

PH.140.751 - Advanced Methods in Biostatistics I

Instructor:

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Course Schedule:

This class consists of two lectures per week during the first quarter of the JHSPH academic year. Lectures are held on Tuesdays and Thursdays between 10:30 - 11:50am in W2033 (615 N. Wolfe Street).

Prerequisites:

140.673-674 & elementary course in matrix algebra; students must also register for the follow-up course 140.752.

Course Description:

Introduces students to applied statistics for biomedical sciences, with a particular focus on linear models. Requires students to present results in both written and oral form, which in turn requires them to learn the software package R.

Materials:

There is no textbook, but notes will be provided online. There are also many excellent books on this subject that can be used as reference, including "*Linear Statistical Inference and its Applications*", by C. R. Rao, "*Linear Models*", by S. R. Searle, "*Theory and Application of the Linear Model*", by F. A. Graybill, "*Plain Answers to Complex Questions: The Theory of Linear Models*", by R. Christiansen, and "*Linear Models with R*", by J. Faraway.

Analysis Software:

We will be using the statistical software package R, which is freely available at <https://www.r-project.org>.

Homework:

There will be four homework sets. Students will be encouraged to work together on homework sets. However, submitted work must be written and completed by each student separately.

Evaluation:

Students will be evaluated by homework and a final exam. Class grading will consist of homework (50%) and final exam (50%).

Tentative course topics:

1. Background
2. Linear Models and Least Squares
3. Single Variable Regression
4. Simple Linear Regression
5. Multivariate Least Squares
6. Multivariate Moments
7. Moment Properties of Least Squares Estimates
8. Partitioning Variability
9. Multivariate Normal Distribution
10. Normal Errors and Likelihood under Gaussian Assumptions
11. Distributional Properties of Estimates under Gaussian Assumptions