Biostatistics - Syllabus

Instructor: Giacomo Fiorin
Email: giacomo.fiorin@temple.edu
Office location: Biology-Life Sciences Building, room 113B

Hours and Location

Classes will be held Tuesdays and Thursdays, between 12:30 - 1:50, in Barton Hall B, Room 400.

Tuesday classes will be in lecture format, while most of Thursday classes will vary between a review of the Tuesday lecture, activities in class, and exercises.

The course will include several activities in a computer lab at the Tuttleman Learning Center, to be held typically on Thursdays, also between 12:30 - 1:50.

Midterm and final exams will be conducted in Barton 400.

Office Hours

Office hours are on Tuesdays between 3:30 and 5:00, and on Wednesdays between 2:30 - 4:00, in the Biology-Life Sciences Building, room 113B.

Outside of these hours, an appointment is required.

Homework

Homework will be assigned through 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, counting towards improving the final score beyond 100%.

Assignments may be turned in on paper or Blackboard in class (typically on Tuesday): solutions will be explained in class on the following lecture day (typically Thursday). Assignments turned day late will carry a penalty of 5 points. Assignments turned in after solutions are given out will count as zero.

Exemptions can be requested, no later than one day before the deadline: the final grade will be prorated. A maximum of 2 exemptions are allowed.

Exams and Final Scores

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, and will carry up to 150 points: up to 75 points will be awarded from a classroom test, and up to 75 points from a homework assignment.

Absence from an exam without proper justification, or cheating on the test will result in a zero score for that exam.

Both classroom tests and the final assignment feature the option to earn extra points for the most difficult questions.

Software

Several activities will be conducted in one of the computer labs at TLC (dates will be communicated two lectures ahead).

During the first month, it will be illustrated how to use a regular spreadsheet program (MS Excel or OpenOffice/LibreOffice Calc) for statistical analysis. During the second and third month, specialized statistical software such as JMP will be required: JMP is installed on the computers at TLC and the Tech Center, and can be downloaded from the webpage *download.temple.edu* using one's own AccessNet ID. Other statistical packages useful to this purpose are SAS, SPSS, and R. Students who are already proficient in these programs or in a programming language should contact me early in the semester to find alternatives.

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

Textbook

The reference textbook for the Fall 2013 class 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 certain minor paragraphs, and a few additional problems in the US edition.
I will only cover material or assign problems that are present 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)

Wikipsedia (with the usual grain of salt!)

Preliminary Calendar

The following may be subject to change. Exam dates are marked in boldface.

Days	**Subject**	**Chapters**
Aug 27, Aug 29	Types of data and how to visualize them: communicating data to other people clearly and without bias.	1 + lecture slides
Sep 3, Sep 5	Descriptive statistics: median, mean, standard deviation, etc.	2
Sep 10, Sep 14	Elements of probability theory; conditional events; from frequency to probability; brief mention of Bayesian inference.	3
Sep 17, Sep 19	Discrete probability distributions: dice rolls, binomial, Poisson.	4
Sep 24, Sep 26	Continuous probability distributions: normal curve, *z*-score. Normal approximation to the binomial distribution.	5
Oct 1 - Oct 3	Estimating population quantities from sample data: central limit theorem, standard error of the mean, confidence intervals.	6
Oct 8, **Oct 10**	**Practice and Midterm Exam 1**	
Oct 15, Oct 17	One-sample inference: hypothesis testing, significance, Type I and Type II errors, power, sample size estimation.	7
Oct 22, Oct 24	Two-samples inference / hypothesis testing: Student's distribution, *t*-test, pooled and split variances, paired *t*-test.	8
Oct 29, Oct 31	Multisample inference: one-way ANOVA, F-test, post-hoc comparisons, Fisher's LSD and Bonferroni correction.	12
Nov 5, Nov 7	Multisample inference: linear contrasts, two-way ANOVA. Regression and correlation: least squares, inference, correlation coefficient.	12 + 11
Nov 12, **Nov 14**	**Practice and Midterm Exam 2**	
Nov 19, Nov 21	Non-parametric statistics for nominal data: brief intro to Poisson distribution, contingency tables, chi-square test.	10
Nov 26, (break), Dec 3	Non-parametric statistics for ordinal data: Wilcoxon rank-sum test (aka Mann-Whitney U), sign test, Wilcoxon signed-rank test.	9
Dec 12	*Final Exam (assignment due + test in class)*	