Fall 9-1-2005

# BMED 609.01: Biomedical Statistics

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# BMED 609 SYLLABUS
# Biomedical Statistics
# Fall 2005

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**Textbooks:** Zar, J. H. 1996. *Biostatistical Analysis*, 4th ed. Prentice-Hall Inc., Englewood Cliffs, New Jersey, 662 pp. ISBN# 0-13-081542-X.

Altman, D. G. 1991. *Practical Statistics for Medical Reasearch*. Chapman & Hall/CRC, London, 611 pp. ISBN# 0-412-27630-5 (**optional**).

Motulsky, H. 1995. *Intuitive Biostatistics*, Oxford University Press, New York, 386 pp. ISBN# 0-19-508607-4 (**optional**).

**Software:** *SPSS* available in SB 214 computer lab
*InStat* and/or *Prism* software from *GraphPad* (**optional**)

**Online Reference:**
http://www.statsoft.com/textbook/stathome.html

**Course objective:**
This course is designed for graduate students in biomedical research. An emphasis will be placed on a "practical" knowledge of experimental design and "appropriate" statistical analysis techniques. In addition, the course will familiarize students with analytical software and enable them to develop and evaluate the experimental designs and data analyses used in current biomedical research.

**Course organization:**
Material will be presented in the form of lectures and reading assignments. Handouts will be provided to illustrate the main points in the lecture and to direct study from the text. Necessary supplemental reading will also be in the form of handouts. All lecture handouts will be accessible on the Pharmacy School server (skaggs-03.gs.umt.edu) under "PharmSci" and then BioMed Stat". There will be two exams: midterm and final. The exams will involve a take-home portion, which will involve designing and analyzing a mock experiments using computer-aided statistical analysis, presentation, and interpretation of the results. The in-class exam will be over concepts and will involve some computations. There will be homework assignments corresponding to the text and lecture that will be factored into the grade. These exercises will be graded weekly.

**Credit Hours:** 3

**Tentative class schedule:**

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| Week 1: | Introduction to statistics, using the computer for analysis, types of data, frequency distributions, populations and samples (Zar ch.1 & 2). |
| Week 2: | Measures of central tendency, measures of dispersion (variability), probability (Zar ch. 3, 4, and 5). |
| Week 3: | The normal "Gaussian" distribution, the sampling distribution of means, introduction to hypothesis testing, tests for normality (Zar ch. 6). |
| Week 4: | One-sample hypotheses, (Zar ch. 7). |
| Week 5: | Testing for independence, chi-square, contingency tables (Zar, ch. 22 & 23). |
| Week 6: | Binomial distribution, Proportions, Clinical trials (odds ratios, relative risk), Diagnostic tests (Zar ch. 24, & supplemental). |
| Week 7: | Poisson Distribution, Two-sample hypotheses (Zar ch. 25 & 8). |
| Week 8: | Paired-sample hypotheses, Multi-sample hypotheses, Introduction to analysis of variance ANOVA (Zar ch. 9 &10). |
| Week 9: | One-way ANOVA, *post hoc* multiple comparisons (Zar ch. 11, & supplemental). |
| Week 10: | Trend Analysis/Contrasts using ANOVA, Two-factor ANOVA, Data transformations (Zar ch. 12, 13 and supplemental). |
| Week 11: | Multi-way factorial ANOVA, Nested designs, MANOVA, a look at the literature (Zar ch. 14 & 15 and supplemental). |
| Week 12: | Simple linear regression (Zar ch. 17 & 18). |
| Week 13: | Simple linear correlation (Zar ch. 19). |
| Week 14: | Multiple regression, Multiple correlation, Logistic regression (supplemental). |
| Week 15: | Survival analysis, Proportional-hazards (Cox) regression, Review (supplemental). |

**Grading:**

Midterm - 40 points (20 take-home/ 20 in-class)
Final (non-comprehensive) – 40 points (20 take-home/ 20 in-class)
Homework – 20 points total
Total – 100 points

**Things you will need:**

Scientific calculator
Computer access for data analysis, and graphics