

## 00101756: Modern Statistical Modeling Spring 2023

**Lectures:** Fridays 10:10 am–12 noon and even Tuesdays 1:00–2:50 pm, 306 Classroom Building 3

**Instructor:** Wei Lin (weilin@math.pku.edu.cn)

*Office hours:* Mondays 10:00–11:30 am, 1547 Science Building 1

**Teaching Assistants:** Qingyuan Zheng (zhengqingyuan@pku.edu.cn)

*Office hours:* Fridays 2:00–4:00 pm, 118 Building 21

### Course Description:

This course deals with a variety of statistical models and methods that generalize classical linear regression to include many others that have been found useful in statistical analysis and applications. We will first review key concepts in linear regression, expand the scope in depth to generalized linear models, and then head for several important directions: linear and generalized linear mixed models, generalized estimating equations, nonparametric regression and generalized additive models, survival analysis, and neural networks (if time permits). The course is a mixture of theory and applications and includes lab exercises featuring R programming.

### References:

1. Efron, B. (2023). *Exponential Families in Theory and Practice*. Cambridge University Press.
2. Rao, C. R., Toutenburg, H., Shalabh and Heumann, C. (2008). *Linear Models and Generalizations: Least Squares and Alternatives* (3rd ed.). Springer.
3. McCullagh, P. and Nelder, J. A. (1989). *Generalized Linear Models* (2nd ed.). Chapman and Hall/CRC.
4. Diggle, P. J., Heagerty, P., Liang, K.-Y. and Zeger, S. L. (2002). *Analysis of Longitudinal Data* (2nd ed.). Oxford University Press.
5. Agresti, A. (2013). *Categorical Data Analysis* (3rd ed.). Wiley.
6. Wasserman, L. (2006). *All of Nonparametric Statistics*. Springer.
7. Györfi, L., Kohler, M., Krzyżak, A. and Walk, H. (2002). *A Distribution-Free Theory of Nonparametric Regression*. Springer.
8. Fan, J. and Gijbels, I. (1996). *Local Polynomial Modelling and Its Applications*. Chapman and Hall/CRC.
9. Hastie, T. J. and Tibshirani, R. J. (1990). *Generalized Additive Models*. Chapman and Hall/CRC.
10. Faraway, J. J. (2014). *Linear Models with R* (2nd ed.). Chapman and Hall/CRC.
11. Faraway, J. J. (2016). *Extending the Linear Models with R: Generalized Linear, Mixed Effects and Nonparametric Regression Models* (2nd ed.). Chapman and Hall/CRC.

### Homework:

There will be several homework and lab assignments due in class. If you missed the class, contact the TA to turn in your homework by the end of the day. No late homework will be accepted.

### Exam:

There will be a closed-book final exam in the exam weeks.

### Grading:

The course grade breaks down as follows: homework and lab assignments 50%, final exam 50%.

### Website:

Lecture topics and homework and lab assignments will be posted on the course website at <http://www.math.pku.edu.cn/teachers/linw/1756s23.html>.