- **Course Code and Title:**
  STAT 812: Computational Statistics

- **Students in what programs might be interested in this course?**
  Statistics, Biostatistics, Mathematics, SPH, Epidemiology, Computer Science, Engineering

- **Schedule:**
  TR 10:00 AM - 11:20 AM, McLean Hall 242.1

- **Tentative List of Topics:**
  - Chapter 1: Single-level regression (linear regression, GLM, logistic regression)
  - Chapter 2: Optimization and solving nonlinear equations (includes nonlinear regression)
  - Chapter 3: EM optimization method
  - Chapter 4: Simulation and Monte Carlo integration
  - Chapter 5: Bayesian inference and MCMC
  - Chapter 6: Multilevel regression
  - Chapter 7: An Introduction to Statistical Learning (time permitting).

- **Learning Outcomes:**
  This course will provide a systematic treatment of modern computational statistics. It emphasizes the role of computation as a fundamental tool of discovery in data analysis. On successful completion of the course, you will be a competent R user with skills that adapt readily to other statistical software packages. Students who successfully complete this course will be able to:
  - fit, understand and graph classical regressions and generalized linear models;
  - use regression to learn about quantities of substantive interest;
  - implement optimization techniques for nonlinear equations;
  - implement EM optimization methods for missing data problems;
  - simulate random numbers to estimate some functional of a probability distribution (i.e., Monte Carlo experimentation);
  - carry out Bayesian inference, and use Hamiltonian Monte Carlo techniques for Bayesian analysis (implements full Bayesian statistical inference using the R package “rstan”);
  - understand, graph and fit multilevel models using R and STAN.