

CS 3341-501: Probability and Statistics in CS (FALL 2005)
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 2.410.

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/FALL05/>

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.

Teaching assistant: To be announced on the course website.

Grading: Best 9 of 10 ten-minute quizzes: 30%
A 1¼ - hour Midterm exam: 30%
A 2½ - hour comprehensive Final exam: 40%

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.
- All quizzes and exams are open-book and open-notes.
- Your solutions, not answers, are graded. Show your work. 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 and TA'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: (This schedule may change slightly during the semester. However, the quiz/exam dates are firm.)

Week #	Date	Topics	Book chapters
1	Aug 22 – 24	Introduction, events and outcomes, probability rules.	1
2	Aug 29 – 31	Combinatorics. Conditional probability. Independence. Bayes' rule.	1
	Aug 31	Quiz 1 (Week 1 topics)	
3	Sep 7	Discrete random variables and their distributions.	2.1 – 2.4
	Sep 7	Quiz 2 (Week 2 topics)	
4	Sep 12 – 14	Discrete distributions: Bernoulli, Binomial, Geometric, Negative Binomial, Poisson	2.5
	Sep 14	Quiz 3 (Week 3 topics)	
5	Sep 19 – 21	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,
	Sep 21	Quiz 4 (Week 4 topics)	
6	Sep 26 – 28	Distributions of sums and functions of normal random variables. Expectation and moments.	3.8 – 3.9, 4.1 – 4.3, 4.5
	Sep 28	Quiz 5 (Week 5 topics)	
7	Oct 3 – 5	Central limit theorem. Review for Midterm.	4.7
8	Oct 10	Midterm (Week 1 – 7 topics)	
	Oct 12	Simulation of random variables. Solving problems by Monte Carlo methods.	Lecture notes.
9	Oct 17 – 19	Stochastic processes. Main concepts and classification. Bernoulli, Binomial and Poisson process.	6.1 – 6.4
	Oct 19	Quiz 6 (Week 8 topics)	
10	Oct 24 – 26	Markov chains	7.1 – 7.2
	Oct 26	Quiz 7 (Week 9 topics)	
11	Oct 31 – Nov 2	Markov chains (continued). Statistical inference.	7.3, 10.1 – 10.2
	Nov 2	Quiz 8 (Week 10 topics)	
12	Nov 7 – 9	Statistical inference (continued).	10.3
	Nov 9	Quiz 9 (Week 11 topics)	
13	Nov 14 – 16	Statistical inference (continued).	10.3
	Nov 16	Quiz 10 (Week 12 topics)	
14	Nov 21 – 23	Linear regression. Method of least squares.	11.1 – 11.3
15	Nov 28	Review for Final.	
	Nov 30 (5 – 7.30pm)	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 $\frac{d}{dx}(1 - e^{-3x})$
Integration of polynomial and exponential functions, integration by parts and integration by substitution	Chap 3, 4	Compute $\int_0^b (x^2 + x^3) dx$; 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 $\lim_{x \rightarrow 0} \frac{\sin(\pi x)}{x}$, $\lim_{x \rightarrow \infty} \frac{\sin(\pi x)}{x}$

*This material will be presented in the class.