

## Draft Topics – Mathematics 363

### 1. Observation and Experimental Design

Sampling strategies

Introduction to case studies

Role of statistics in the scientific method

### 2. Review of mathematical topics

Calculus

Matrix algebra

### 3. Introduction to probability distributions

Common parametric families of discrete and continuous random variables

Mean and expectation

Role of independence

Central limit theorem

### 4. Estimation techniques

Method of moments

Likelihood

Efficiency and sufficiency (?)

### 5. Hypothesis testing and goodness of fit

Logic of hypothesis testing - types of errors, power, P-values

Likelihood ratio tests

### 6. Two sample methods

t-procedures

Mann-Whitney test

### 7. Multiple sample methods

Analysis of variance

8. Linear regression

Correlation

Least squares

Parameter estimation

9. Categorical data

Fisher's exact test

Chi-square tests

10. Bootstrap

11. Bayesian approaches