	Course	STAT 3332.003 Statistics for Life Sciences
UTD	Professor	Pankaj Choudhary
	Term	Fall 2013
	Class Sessions	TR 10:00 am - 11:15 am, GR 3.420

Created on: May 31, 2013

Professor's Contact Information

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	All course related materials, including lecture notes, will be posted here.
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General Course Information

Prerequisite	**One** *of the following 2 options is required: (a) MATH 1325 (Applied Calculus)*, or *(b) MATH 2312 (Precalculus)*. This background is anticipated, but not emphasized, and can be refreshed as needed.
Course Description	In the *life and health sciences*, decision-making using data is pervasive. Essential to this purpose is *proper design of the experiments* that acquire the relevant data. Also essential is *proper interpretation of the data*, once gathered. *Statistical science* centers on these challenging goals. For example, one may try to determine the true rate of occurrence for a certain kind of mutation. Or compare the effectiveness of two or more medical procedures. Or fit a line to explain the relationship between two variables. Or test whether two variables are related or independent. Statistical science involves <u>basic concepts</u> about how to *make inferences from data*. It also involves <u>practical tools</u> for implementing the concepts. Although its tools include some mathematical or computational steps, statistical science is not a branch of mathematics. It is very different and very special – a conceptual discipline centering on *data as a source of information that we can use profitably*. This course emphasizes <u>*critical statistical thinking*</u>, especially for applications in the life sciences. <u>*Key topics*</u>: *design of experiments, descriptive statistics, correlation, regression, probability models, sampling, estimation, confidence intervals, and hypothesis testing*.
Desired Learning Outcomes	An appreciation of <u>*critical statistical thinking*</u>, a working knowledge of <u>*basic statistical methods*</u> used in the life sciences, and a readiness to conduct <u>*statistical discussions*</u>. Particular goals are to: 1. Understand some basics of experimental design. 2. Have familiarity with the most basic probability models. 3. Recognize which statistical method (confidence interval or hypothesis testing) is appropriate for a given typical problem. 4. Apply statistical procedures to data and interpret the results. 5. Critically read statistical work in published literature.

Required Text	Freedman, D., Pisani, R., and Purves, R. *Statistics*, 4th edition, W. W. Norton, 2007. (The international edition is also acceptable.)
Other Materials	Some useful handouts and additional suggested readings are listed at http://www.utdallas.edu/~serfling/3332.htm

Syllabus (*Material between ☺ indicates an additional topic not in text*)

T 8/27 R 8/29	***PART I. DESIGN OF EXPERIMENTS*** Ch. **1**: *Controlled Experiments.* Ch. **2**: *Observational Studies.*
T 9/3 R 9/5	***PART II. DESCRIPTIVE STATISTICS*** Ch. **3**: *The Histogram.* Ch. **4**, § **5.4**: *The Average, the Median, the Standard Deviation, the Percentiles, and the Interquartile Range.* ☺ *The Boxplot* ☺ Ch. **5**: *The Normal*
T 9/10 R 9/12	*Approximation for Data.* ***PART III. CORRELATION AND REGRESSION*** Ch. **8**, §§ **9.3**, **9.5**: *Correlation. Outliers. Association is Not Causation.* **(R) QUIZ 1 on 8/27-9/5 Material**
T 9/17 R 9/19	Ch. **10**, § **11.3**: *Regression. Plotting Residuals.* Ch. **12**: *The Regression Line (continued).* **(R) QUIZ 2 on 9/10-9/12 Material**
T 9/24 R 9/26	***PART IV. PROBABILITY*** Ch. **13**, §§ **14.1**, **14.2**: *What are the Chances? Counting Outcomes. The Addition Rule.* **(R) TEST 1 on 8/27-9/12 Material**
T 10/1 R 10/3	*Chances, continued.* Ch. **15**: *The Binomial Formula and the Binomial Distribution.* *The Binomial Distribution, continued.* **(R) QUIZ 3 on 9/17-9/24 Material**
T 10/8 R 10/10	☺ *The Geometric, Poisson, and Exponential Distributions* ☺ ***PART V. CHANCE VARIABILITY*** Ch. **16**: *Law of Averages.* Ch. **17**: *Expected Value and Standard Error*. **QUIZ 4 on 10/1-10/3 Material**
T 10/15 R 10/17	Ch. **18**: *The Normal Approximation for Histograms (Central Limit Theorem).* **(R) TEST 2 on 9/17-10/3 Material**
T 10/22 R 10/24	***PART VI. SAMPLING*** Ch. **19**: *Sample Surveys.* Ch. **20**: *Chance Errors in Sampling.* Ch. **21**: *The Accuracy of Percentages (Confidence Interval for a Population Percentage).* **(R) QUIZ 5 on 10/8-10/15 Material**
T 10/29 R 10/31	Ch. **23**: *The Accuracy of Averages (Confidence Interval for a Population Mean).* ☺ *Confidence Interval for a Difference of Means of Two Populations* ☺ ***PART VIII. TESTS OF SIGNIFICANCE*** Ch. **26**: *Tests of Significance. The One-Sample z-Test.* **(R) QUIZ 6 on 10/22-10/24 Material**
T 11/5 R 11/7	*The t-Distributions. The One-Sample t-Test.* ☺ *The Sign Test (for One-Sample Inference)* ☺ Ch. **27**: *More Tests for Averages (Two-Sample Tests of Means and Proportions).* **(R) QUIZ 7 on 10/29-10/31 Material**
T 11/12 R 11/14	☺ *The Wilcoxon Rank Sum Test (for Two-Sample Inference)* ☺ **(R) TEST 3 on 10/8-10/31 Material**
T 11/19 R 11/21	Ch. **28**: *The Chi-Square Distributions. The Chi-Square Test of Goodness of Fit.* *Chi-Square Test of Independence.* ☺ *Chi-Square Test of Homogeneity* ☺ **(R) QUIZ 8 on 11/5-11/12 Material**

T 11/26	☺ *Fall Break – University Closed* ☺
R 11/28	☺ *Thanksgiving Holiday – University Closed* ☺
T 12/3 **R 12/5**	☺ *The F-Distributions. Analysis of Variance: The One-Way Layout* ☺ ☺ *Analysis of Variance: The Two-Way Layout* ☺ **(R) QUIZ 9 on 11/19-11/21 Material**
T 12/10	**(T) TEST 4 on 11/5-11/21 Material + 2 Bonus Questions on 12/3-12/5 Material**

Course Policies

Quizzes and Tests	There will be 9 *closed-book 10-minute quizzes*. There will be 4 *closed-book 60-minute tests*. The quizzes and tests will be based on a specified range of course content (text, handouts, class sessions, recommended exercises). See the previous table for their coverage. In general, each quiz will be based on the material covered since the previous quiz up to (and including) the material covered in the previous week. The quizzes and tests are not intended to strain memory. As a practical matter, however, we need to be able to call forth from memory at least some basic information and details. I would not ask a student to state a complicated formula from memory but would require selecting the correct one from given choices. *Depth and scope of understanding of concepts and methods will be tested*. Each quiz will consist of 5 multiple-choice questions of equal value, and each test will be consist of 25 multiple-choice questions of equal value, except that Test 4 will have 2 bonus questions for extra credit. **For each quiz and test, each student must bring a scantron score sheet, FORM NO. F-1712-PAR-L. They (the scantron sheets) should be _clean_ and _not bent or mutilated_. These are available in the bookstore. The instructor will NOT be providing scantron sheets.** **Also, for each quiz and test, each student must bring a *NUMBER 2 pencil* with a good eraser, for use with the scantron sheet. The instructor will NOT be providing these.** Due to the modular style of the course and the associated timely testing during the course, *a final exam will not be necessary*. **No final exam will be held**. Note. Students must bring their UTD IDs to every quiz and test and be ready for them to be checked before or after the test.
Grading Criteria	_Two lowest quiz grades will be dropped._ The remaining 7 quiz grades will be averaged together and count for 25% of the *overall course score*. _The lowest of the four test grades will be dropped_. The remaining 3 test grades will be averaged together and count for 75% of the *overall course score*.

	The course grade is based on the overall course score, as follows: A+ 98-100; A 93-97.9999; A- 90-92.9999; B+ 87-89.9999; B 83-86.9999; B- 80-82.9999; C+ 77-79.9999; C 73-76.9999; C- 65-72.9999; D+ 60-64.9999; D 55-59.9999; D- 50-54.9999; F 0-49.9999 ***<u>Classroom participation</u> as measured by presence at two or more roll calls at random times*** *will raise the letter grade to the next higher level.* In the interest of *<u>equitable treatment of all students</u>*, **no individual requests for special projects, extra assignments, extra tests, etc., will be granted**.
Missed Tests and Quizzes **Late Arrivals, Early Departures**	If up to two quizzes are missed, they will count as the dropped quizzes. For a further missed quiz, *<u>if the absence is excused (based on documentation of why the absence)</u>*, then *the average of the six non-dropped quizzes will be used for the missing grade.* If one test is missed, it will count as the dropped test. For a further missed test, *<u>if the absence is excused (based on documentation of why the absence)</u>*, then *the average of the two non-dropped tests will be used for the missing grade.* *If the absence is not excused, the further missed test or quiz receives the grade of zero.* **Absences due to oversleeping, car troubles, forgetfulness, etc., will <u>not</u> be excused.** *NOTE. For each quiz and test,* **<u>arrival after someone has finished and departed is NOT permitted</u>**. *Noncompliance results in a grade of zero for that quiz or test.*
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. See the UTD publication, *A to Z Guide*, issued to each registered student.
Academic Integrity	The faculty expects from students a high level of responsibility and academic honesty. Scholastic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, and falsifying of records. Violators face 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.
Withdrawal	Deadlines for withdrawal from courses are published in each semester's course catalog. *A faculty member cannot drop or withdraw a student.* Tt is the student's responsibility to handle withdrawal procedures from any class to avoid receiving a grade of "F".
Incomplete Grades	As per university policy, incomplete grades are granted only in the case of work unavoidably missed (and excused) and not already covered by the professor's policy on missed work or activities, and only if at least 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 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-Thursday 8:30 a.m. to 6:30 p.m. and Friday 8:30 a.m. to 5:00 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. The student should notify the professor 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 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. Missed assignments, quizzes, tests, or exams, will be covered by the professor's policy for excused missed or late work.
Copyright Notice	A UTD student is required to follow the UTD copyright policy. See http://www.utsystem.edu/ogc/intellectualproperty/copypol2.htm.