Syllabus – STOR 655

Spring 2020 (January 8 – April 24)
TuTh 9:30 – 10:45am
Hanes 130

Instructor:	Jan Hannig	**Phone:** (919) 962-7511	
Office:	330 Hanes	**E-mail:** jan.hannig@unc.edu	
Office Hours:	MW 12:30 – 1:30PM	**Course home page on**	
	and by appointment	https://hannig.cloudapps.unc.edu/STOR655	
TA:	Stephanie Lin	**TA's E-mail:** tzlin@live.unc.edu	
TA Office:	Hanes B7	**TA's Office Hour:** W 2-3PM	

Target Audience: First year Ph.D. students in the Department of Statistics and Operations Research who have successfully completed STOR654 and STOR634.

Required Text: Ferguson, *A course in large sample theory*, CRC Press, ISBN 041204371-8

Optional Texts: Casella and Berger: *Statistical Inference*, Duxbury 2/e,
Bickel and Doksum, *Mathematical Statistics, Vol 1*, 2/e, Prentice Hall
A. W. van der Vaart, *Asymptotic statistics*, Cambridge University Press
Mood, Graybill, Boas, *Introduction to the Theory of Statistics*

Course Objective This is a second theoretical course in mathematical statistics. We will continue where STPR654 has left off. The covered topics will multiple testing procedures, multivariate normal distribution, asymptotic statistics and additional topics.

Course Format: Traditional lecture

Assessment: Your grade will be based on a midterm exam (40% of the grade), a final exam (50% of the grade) and weekly homework sets (10% of the grade). The instructor might also assign "extra credit problems" from time to time.

Important dates:

Final Exam: Friday, May 1, 8:00 – 11:00 AM
(see the published university schedule)

Midterm exam: Thursday, February 27.

Homework: Homework sets will be usually assigned on Thursday and due Thursday next week at the beginning of the class. Late/missed homework will receive a grade of zero. Students are welcome to discuss the homework problems with other members of the class, but should prepare their final answers on their own.

Course Outline:

1. Combination of p-values
2. Multiple testing adjustment (Bonferroni, Benjamini-Hochberg)
3. Convergence in probability
    a. Definition
    b. Continuous and uniformly continuous functions
    c. Closure properties of in-probability convergence[*]
    d. Weak law of large numbers
4. Convergence in distribution
    a. Definition (using expectations of bounded continuous functions)
    b. Connections with convergence in probability
    c. Continuous mapping theorem / Slutsky's theorem
    d. The delta method
5. Basic asymptotic theory
    a. Consistency of MLE
    b. Asymptotic normality of MLE
    c. Asymptotic efficiency of MLE
    d. Asymptotic distributions of LR test statistics
    e. chi^2 goodness of fit tests
6. Other / Special Topics (time permitting)
    a. Projections and U-Statistics
    b. Asymptotic properties of Bayesian Posterior
    c. Bootstrap
    d. Lower bounds

Note: The instructor reserves the right to make any changes he considers academically advisable. It is your responsibility to attend classes and keep track of the proceedings.