# Biostatistics

## Math4310/Biol6317
## Fall 2011

**Class:**            TuTh 1pm-2:20pm, PGH 348

**Instructor:**       Bernhard Bodmann, bgb@math.uh.edu

**Office:**           PGH 604; Tu 11:30-12:20pm, Wed 2:00-2:50pm,

**Objectives:**       This course covers applications of statistics in biology and medicine, motivated by typical case studies. The students will learn a variety of uses, and abuses, of statistical methods. The material will be interspersed with simple programming projects, which allows the students to become familiar with R, the open-source software package used in this course.

**Contents:**         The first part of the course is a rapid review of essentials in probability and statistics. The main part of the material focuses on typical estimation problems and hypothesis testing applied to data from medicine as well as population, molecular and physiological biology.

| Topic | Approximate Time |
|---|---|
| Probability and statistics essentials | 2 weeks |
| Inferences for one sample | 2 weeks |
| Summarizing and describing data | 1 week |
| The two sample problem | 2 weeks |
| Contingency tables | 2 weeks |
| Case-control and cross-sectional studies | 2 weeks |
| Introduction to non-parametric methods | 2 weeks |
| Large datasets | 1 week |

Topics include: Independence, Bayes rule, sensitivity and specficity of a test, likelihood ratio; normal and chi-squared distribution, condence intervals; students t-distribution; empirical quantiles, boxplot, qauntile-quantile plot; kernel density estimates, stem and leaf plots, histograms; bootstrap principle; binomial confidence intervals; group comparisons; Pearsons chi-squared test; retrospective case/control studies; multiplicity: Bonferroni adjustment for family-wise error, false-discovery rate; stratified tables; matched pairs; Poisson processes and rate estimate.

**Prerequisites:**    MATH 1432 and MATH 2311 or equivalent.

**Text:**             The lectures will be as self-contained as possible. The course material follows the book: Bernard Rosner, Fundamentals of Biostatistics, 6th edition, Thomson Brooks/Cole, 2006. Due to its price, this is recommended, not mandatory. An alternative text, which covers most of the material in the course, is the book: Michael Whitlock and Dolph Schluter, The analysis of biological data, Roberts and Company, 2009