

CS/SE 3341 *Probability and Statistics in Computer Science*

Spring 2009

Time: MW 5³⁰ pm – 6⁴⁵ pm

Room: ECSS 2.305

Instructor: Dr. Michael Baron

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Office hours: Monday, Wednesday 12:00 noon – 1:00 pm

Internet : <http://www.utdallas.edu/~mbaron/3341/Spring09/>

This site will contain *homework assignments*, some *lecture notes*, solutions to *quizzes* and *exams* (after you submit them!), hints and answers to homework problems, and other info.

Also, see <http://webct.utdallas.edu/> to check your *performance* and join *discussion*, *mail*, or *chat* with your classmates. Use your Unix password to log in.

Textbook : Probability and Statistics with Reliability, Queuing, and Computer Science Applications, by K. Trivedi, John Wiley and Sons, New York, second edition

Grading:

Best 10 of 11 ten-minute quizzes	=	30%
A 1 $\frac{1}{4}$ -hour Midterm exam	=	30%
A 2-hour Final exam	=	40%

97 – 100 %	=	A+	93 $\frac{1}{3}$ – 97 %	=	A	90 – 93 $\frac{1}{3}$ %	=	A–
86 $\frac{2}{3}$ – 90 %	=	B+	83 $\frac{1}{3}$ – 86 $\frac{2}{3}$ %	=	B	80 – 83 $\frac{1}{3}$ %	=	B–
76 $\frac{2}{3}$ – 80 %	=	C+	73 $\frac{1}{3}$ – 76 $\frac{2}{3}$ %	=	C	70 – 73 $\frac{1}{3}$ %	=	C–
66 $\frac{2}{3}$ – 70 %	=	D+	60 – 66 $\frac{2}{3}$ %	=	D	55 – 60 %	=	D–

Incomplete grade is possible only in the case of a documented serious medical emergency near the end of semester, with $\geq 70\%$ of work completed at an on-going passing grade.

Rules : All quizzes and exams are open-book and open-notes.

Your solutions, not your answers, are graded. Show your work. No work - no credit.

No late exams or quizzes. However, it may be possible to take an exam/quiz early.

Homework will be assigned but will not be collected or graded.

Tips : A steady effort to work out all the assigned problems is highly recommended.

Use your absolute right to ask questions in class and during office hours. For example, any homework problem can be discussed.

For each exam/quiz, review all the new concepts, methods, formulae, etc. Try to understand the methods rather than to memorize them.

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 the most convenient way.

Be sure to have the required calculus skills for each exam and quiz.

SCHEDULE

This schedule may change slightly during the semester. However, the quiz/exam dates are firm.

DATE	TOPICS	CHAPTERS
Jan 12 - 26 Jan 19	Introduction. Events and outcomes. Probability rules. <i>No class - Martin Luther King Day</i>	1
Jan 26 - 28	Conditional probability. Independence. Examples. Bayes' Rule.	1
Feb 2 - 4	Random variables and their distributions. Discrete random variables and random vectors.	2.1-2.4 2.8-2.9
Feb 9 - 11	Discrete distributions: Bernoulli, Binomial, Geometric, Negative Binomial, Poisson.	2.5
Feb 16 - 23	Continuous distributions and probability densities: Uniform, Exponential, Gamma, Normal.	3
Feb 23 - 25	Expectation and moments. Central Limit Theorem.	4
March 4	Simulation of discrete and continuous random variables. Solving problems by Monte Carlo methods.	<i>Lecture notes</i>
March 9 March 11	<i>Review</i> MIDTERM EXAM	1-4
March 16-21	<i>S P R I N G B R E A K</i>	
Mar 23 Mar 25 - 30	Stochastic processes. Main concepts and classification. Bernoulli process. Poisson process.	6.1-6.2 6.3-6.4
Apr 1 - 8 Apr 8 - 15	Markov chains and simple queuing systems. Single-server queues, performance evaluation.	7, 9 9, notes
Apr 20 - 27	Statistical inference. Parameters and statistics. Parameter estimation and hypothesis testing.	10
April 29	Linear regression. Method of least squares (if time permits).	11
May 4 May 13	<i>Review.</i> FINAL EXAM, 5:00 - 7:00 pm	6-11 (1-11)

<u>Quizzes:</u>	Day	Sections	Day	Sections	Day	Sections
	Jan 28	1.1-1.7 pp.26-27	Feb 18	2.5	Apr 8	7.1-7.2
	Feb 4	1.8-1.11	Feb 25	3	Apr 15	7.7, notes
	Feb 11	2.1-2.4, 2.8-2.9	Mar 4	4	Apr 22	9.1, notes
			Apr 1	6.1-6.4	Apr 29	10.1-10.2

CALCULUS AND ALGEBRA PROFICIENCY REQUIRED FOR THIS COURSE

Concepts and skills	When needed	Examples
Factorial(*)	sect. 1.8, 2.5	compute $5!$, simplify and compute $35!/33!$
Sigma-notation	sect. 1.7	compute $\sum_{k=1}^{10} k^2$
Geometric series	sect. 2.5	compute $\sum_{j=3}^{\infty} 3(0.2)^j$, $\sum_{j=3}^{\infty} j(0.2)^j$
Derivatives and integrals	Ch. 3,4	$\frac{d}{dx}(1 - e^{-3x})$, $\frac{d}{dx} \int_0^x e^{t^2/2} dt$
Integration of polynomial and exponential functions	Ch. 3,4	find $\int_0^b (x^2 + 2^x) dx$; compute the area under the graph of x^2 between $x = -1$ and $x = 2$
Integration by substitution	Ch. 3,4	$\int_0^1 e^{5x} dx$, $\int x^2 e^{5x^3} dx$
Integration by parts	Ch. 3,4	$\int x^2 e^x dx$
Gamma function and related integrals(*)	sect. 3.4	compute $\Gamma(4)$, $\int_0^{\infty} x^8 e^{-x/5} dx$, simplify $\Gamma(n+k)/\Gamma(n)$ for $k, n > 0$
Inverse functions	3.5, Monte Carlo	If $f(x) = 2p^x$, find $f^{-1}(y)$
Matrices(*)	Ch. 7	Let $A = \begin{pmatrix} 0 & .75 & .25 \\ .9 & 0 & .1 \\ .8 & .2 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} .7 & .2 & .1 \\ .3 & .4 & .3 \\ .1 & .3 & .6 \end{pmatrix}$. compute $A + B$, $A - B$, AB , A^3 .
Limit	sect. 3.1, 4.7	compute $\lim_{x \rightarrow \infty} \frac{\sin(\pi x)}{x}$, $\lim_{x \rightarrow 0} \frac{\sin(\pi x)}{x}$

(*) This material will be presented and discussed in class.