedi, John Wiley, 2002
Suggested Texts, Readings, & Materials	*Probability and Statistics for Computer Scientists*, M. Baron, Chapman & Hall/CRC, 2006 *Concepts in Probability and Stochastic Modeling*, Higgins, J. J. and Keller-McNulty, S., Duxbury, 1994

Academic Calendar

Week #	Date	Topics	Book chapters
1	Jan 7 – 9	Introduction, events and outcomes, probability rules.	1
2	Jan 14 – 16	Combinatorics. Conditional probability. Independence. Bayes' rule.	1
3	Jan 23	Discrete random variables and their distributions.	2.1 – 2.4
	Jan 23	**Quiz 1**	
4	Jan 28 – 30	Discrete distributions: Bernoulli, Binomial, Geometric, Negative Binomial, Poisson	2.5
	Jan 30	**Quiz 2**	
5	Feb 04 – 06	Discrete random vectors, independent random variables, Continuous random variables. Continuous distributions: Uniform, Exponential, Gamma, Normal.	2.8 – 2.9, 3.1 – 3.4, 3.6
	Feb 06	**Quiz 3**	
6	Feb 11 – 13	Distributions of sums and functions of normal random variables. Expectation and moments.	3.8 – 3.9, 4.1 – 4.3, 4.5
	Feb 13	**Quiz 4**	
7	Feb 18 – 20	Central limit theorem. Simulation of random variables. Solving problems by Monte Carlo methods.	4.7, lecture notes
	Feb 20	**Quiz 5**	
8	Feb 25 – 27	Stochastic processes. Main concepts and classification. Bernoulli, Binomial and Poisson process.	6.1 – 6.4
	Feb 27	**Midterm**	
9	Mar 03 – 05	Markov chains	7.1 – 7.2
10	Mar 17 – 19	Markov chains (continued).	7.3
	Mar 19	**Quiz 6**	
11	Mar 24 – 26	Statistical inference	10.1 – 10.2
	Mar 26	**Quiz 7**	
12	Mar 31 – Apr 02	Statistical Inference (continued).	10.3
	Apr 02	**Quiz 8**	
13	Apr 07 – 09	Statistical Inference (continued).	10.3
	Apr 09	**Quiz 9**	
14	Apr 14 – 16	Statistical Inference (continued)	10.3
	Apr 16	**Quiz 10**	
15	Apr 21 - 23	Linear regression	11.1 – 11.2
16	Apr 28	Linear regression (continued)	11.3
	May 07 (5 am-7 pm)	**Final (comprehensive)**	

Calculus and Algebra proficiency required for this course:

Concepts	When needed	Examples
Factorial*	Sec 1.8, 2.5	Compute 5!, Simplify and compute 35!/33!
Sigma-notation	Sec 1.7	Compute $\sum_{k=1}^{10} k^2$
Geometric series	Sec 2.5	Compute $\sum_{j=1}^{\infty} (0.2)^j$, $\sum_{j=1}^{\infty} j(0.2)^j$
Derivatives	Chap 3, 4	Compute $\frac{d}{dx}\left(1-e^{-3x}\right)$
Integration of polynomial and exponential functions, integration by parts and integration by substitution	Chap 3, 4	Compute $\int_0^b \left(x^2+x^3\right)dx$; compute the area under the graph of x^2 between x = -1 and x = 2. Compute $\int_0^b e^{-x}dx$; Compute $\int_0^{\infty} x^2 e^{2x}dx$
Gamma function and related integrals*		Compute $\Gamma(4)$, $\int_0^{\infty} x^8 e^{x/5}dx$. Simplify $\Gamma(n+k)/\Gamma(n)$ for positive n and k.
Inverse functions	3.5, Monte Carlo	If $f(x)=2p^x$, find $f^{-1}(y)$
Matrices	Chap 7	$A=\begin{pmatrix} 0 & 0.75 & 0.25 \\ 0.9 & 0 & 0.1 \\ 0.8 & 0.2 & 0 \end{pmatrix}, B=\begin{pmatrix} 0.7 & 0.2 & 0.1 \\ 0.3 & 0.4 & 0.3 \\ 0.1 & 0.3 & 0.6 \end{pmatrix}$ Compute $A + B$, $A - B$, AB, A^3.
Limit	Sec 3.1, 4.7	Compute $\lim_{x\to 0}\frac{\sin(\pi x)}{x}$, $\lim_{x\to\infty}\frac{\sin(\pi x)}{x}$

*This material will be presented in the class.

Some tips:

- Try to work out all the HW problems before you look at the solutions.
- Use your absolute right to ask questions in the class and during my office hours.
- For each exam/quiz, review all the new concepts, methods, formulae, etc. Try to *understand* the concepts.
- Be sure to have the required calculus skills.

Course Policies

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<tr><td>Grading (credit) Criteria</td><td>
Best 9 of 10 ten-minute quizzes: 30%
One 1¼ - hour in-class Midterm exam: 30%
One 2- hour comprehensive Final exam: 40%

<table>
<tr><td>97 – 100 % = A +</td><td>86 – 90 % = B +</td><td>76 – 80 % = C +</td><td>66 – 70 % = D +</td></tr>
<tr><td>93 – 97 % = A</td><td>83 – 86 % = B</td><td>73 – 76 % = C</td><td>60 – 66 % = D</td></tr>
<tr><td>90 – 93 % = A –</td><td>80 – 83 % = B –</td><td>70 – 73 % = C –</td><td>55 – 60 % = D –</td></tr>
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Incomplete grade is possible only in the case of a documented serious medical emergency near the end of the semester, with at least 70% of work completed at an on-going passing grade.
Homework will be assigned but will not be collected or graded. Solutions will be provided.
The quizzes are closed-book and closed-notes. The midterm and the final are open-book and open-notes.
Show your work. No work – no credit.

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<tr><td>Make-up Exams</td><td>No make-up quizzes and exams.</td></tr>
<tr><td>Extra Credit</td><td>No extra credit work will be assigned.</td></tr>
<tr><td>Late Work</td><td>No late quizzes and exams. It may be possible take a quiz/exam early.</td></tr>
<tr><td>Special Assignments</td><td>None.</td></tr>
<tr><td>Class Attendance</td><td>You are encouraged not to miss any class. If you do miss, please arrange with your classmates to find out what was discussed in the class. Let me know if I can be of any help.</td></tr>
<tr><td>Classroom Citizenship</td><td>You are encouraged to ask questions and participate in discussions in the class.</td></tr>
<tr><td>Field Trip Policies Off-Campus Instruction & Course Activities</td><td>Off-campus, out-of-state, and foreign instruction and activities are subject to state law and University policies and procedures regarding travel and risk-related activities. Information regarding these rules and regulations may be found at the website address http://www.utdallas.edu/BusinessAffairs/Travel_Risk_Activities.htm. Additional information is available from the office of the school dean. Below is a description of any travel and/or risk-related activity associated with this course.</td></tr>
<tr><td>Technical Support</td><td>If you experience any problems with your UTD account you may send an email to: assist@utdallas.edu or call the UTD Computer Helpdesk at 972-883-2911.</td></tr>
<tr><td>Student Conduct and Discipline</td><td>
The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD printed publication, A to Z Guide, which is provided to all registered students each academic year.

The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the Rules and Regulations, Series 50000, Board of Regents, The University of Texas System, and in Title V, Rules on Student Services and Activities of the university's Handbook of Operating Procedures. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff
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	members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391) and online at http://www.utdallas.edu/judicialaffairs/UTDJudicialAffairs-HOPV.html A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.
Academic Integrity	The faculty expects from its 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 for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work. Scholastic Dishonesty, any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.
Copyright Notice	The copyright law of the United States (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 such infringement 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 about the fair use exemption, see http://www.utsystem.edu/ogc/intellectualproperty/copypol2.htm
Email Use	The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.
Withdrawal from Class	The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog.

	Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.
Student Grievance Procedures	Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's *Handbook of Operating Procedures*. In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the deal will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.
Incomplete Grades	As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) 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 is changed automatically to a grade of **F**.
Disability Services	The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office 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. The contact information for the Office of Disability Services is: The University of Texas at Dallas, SU 22 PO Box 830688 Richardson, Texas 75083-0688 (972) 883-2098 (voice or TTY) disabilityservice@utdallas.edu If you anticipate issues related to the format or requirements of this course, please meet with the Coordinator of Disability Services. The Coordinator is available to discuss ways to ensure your full participation in the course. If you determine that formal, disability-related accommodations are necessary, it is very important that you be registered with Disability Services to notify them of your eligibility for reasonable accommodations. Disability Services can then plan how best to coordinate your accommodations. It is the student's responsibility to notify his or her professors of the need for such an

	accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.
Religious Holy Days	The University of Texas at Dallas will excuse a student from class or other required activities for the 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. The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment. If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.

These descriptions and timelines are subject to change at the discretion of the Professor.