

MS Course textbook

(The attached PDF file has better formatting.)

The textbook for the course is *Modern Mathematical Statistics with Applications* by Jay L. Devore, Kenneth N. Berk, and Matthew A. Carlton, 3<sup>rd</sup> edition (Springer Texts in Statistics, New York 2021), 2<sup>nd</sup> edition (2011) or 1<sup>st</sup> edition (2007). All three editions may be used for this course; the material is the same, though the third edition has somewhat clearer exposition and more end of chapter exercises.

The textbook balances real-world practicability with mathematical rigor. It assumes competency in calculus and probability, but it focuses on understanding of statistical concepts, not just on the mathematical proofs. It uses examples drawn primarily from life sciences (ecology, medicine, genetics) and social sciences (public opinion, marketing, politics).

- ! The second edition of the Devore text is on the discussion forum, attached to this posting.
- ! The third edition of the Devore text may be bought from Amazon or other booksellers.

The last two modules of this course apply the statistical methods to actuarial pricing and risk classification. The required readings are on the discussion forum.

No statistical software is required for the course, but you will master the material quicker if you reproduce the examples on a spread-sheet or other computer package. As you work through this course, check your work with spread-sheets (Excel), statistical packages, or internet sites.

Excel has built-in cumulative distribution functions for the normal distribution,  $t$  distribution,  $F$  distribution, and most other distributions used in this course. The Analysis ToolPak add-in for Excel reproduces several of the analyses ( $t$  tests, ANOVA, regression analysis) in the textbook. (The add-in comes with the Excel package.)

Read the Microsoft instructions: "Use the Analysis ToolPak to perform complex data analysis":

<https://support.office.com/en-us/article/use-the-analysis-toolpak-to-perform-complex-data-analysis-6c67ccf0-f4a9-487c-8dec-bdb5a2cefab6>

Excel Easy explains the Analysis ToolPak on <http://www.excel-easy.com/data-analysis/analysis-toolpak.html>

The mathematical statistics course assumes basic knowledge of probability. Only the statistics material in the textbook is tested on the final exam.

Several distributions are used in the statistics sections: the normal distribution,  $t$  distribution,  $\chi^2$  distribution,  $F$  distribution, binomial distribution, Poisson distribution, logit distribution, and uniform distribution. Know the shape and attributes of these distributions; they are not tested directly on the final exam, but they affect the normal probability plots. For example, probability plots (quantile comparison plots), which are tested on the final exam, depend on the shape of the distribution being compared to the normal distribution.

The mathematical statistics course assumes knowledge of the probability density function and the cumulative distribution function. The textbook also covers the moment generating function, which is not tested on the final exam and is not needed for this course.