

# Stats 2B03 - Statistical Methods for Science

## Textbook:

Biostatistics: A Foundation for Analysis in the Health Sciences (8th, 9th, or 10th edition) by Wayne Daniel

## Course Schedule:

3 Lectures per week

1 lab per week

## Objectives:

- To obtain a good understanding of the basic fundamental ideas of statistics
- To be able to carry out statistical calculations by hand
- To be able to analyze large data sets using Minitab
- To be able to understand and interpret computer output, and their relation to hand calculations
- To be able to determine which methods can be applied to a given data set
- To understand and be able to check the assumptions behind each statistical procedure

## Major Topics:

Describing data, graphical representations of data, probability, confidence intervals, hypothesis testing, one-way ANOVA, analysis of categorical data, regression and correlation, nonparametric statistics

## Software:

Minitab

## Course Evaluation:

5 Assignment/Labs - 3% each

2 Tests - 20% each

Final Exam - 45%

## Format of Combined Assignment/Labs

- Some hand calculations
- Some Minitab calculation to verify hand calculations and to provide information that can't be obtained by hand (e.g.  $p$ -values for an F-test)
- Using Minitab to analyse some large data sets (possibly provided by interested departments), interpreting the output, and checking assumptions

## **Lecture Schedule:**

**Lectures 1:** Chapter 1 - Some basic concepts and terminology

**Lectures 2-4:** Chapter 2 - Organizing Data, grouped frequency distributions, describing data with graphs, measures of center and variability, the empirical rule, z-scores, percentiles, outliers, five-number summary, boxplots

**Lectures 5,6:** Chapter 3 - Probability, sample spaces, addition rules, multiplication rule, conditional probability

**Lectures 7-10:** Chapter 4 - Binomial distribution, Poisson distribution, the standard normal distribution, applications of the normal distribution, determining normality (normal probability plots)

**Lecture 11:** 5.3 - Central Limit Theorem

**Lecture 12-14:** Chapter 6 - Point and interval estimation for the population mean and proportion

**Lectures 15-18:** Chapter 7 - Hypothesis testing for the population mean and proportion, p-values, power, inference for the difference between two population means

**Lectures 19-22:** 8.2 - one-way ANOVA, paired comparisons, checking the ANOVA assumptions

**Lectures 23-25:** Chapter 12 - Analysis of categorical data, contingency tables, Pearson's Chi-Square statistic, testing for goodness of fit, independence, and homogeneity

**Lectures 26-29:** Chapter 9 - Linear regression and correlation, ANOVA for regression, testing the usefulness of the linear regression model, diagnostic tools for checking the regression assumptions, estimation and prediction

**Lectures 30-33:** Chapter 10 and 11.2 - Multiple regression analysis, interpreting the results of a significant regression, misinterpreting a regression analysis, using qualitative and quantitative predictor variables, testing sets of regression coefficients

**Lectures 34-35:** Chapter 13 - Nonparametric statistics, the Wilcoxon signed rank test, and the Mann-Whitney test