CS 3341-501: Probability and Statistics in CS (SPRING 2006)
Course Information and Syllabus

Goal: Learn some basic probability and statistics useful in computer science.

Instructor: Pankaj Choudhary, ECSN 3.908, 972-UTD-4436, pankaj@utdallas.edu

Office hours: MW 4.00-5.00 p.m. or by appointment

Class: MW 5.30-6.45p.m., ECSS 2.412.

Text: *Probability and Statistics with Reliability, Queuing and Computer Science Applications*, 2nd edition, K. Trivedi, John Wiley, 2002. For reference, you can also use *Concepts in Probability and Stochastic Modeling*, Higgins, J. J. and Keller-McNulty, S., Duxbury, 1994.

Course website: http://www.utdallas.edu/~pankaj/3341/SP06/
This site will contain skeleton lecture notes, homework assignments, solutions to homework assignments, quizzes and exams, and the announcements. *Please bring a printout of the lecture notes for each class*.

Also, visit http://webct.utdallas.edu/ to check your performance and enjoy discussion, mail, and chat with your classmates. You will need your UTD NETID and password to login.

Grading: Best 5 of 6 ten-minute quizzes: 35%
A 1¼ - hour Midterm exam: 30%
A 2½ - hour comprehensive Final exam: 35%

97 – 100 % = A +	86 – 90 % = B +	76 – 80 % = C +	66 – 70 % = D +
93 – 97 % = A	83 – 86 % = B	73 – 76 % = C	60 – 66 % = D
90 – 93 % = A –	80 – 83 % = B –	70 – 73 % = C –	55 – 60 % = D –

- 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.
- No make-up or late quizzes and exams. However, it may be possible to take an exam/quiz early.
- Homework will be assigned but will not be collected or graded.
- You can bring 1 page of notes for each quiz and 2 pages of notes for the midterm. The final is open-book and open-notes.
- Show your work on quizzes/exams. No work – no credit.

Some tips:

- Try to work out all the HW problems before you look at the solutions.
- Use your absolute right to ask questions in class and during instructor's office hours.
- For each exam/quiz, review all the new concepts, methods, formulae, etc. Try to *understand* the concepts.
- For efficient use of the exam time, prepare a brief summary of important formulae and methods you may need for the exam. Arrange it on a single sheet of paper in a convenient way.
- Be sure to have the required calculus skills.

Tentative schedule: (It may change slightly during the semester. The quiz/exam dates are firm.)

# classes	Date	Topics	Book chapters
2	Jan 9 – 11	Introduction, events and outcomes, probability rules.	1
2	Jan 18 – 23	Combinatorics. Conditional probability. Independence. Bayes' rule.	1
	Quiz 1: Jan 23		
3	Jan 25 – Feb 1	Discrete random variables and their distributions. Discrete distributions: Bernoulli, Binomial, Geometric, Negative Binomial, Poisson	2.1 – 2.5
3	Feb 6 – 13	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
	Quiz 2 : Feb 6		
3	Feb 15 – 22	Distributions of sums and functions of normal random variables. Expectation and moments.	3.8 – 3.9, 4.1 – 4.3, 4.5, 4.7
	Quiz 3: Feb 20		
2	Feb 27 – Mar 1	Simulation of random variables. Solving problems by Monte Carlo methods. Review for Midterm.	Lecture notes
	Midterm: Mar 13		
3	Mar 15 – 22	Stochastic processes. Main concepts and classification. Bernoulli, Binomial and Poisson process.	6.1 – 6.4
2	Mar 27 – 29	Markov chains	7.1 – 7.3
	Quiz 4: Mar 27		
4	Apr 3 – 12	Statistical inference	10.1 – 10.3
	Quiz 5: Apr 5		
2	Apr 17 – 19	Linear regression. Method of least squares.	11.1 – 11.3
	Quiz 6: Apr 17		
1	Apr 24	Review for Final.	
	Final: Apr 26 (5 – 7pm)	**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.