

**STOR 754, SPRING 2019**  
**TIME SERIES AND MULTIVARIATE ANALYSIS**  
**Instructor: Richard L. Smith**

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This course is on Tuesdays and Thursdays, 12:30-2:15 pm.

Location: Hanes 130

Instructor: Richard L. Smith, Hanes 303. Telephone 962-2660; email  
rls *at* email.unc.edu

Office hours: Mondays 1:00-3:30; Wednesdays 1:00-3:00.

Instructional Assistant: N/A

Course webpage: <https://rls.sites.oasis.unc.edu/s754-2019/s754.html>

The course STOR 754 is one of the Statistics program's "B-level" courses. Students in the Statistics program will have already taken the first-year or "A-level" courses. Students from other programs are welcome to take the course provided they have had roughly the following background: a graduate-level course in regression and linear models equivalent to STOR 664; and some exposure to graduate-level statistical theory at the level of the STOR 654/655. If in doubt, please email the instructor.

**Required** text: *Time Series: Theory and Methods* (Springer Series in Statistics) by Peter J. Brockwell, Richard A. Davis

**Recommended** text: *Multivariate Analysis* (Probability and Mathematical Statistics) (Paperback) by K.V. Mardia, J.T. Kent and J.M. Bibby.

These will be supplemented by the instructor's own course notes, posted on the course website.

Class announcements, homework assignments and any changes in schedule will be posted on this website and/or the sakai course page.

The first class is on Thursday, January 10 and the last class is on Thursday, April 25. There will be no class March 12 or 14 because of Spring Break. The final exam is fixed by the University Registrar for **Friday, May 3 at noon**. There is a possibility that I may decide to replace the final exam by a take-home final, but unless announced otherwise, please assume that is the time of the final exam and do not schedule any activities for yourself that are in conflict with that.

In addition to the final exam, there will be homeworks at roughly two-week intervals, and a midterm exam. The midterm is tentatively scheduled for **Thursday, February**

28 ; however, I have more flexibility to change that than I do for the final exam, so please let me know if you foresee any conflict at that time.

**Topics, Time series:** Stationary processes; autocovariances, spectral density, linear process, ARMA. Estimation, time and spectral domain methods. Prediction.

**Topics, Multivariate analysis:** Basic theory of the multivariate normal and Wishart distributions. Principal components, canonical correlations, factor analysis, cluster analysis.

Other topics that may be covered as time permits: Multivariate time series, state space models, long-range dependence, dimension-reduction techniques in multivariate analysis.

**Software:** The Brockwell-Davis book includes an excellent self-contained (and very user-friendly) time series package called ITSM, and part of the time we will use that. However, R also includes extensive facilities for both time series and multivariate analysis, so we will use that as well. No previous knowledge of ITSM is needed; some previous exposure to R is desirable but not essential. If you don't know R already you can download it from <http://www.r-project.org>. The course notes include programs in S-PLUS, but where necessary, we will update these to run in R. S-PLUS will not be used in this course.

You are reminded that the university Honor Code is in effect for this course. For homework assignments, you are allowed to discuss the problems among yourselves, but the work you hand in must be your own; direct copying is not permitted. For exams, whether in-class or take-home, you are expected to work the problems entirely by yourselves and consultation of any kind is forbidden, unless it is with me or the Instructional Assistant (if we have one).