

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