Math 5080–2019/20 Fall (Day section)

Textbook: Introduction to Probability and Mathematical Statistics
by L. Bain and M. Engelhardt, Second Ed. (or first ed.)

Instructor: Lajos Horváth (e-mail: horvath@math.utah.edu)
Time and place of the class: M/W/F 10:45 pm–11:35 pm LCB 225 Prereq: Math 5010 (Introduction to Probability Theory)
Office hour: Monday 1:00 pm–2:00 pm JWB 222 (or by appointment)

Quizes: August 26
September 4, 9, 16, 23, 30
October 21, 28
November 4, 11, 18, 25

Midterms: October 2 (50 minutes)
December 2 (50 minutes)

Final: December 9, 10:30 am-12:30 pm (120 minutes)

Discussion sections: September 30
November 25
(time and place to be announced)

Computation of the final grade: Quizzes: 10%
Midterm 1: 25%
Midterm 2: 25%
Final : 40%

A : 95–100 C : 64–68
B+ : 84–88 D+ : 54–58
B : 79–83 D : 44–53
C+ : 69–73 E : 0–28

Rules for exams (quizzes/midterms/final) Books, notes, phones, tablets, computers cannot be used. They cannot be taken out during the exams. You can use calculator only (no phones/tablets/PC’s with that feature). I provide papers and tables, you need to bring pen or pencil only. You must cross out everything which is not part of your final answer. If you leave the classroom during the exam, you are not allowed to return and continue the exam. Medical condition is an exception but I need a note from your physician. If you write the exam in the testing center, you need to start the exam while the class is still working on the problems.

Homework: Chapter 6 (pp. 226–230):
1, 2, 3, 4, 10, 13, 14, 15, 16, 17, 18, 21, 23, 25, 29, 31, 35
Chapter 7 (pp. 259–262):
Please note that the homework will not be collected. However, you are supposed to work on them and the some of the quizzes will be based on them. The homework problems will not be solved in the classroom. If you cannot solve them or you are not sure that you are doing the right thing, come to see me. If you have any questions concerning any material discussed in the class, please talk to me. If you want some extra material to practice, I can provide all quizzes and/or tests. Just let me know. If you struggle in the class, or you have any concern, talk to me and hopefully we can find a solution. If not, Professor Nate Smale, Associate Chair can help you.

Topics to be covered

- **Review of probability theory**—distribution and density functions, expected value, moments, conditional distribution and expected value, famous distributions and their basic properties (exponential, Gamma, normal, uniform, binomial and Poisson)

- **Functions of random variables**—the cumulative distribution function technique, computation of the density in the univariate and multivariate case, independence of random variables, sums of independent random variables (convolution formula, the moment generating function and characteristic function techniques, order statistics, distribution of the order statistics including the largest and smallest observations

- **Limit theorems**—definitions of convergence in probability and distribution, connection between different type of convergence, basic properties of convergence, Slutsky’s lemma, the central limit theorem, approximation with Poisson distribution, limits of middle order statistics, convergence of the largest and smallest observations

- **Distributions derived from normal**—$\chi^2$, t- and F-distributions, derivation of their densities, degrees of freedom, sampling distributions from normal populations, independence of the sample mean and variance in normal populations, large sample approximations for $\chi^2$ and $t$-distributions

- **Point estimation**—method os moments, least squares, likelihood method (regular and non regular cases), evaluating estimators, bias, mean squared error, efficiency, Cramér–Rao inequality, information number, limit results for maximum likelihood estimators in the regular case

- **Sufficiency and completeness**—conditional expected value as a random variable, basic properties of the conditional expected value, uniformly minimum variance
unbiased estimator, sufficient statistics, factorization theorem, completeness, exponential class, completeness of the largest and smallest observations, Rao–Blackwell theorem, Lehmann–Scheffe theorem

Notes from the University of Utah and the Department of Mathematics

• The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu <https://safeu.utah.edu/>.

• The website http://www.math.utah.edu provides useful information for graduates as well as for undergraduates.

• The website https://www.utah.edu/nondiscrimination/ contains information on Nondiscrimination & Accessibility.