Applied Biostatistics
An elective course for Biology / Statistics majors

Goal: Biostatistics applies to the principles of statistics to the biological, medical or health fields. The statistical techniques discuss here can be applied broadly to both Biology and Statistics majors (3 credit hours).
This is a new course which is equivalent to the level of Statistical Methods I with the emphasis in biological or health related data analysis.
Prerequisite: STA 2014 or an equivalent course

Instructor: Dr. Pali Sen, Associate Professor of Statistics, Dept. of Math & Stat.

Here are some interesting data descriptions based on the biological factors. All data analysis will be done using Statistical software (SAS) that are readily available to the students and widely used elsewhere.

1. Heart study for Longitudinal data
   The data collected as part of a large study for approximately 6 years with 4434 participants. Each participant has 1 to 3 observation period depending on the number of exams the subject attended. The variables include sex, examination cycle, age, blood pressure (systolic and diastolic), serum glucose, drug use, smoking habit, cholesterol level, BMI, heart rate, heart disease history. A study of this magnitude requires different statistical techniques to make meaningful interpretation of the findings. Chapters 1 – 11 given below will be used to analyze the data.

2. The dependence of yield from a strawberry plant on the number of flower heads produced in the fruiting season was estimated from measurements on 37 plants. We analyze the data using procedures described below in Chapter 9.

3. In an experiment on the survival time of a cell suspension, 5 subsamples were taken daily on 6 successive days, and a count made on each sample of the number of dead cells in 100 cells. We analyze the data using procedures from Chapter 9 of the course description.

Course Contents:

1. Summarizing Data
   a. Graphical Methods
   b. Numerical Methods

2. Probability
   a. Discrete distribution
   b. Binomial distribution
   c. Normal distribution

3. Sampling Distributions
   a. The Central Limit Theorem
   b. Application of SAS

4. Statistical Inference: Procedures for :
   a. Confidence Interval
   b. Sample size
   c. Hypothesis Tests

5. Statistical Inference: Procedures for ($:_1$ - $:_2$)
   a. Two Independent populations – variances known/ variances unknown
   b. Two dependent populations – matched or paired

6. Categorical Data
   a. Cross-Tabulation Tables
   b. Statistical Inference Concerning p
   c. Statistical Inference Concerning ($p_1 - p_2$)
   d. Chi-square Tests – Goodness of tests and Tests of Independence

7. Comparing Risks in Two Populations
   a. The Chi-square tests of Homogeneity
   b. Fisher's exact tests
   c. Cochran –Mantel- Haenzel Method

8. Analysis of Variance
   a. Fixed versus Random Effects Models
   b. Multiple comparisons Procedures – Tukey and Scheffe

9. Correlation and Regression
   a. Simple Linear Regression
   b. Multiple Regression Analysis

10. Logistic Regression Analysis
    a. The Logistic Model
    b. Multiple Logistic Regression
    c. Area under the ROC curve

11. Introduction to Survival Analysis
    a. Survival Analysis Technique
    b. Life-Tables

For further information contact the Department of Mathematics and Statistics at 620-3711 or stop by the office: Building 14/Room 2731