

Biostatistics - Syllabus

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If room 509 in Wachman Hall is unavailable for any reason, room 609 (undergraduate lounge) in the same building will be used instead.

For assistance outside the scheduled hours, you must **request an appointment** by writing an email to all three instructors simultaneously, and obtain a confirmation from one of them before walking in. Priority will be given to students with proven schedule conflict with all the scheduled slots.

Class Hours and Location

Lectures and tests in class are held Tuesdays and Thursdays between 12:30-1:50, in the **Science Education and Research Center (SERC), room 108A**.

Alternative locations for specific activities or tests in class will be communicated in advance by email.

Homework

Homework will be assigned throughout the semester with frequency at most weekly. Assignment scores will contribute to the final grade, each carrying 20 points maximum. Bonus points beyond 20 will be awarded for the most difficult tasks in each assignment.

Assignments may be turned in electronically via Blackboard, or on paper in class. Assignments turned in up to 24 hours late will carry a penalty of 5 points. Assignments turned in more than 24 hours late will count as zero.

Exemptions may be requested, no later than one day before the due date: the final grade will be prorated. A maximum of 2 exemptions are allowed through the semester.

Exams

The course is organized in three sections, separated by two midterm exams. The first and second midterms are non-cumulative tests in classroom (including both problems and multiple-choice quizzes), and carry a maximum of 100 points each. The final exam will be cumulative, focusing largely on material from the first two sections, and will carry up to 150 points. Absence from an exam without proper justification will result in a zero score for that exam. Tests carry the option to earn bonus points for the most difficult questions (i.e. the maximum score may be higher than 100% on a given test).

Final Grades

The highest number of points possible for grading purposes is given by the number of assignments times 20 points, 100 points from each midterm, and 150 points from the final. In percentages, these are approximately **30% from the assignments, 20% from each midterm, and 30% from the final.**

If the score on the final is significantly different from the average score of the two midterms, the higher number will be used to calculate the grade, while maintaining a 30% contribution from the assignments.

Students of the *graduate course (5312)* and students who have signed the *Honors Contract* early in the semester have the option of carrying out a short project involving statistical analysis, and giving a short paper or a presentation as final evaluation (which is alternative to the test in class). Before beginning the project, approval by the instructor is required.

Computer Software

During the first month of the semester, it will be illustrated how to use a regular spreadsheet program (MS Excel or OpenOffice Calc) for statistical analysis.

During the second and third month, more specialized statistical software such as JMP will be required: JMP is installed on all computers at the Tuttleman Learning Center and at the Tech Center, and can be downloaded from the webpage <http://download.temple.edu> using your own credentials.

Other statistical packages useful to this purpose are e.g. SAS, SPSS, R and Matlab. Students already proficient in one of these programs or in a programming language should let the instructor know of their skills for suggestions on how to use them to their advantage.

To typeset assignments, each student can make use of any software of their choice, provided that the file submitted is in Adobe PDF, MicroSoft Office, or OpenDocument format.

All electronic submissions will be screened for plagiarism.

Textbook

The reference textbook is:

B. Rosner. “*Fundamentals of Biostatistics*”, 7th edition, Brooks/Cole, 2010 (ISBN 978-0-538-73349-6)

Note: this textbook is available in “US” and “international” editions. The differences between the two editions are a few minor paragraphs, and the numbering of examples and problems.

I will only cover material or assign problems available in both editions. Editions prior to 7th contain the same basic material, but are not officially supported.

Other optional readings are:

G. Norman and D. Streiner. “*Biostatistics: the bare essentials*”, 3rd edition, BC Decker Inc, 2008 (ISBN 978-1-55009-347-6)

H. Motulsky. “*Intuitive Biostatistics: a non-mathematical guide to statistical thinking*”, Oxford University Press, USA, 2010 (ISBN 978-0-19-973006-3)

Academic honesty and Civility

You must abide by Temple’s Code of Conduct, which prohibits:

1. Academic dishonesty and impropriety, including plagiarism and academic cheating.
2. Interfering or attempting to interfere with or disrupting the conduct of classes or any other normal or regular activities of the University.

Disability Disclosure

Any student who has a need for accommodation based on the impact of a documented disability, including special accommodations for access to technology resources and electronic instructional materials required for the course, should contact the instructor privately to discuss the specific situation by the end of the second week of classes or as soon as practical.

If you have not done so already, please contact Disability Resources and Services (DRS) at 215-204-1280 in 100 Ritter Annex to learn more about the resources available to you.

Student and Faculty Academic Rights and Responsibilities Policy

Freedom to teach and freedom to learn are inseparable facets of academic freedom. The University has a policy on Student and Faculty and Academic Rights and Responsibilities (Policy #03.70.02) which can be accessed at: http://policies.temple.edu/getdoc.asp?policy_no=03.70.02

Calendar

Items in *italics* will be covered provided that additional time is available, and are in any case required only in the graduate course (5312) or when taking the 3312 course at the Honors level.

	Subject	Chapters of Rosner book
Aug 25, Aug 27	Types of data and how to visualize them: communicating data to other people clearly and without bias. <i>Critical examination of a scientific report.</i>	1
Sep 1, Sep 3	Descriptive statistics: median, mean, standard deviation, etc. <i>Definition of higher-order statistical moments (skewness, kurtosis), standard deviation of derived data (chain rule).</i>	2
Sep 8, Sep 10	Elements of probability theory. Relationships between events. From frequency to probability. <i>Frequentist vs. Bayesian definition of probability.</i>	3
Sep 15, Sep 17	Discrete probability distributions: dice rolls, binomial, Poisson. <i>Relationship with continuous distributions (probability mass functions vs. probability density functions). Numeric integrals.</i>	4
Sep 22, Sep 24	Continuous probability distributions: normal distribution, z-score. Normal approximation to the binomial distribution. <i>Tests of normality. Asymmetric probability distributions: log-normal, power-law.</i>	5
Sep 29, Oct 1	Estimation of quantities from sampled data: central limit theorem, standard error of the mean, confidence intervals. <i>Estimation using exact distributions (without normal approximation).</i>	6
Oct 6, Oct 8	Review and Midterm Exam 1	

Oct 13, Oct 15	One-sample hypothesis testing. Significance, Type I and Type II errors, power, sample size estimation. <i>Hypothesis testing for discrete probability distributions.</i>	7
Oct 20, Oct 22	Two-samples inference and hypothesis testing: Student's <i>t</i> -distribution, <i>t</i> -test, pooled and split variances, paired <i>t</i> -test. <i>Test for equal variances.</i>	8
Oct 27, Oct 29	Multisample hypothesis testing: one-way ANOVA F-test, sums of squares, post-hoc comparisons, Fisher's LSD and Bonferroni correction. <i>Linear contrasts, two-way ANOVA.</i>	12
Nov 3, Nov 5	Regression and correlation: least squares, inference, correlation coefficient. <i>Analysis of covariance (ANCOVA).</i>	12 + 11
Nov 10, Nov 12	Practice and Midterm Exam 2	
Nov 17, Nov 19	Non-parametric statistics for nominal data: Poisson distribution, chi-square test, contingency tables. <i>Fisher's exact test. Assignment of final projects.</i>	10
Nov 24, Nov 26	Break	
Dec 1, Dec 3	Non-parametric statistics for ordinal data: Wilcoxon rank-sum test (aka Mann-Whitney U), sign test, Wilcoxon signed-rank test. <i>Application of rank and sign tests to skewed parametric data. Reexamination of the scientific report from Week 1.</i>	9
Dec 10	Final Exam (10:30 – 12:30) <i>Graduate projects due</i>	