Semester course: STAT 6950 -- 4 CREDIT HOURS

1. Transcript Abbreviation: (maximum 18 characters)
   Appl Statist 2

2. Long course title
   Applied Statistics II

3. Course description: (maximum of 250 characters)
   Simple and multiple linear regression, diagnostics, model selection, the mixed model, and generalized linear models. Intended primarily for students in the PhD program in Statistics or Biostatistics.

4. Prerequisites / Co-requisites (use quarter and semester codes):
   Stat 620 (Stat 6801 under semesters) and Stat 641 (Stat 6910 under semesters), or written permission of the instructor

5. Exclusions (use quarter and semester codes):
   Not open to students with credit for Stat 645 (Stat 6450 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 Simple linear regression
   2 Fitting the simple linear regression model
   3 Statistical inference for regression
   4 Diagnostics
   5 Multiple linear regression
   6 Model building and model selection
   7 Iteratively reweighted least squares
   8 Robust regression
   9 Mixed effects regression
   10 The generalized linear model

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 2: Regression

Simple linear regression
- Description of the model
- Fitting the model
- Properties of estimators; inference
- Model diagnostics (including outliers, leverage, and case-influence)
- Transformations (including Box-Cox)
- Nonconstant variance/weighted least squares

Multiple linear regression
- Description of the model, scope of the model
- Fitting the model
- Properties of estimators; inference
- Multicollinearity, variance inflation factors
- Model diagnostics

Model selection/variable selection
- Full vs. reduced model comparison
- Model building (mechanistic)
- Model building (empirical, subjective)
- Model building (information criteria)
- Regularization methods
- Model averaging and prediction

Robust regression
- Downweighting the tails (Huber's robust regression)
- Fitting procedure (iteratively reweighted least squares)
- Properties of estimators; inference

Mixed-effects regression models
- Random intercepts, random slopes
- Properties of estimators; inference
- Autocorrelation amongst the errors (simple setting)
- Properties of estimators; inference

Generalized linear model
- Non-Gaussian responses and the mean-variance tie-in (Bernoulli, Poisson)
- The link function
- Fitting procedure (iteratively reweighted least squares)
- Diagnostics (including random effects/overdispersion)
Audience: The audience is our own first-year PhD students. With this in mind, full use will be made of matrix notation. The book must be replaced--see, for example, Section 3.3 on Diagnostics for Residuals.