

**Fariborz Maseeh Department of Mathematics & Statistics
PORTLAND STATE UNIVERSITY
WINTER TERM 2014**

6. January through 14. March
STAT 578 Survival Analysis
CRN: 43616
BSTA 514

T & R 14:00–15:15 CH 400A

Instructor: Professor M. Tableman
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Office Hours:

T & R 13:00–13:50 and 18:00–18:30 & by appointment.

Course prerequisites:

1. A standard pre-calculus course in probability & statistics.
2. A course in applied linear regression models.
3. Calculus is useful, but not necessary.

Textbook: Tableman, M. & Kim, J.S. (2004). *Survival Analysis Using S: Analysis of Time-to-Event Data*. Boca Raton: Chapman & Hall/CRC.

Reference Reading:

1. Hosmer, D.W. & Lemeshow, S. (1999). *Applied Survival Analysis: Regression Modeling of Time to Event Data*. New York: Wiley.
2. Kalbfleisch, J.D. & Prentice, R.L. (2002). *The Statistical Analysis of Failure Time Data, 2nd Edition*. New York: Wiley.
3. Klein, J.P. & Moeschberger, M.L. (2003). *Survival Analysis: Techniques for Censored and Truncated Data, Second Edition*. New York: Springer.
4. Miller, R.G. (1981). *Survival Analysis*. New York: Wiley
5. Venables, W.N. and Ripley, B.D. (2002). *Modern Applied Statistics with S, Fourth Edition*. Springer.

Tools A calculator: either TI-84 Plus or TI-89.

Course Requirements:

1. Take-Home Assignments which incorporate the statistical software R (40%).
2. Midterm (30%): Thursday, February 13. But subject to change.
3. Final Exam (30%): Take-home .

4. Statistical computation with R is required.

Course Description:

The primary purpose of a survival analysis is to model and analyze time-to-event data; that is, data that have as a principal endpoint the length of time for an event to occur. Such events are generally referred to as “failures”. Some examples are time until an electrical component fails, time to first recurrence of a tumor (i.e., length of remission) after initial treatment, time to death, time to the learning of a skill, and promotion times for employees.

In these examples we can see that it is possible that a “failure” time will not be observed either by deliberate design or due to random censoring. This occurs, for example, if a patient is still alive at the end of a clinical trial period or has moved away. The necessity of obtaining methods of analysis that accommodate censoring is the primary reason for developing specialized models and procedures for failure time data. **Survival analysis is the modern name given to the collection of statistical procedures which accommodate time-to-event censored data.** Prior to these new procedures, incomplete data were treated as missing data and omitted from the analysis. This resulted in the loss of the partial information obtained and in introducing serious systematic error (bias) in estimated quantities. This, of course, lowers the efficacy of the study. The procedures discussed here avoid bias and are more powerful as they utilize the partial information available on a subject or item.

This course introduces the field of survival analysis without getting too embroiled in the theoretical technicalities. **Models for failure times describe either the survivor function or hazard rate and their dependence on explanatory variables.** Presented here are some frequently used parametric models and methods, including accelerated failure time models; and the newer nonparametric procedures which include the Kaplan-Meier estimate of survival and the Cox proportional hazards regression model. The statistical tools treated are applicable to data from medical clinical trials, public health, epidemiology, engineering, economics, psychology, and demography as well.

Course Syllabus:

Chapters 1, 2, 3, 4, 5, 6, and if time allows, Section 7.1 of Chapter 7.

NOTES:

1. The R language is the free S and is available to the public for download at www.r-project.org. You want to download the newest version.
2. All data sets discussed in textbook are contained in the zip file `Datasets.zip`.
3. All author-written S functions used in the book have been rewritten to run in both R. The functions are contained in the R file called `TK.R.functions.R`.

Both files, `Datasets.zip` and `TK.R.functions.R`, are downloadable from my personal webpage. The link is titled Materials to use with Survival Analysis textbook and is at the bottom left of my webpage.

4. Class lectures are delivered via overhead slides. These will be available for download from my personal webpage at least one day prior to class.