Semester course: STAT 6801 -- 4 semester hours

1. Transcript Abbreviation: (maximum 18 characters)

STATISTICAL THRY 1

2. Long course title

Statistical Theory I

3. Course description: (maximum of 250 characters)

Introduction to probability, random variables, distribution theory and principles of inference. Intended primarily for students in the PhD program in Statistics or Biostatistics.

4. Prerequisites / Co-requisites (use quarter and semester codes):

Graduate Standing in Statistics or Biostatistics, or written permission of the instructor

5. Exclusions (use quarter and semester codes):

Not open to students with credit for 610 (6301 under semesters).

6. A list of topics that make up the course: (One per line, max of 15 topics -- if you course description is a list of topics, I can just use that list)

1  Sample space, probability measures, combinatorial methods
2  Conditional probability, Bayes’ Theorem, independence
3  Random variables, distribution function, probability density function
4  Expectation, mean, variance, higher moments, moment generating function
5  Discrete distributions
6  Continuous distributions
7  Exponential families, location-scale families
8  Random vectors, marginal distributions, conditional distributions
9  Random samples, sampling distributions
10  Convergence concepts
11  Sufficiency
12  The likelihood principle

7. Does your class have a component that is not just a lecture (YES/NO):

NO

8. If your course is not a straight conversion and adds or removes material, write a brief rationale for the change (one sentence - max 250 characters).

Stat 6801-6802 is a straight conversion of the year-long sequence Stat 620-621-622.
Semester course: STAT 6802 -- 4 semester hours

1. Transcript Abbreviation: (maximum 18 characters)

STATISTICAL THRY 2

2. Long course title

Statistical Theory II

3. Course description: (maximum of 250 characters)

Introduction to statistical inference: Estimation, hypothesis testing, confidence intervals, and decision theory. Intended primarily for students in the PhD program in Statistics or Biostatistics.

4. Prerequisites / Co-requisites (use quarter and semester codes):

STAT 6801 or written permission of the instructor

5. Exclusions (use quarter and semester codes):

None.

6. A list of topics that make up the course: (One per line, max of 15 topics -- if you course description is a list of topics, I can just use that list)

1. Method of moments, minimum variance unbiased estimation
2. Maximum likelihood estimation
3. Efficiency, comparison of estimators
4. Bayesian estimation
5. Decision theory
6. Fisherian testing
7. Neyman-Pearson lemma, most powerful tests
8. Interval estimation, confidence intervals, posterior probability intervals
9. Asymptotics

7. Does your class have a component that is not just a lecture (YES/NO):

NO

8. If your course is not a straight conversion and adds or removes material, write a brief rationale for the change (one sentence - max 250 characters).

Stat 6801-6802 is a straight conversion of the year-long sequence Stat 620-621-622.
The year 1 theory sequence will cover material at the level of Casella and Berger.

The table of contents appears below (subsections omitted, typos mine). Currently, chapters 1 through 5 are covered in 620, 6 and 7 in 621, and 8 through 10 in 622. The transition to semesters will allow us to rethink where the break occurs. Those who have taught 620 recently (including me) think that the material has to be rushed to cover it in one quarter. The proposed split would be Semester 1 - Chapters 1 - 6; Semester 2 - Chapters 7 through 10.

1. Probability Theory
   1.1 Set Theory
   1.2 Basics of Probability Theory
   1.3 Conditional Probability and Independence
   1.4 Random Variables
   1.5 Distribution Functions
   1.6 Density and Mass Functions

2. Transformations and Expectations
   2.1 Distributions of Functions of a Random Variable
   2.2 Expected Values
   2.3 Moments and Moment Generating Functions
   2.4 Differentiating Under an Integral Sign

3. Common Families of Distributions
   3.1 Introduction
   3.2 Discrete Distributions
   3.3 Continuous Distributions
   3.4 Exponential Families
   3.5 Location and Scale Families
   3.6 Inequalities and Identities

4. Multiple Random Variables
   4.1 Joint and Marginal Distributions
   4.2 Conditional Distributions and Independence
   4.3 Bivariate Transformations
   4.4 Hierarchical Models and Mixture Distributions
   4.5 Covariance and Correlation
   4.6 Multivariate Distributions
   4.7 Inequalities

5. Properties of a Random Sample
   5.1 Basic Concepts of Random Samples
   5.2 Sums of Random Variables from a Random Sample
   5.3 Sampling from the Normal Distribution
   5.4 Order Statistics
   5.5 Convergence Concepts
5.6 Generating a Random Sample

6. Principles of Data Reduction
   6.1 Introduction
   6.2 The Sufficiency Principle
   6.3 The Likelihood Principle
   6.4 The Equivariance Principle

7. Point Estimation
   7.1 Introduction
   7.2 Methods of Finding Estimators
   7.3 Methods of Evaluating Estimators

8. Hypothesis Testing
   8.1 Introduction
   8.2 Methods of Finding Tests
   8.3 Methods of Evaluating Tests

9. Interval Estimation
   9.1 Introduction
   9.2 Methods of Finding Interval Estimators
   9.3 Methods of Evaluating Interval Estimators

10. Asymptotic Evaluations
    10.1 Point Estimation
    10.2 Robustness
    10.3 Hypothesis Testing
    10.4 Interval Estimation

11 Analysis of Variance and Regression
    (sections omitted)

12 Regression Models
    (sections omitted)