Semester course: STAT 6910 -- 4 CREDIT HOURS

1. Transcript Abbreviation: (maximum 18 characters)
   Appl Statist 1

2. Long course title
   Applied Statistics I

3. Course description: (maximum of 250 characters)
   One and two-sample problems, randomization-based inference, contingency tables, analysis of variance, the mixed model, experimental designs. Intended primarily for students in the PhD program in Statistics or Biostatistics.

4. Prerequisites / Co-requisites (use quarter and semester codes):
   Concurrent registration in Stat 6801, or written permission of the instructor

5. Exclusions (use quarter and semester codes):
   Not open to students with credit for Stat 641 (Stat 6410 under semesters)

6. A list of topics that make up the course: (One per line, max of 15 topics -- if your course description is a list of topics, I can just use that list)
   1 One-sample problem
   2 Two-sample problem
   3 Randomization-based inference
   4 Goodness of fit
   5 Two-way contingency tables
   6 One-way analysis of variance
   7 Two-way (and up) analysis of variance
   8 Random effects
   9 The mixed model
   10 Block designs
   11 Fractional factorial experiments

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).

   The conversion splits our own PhD students (into this course) from the general audience; the course will move faster, covering more material at a greater depth.
Semester 1: Precursors and Experimental Design

Precursors
- The one-sample problem (summarization, t-test, t-based confidence interval)
- The two-sample problem (pooled t, non-pooled t procedures, power and sample size)
- Transformations to set up the test/confidence interval/inference
- Randomization tests (sign test, mean-based test, rank sum test)

Small tables
- Chi-square test for goodness of fit
- Tests for independence in a two-way table (chi-square, Fisher's exact test)
- Tests for independence in an r x c table

One-way ANOVA
- Principles of running experiments
- Completely randomized design
- Inference - F-test, contrasts, multiple comparisons
- Checking assumptions, fixing violations
- Sequences of models
- Sample size calculations

Two-way (and up) ANOVA (fixed effects)
- The model (additive, with interaction)
- Interpreting the model
- Estimation and inference (with replication)
- Single replicate experiments

Random effects and the mixed model
- Block designs
- Randomized block design and analysis
- Incomplete block design (balanced, unbalanced)
- Latin squares
- The mixed model
- Expected mean squares / randomization theory
- Pseudo-replication and random effects
- Sample size calculations

Factorial experiments
- Fractional factorial designs, confounding, split-plot designs

Analysis of covariance
Extra bits: Students will begin to pick up computing during this course. For now, the natural package to use is R. Core computational knowledge by the end of the semester would be the ability to write a function in R and use it, and to conduct a modest simulation study. If possible, retention of the current course project (design, conduct, analyze experiment) to expose students to a "non-textbook" example, and to encourage them to write.