PRINCIPLES OF PROBABILITY QA 731 * 4 credit hours
Tuesday, Thursday – 4:00-5:45 PM

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Office Hours: My office hours are 3:00 – 4:00 Tuesday and Thursday, and by appointment. Office hours provide you with an opportunity for personal discussion with me concerning course-related problems such as homework, clarification of classroom discussion, test grading etc. If the formal hours are unsuitable for you, please make an appointment with me at a mutually agreeable time. I strongly urge you to take advantage of these hours.

Tests: There will be one midterm exam. This will likely be a take-home on the sixth week of class, but I may change my mind on this issue. If it is an in-class test, it will be given on an evening from 6:00 – 8:40 PM on the sixth week of the course in a classroom to be announced. The comprehensive final will be given as scheduled by the university and will very likely be a take-home exam. If you are forced to miss the midterm for a documented reason beyond your own control, the final exam score will be substituted for the missing midterm exam score. If, for a similar reason, you are forced to delay submitting the completed copy, in the case of a take-home, a special arrangement with me must be made. In all cases, I will be the judge of the severity and validity of the excuse. If this protocol is not followed, the midterm score will be counted as zero. You must contact either the QAOM department administrative assistant or me before missing or delaying submission of the midterm (or final). Otherwise, the exam score will be counted as zero.

Class Communication: Every student will obtain a ***Blackboard*** account by going to http://blackboard.uc.edu/ on the INTENET. This is mandatory. We will use Blackboard to communicate. The student is responsible for all communications sent by the instructor using email via Blackboard. Therefore, students must check to see if their accounts have reached maximum capacity or are otherwise not functioning, and to correct this situation.

Class Notes: The class notes will be made available to you in electronic format. I am always revising the class notes, and I will announce changes as I make them. The topics I will cover will not be in exact one-to-one correspondence with the topics in the text. Nor will they be in the same order. I will post the notes on my Blackboard site, in .pdf format. You may read these documents by obtaining the freeware Adobe Reader. You may print out a copy of the notes if you wish.

Homework: Textbook practice problems are indicated elsewhere in this syllabus. Some other assignments (I call them quizzes), perhaps covering material not covered in the text will also be given. These will be collected and graded. You are expected to complete a textbook practice problem, corresponding to a day's lecture, within one week of that lecture. Assignments to be collected (quizzes) will have a due date to which you must conform. Except under exceptional circumstances, as judged by me, no late assignments will be graded. You are urged to collaborate in a responsible manner when attempting the textbook practice problems, i.e. carrying your own weight in any cooperative arrangement. My version of the "solutions" to collected assignments will be available in my office for your perusal. A solution set to the textbook practice problem assignments will also be posted on *Blackboard*. The solutions seem to be in a semi-coherent order, and there is a good reason for that, based upon the change in editions of the text. You will need to be nimble in finding the solution to a problem that you seek, but I will help you by providing a "key" that was prepared by a former student of mine. You are responsible for

keeping current in the reading from the textbook. Both the practice problems and quizzes may be approached using the Group-Work concept described in the section below.

Group-Work Structure of the Course: I firmly believe that student cooperation and knowledge exchange can enhance learning in a course such as this. Thus, after the first class, each student **may elect** to join a work group. A work group will consist of at least two students, but no more than six. This work group should optimally be maintained for the length of the quarter. The work group should cooperate in all work given during the quarter including practice problems, studying, research project (defined below) and quizzes. All members of a group will share grades on any submitted and/or presented work. One quiz, exam, and project paper is to be submitted in behalf of all members of a work group, and the names of the members of that group should be clearly indicated on the front page. All members are to contribute equitably to the shared workload, carrying a fair weight for the burden. At the end of the quarter, members of each group will be asked to evaluate the contribution of the other work group peers on the basis of a number of criteria taking into consideration such factors as intellectual contribution, attendance at group meetings, mentoring and sharing knowledge, writing up the results, and performing relevant computations. The peer score will reflect, in some sense, an average over all of the work assigned as well as an average of the criterion above. Thus, a student in a work group who may have contributed much on one assignment, may not have contributed the majority of the work on another, yet still such work may be considered by other members to be meritorious "on the average". A copy of the intragroup evaluation form will be posted in the Final Exam folder on Blackboard.

Grading: The midterm exam will be worth 35% of the final grade. The final exam will be worth 40% of the final grade. Exam scores will be adjusted so that a "100-90-80-70-etc." scheme for the corresponding letter grade equivalents "A-B-C-D-F" is appropriate. The collected problems that are graded will account for 15% of the final grade. The remaining 10% will be based upon other "intangible" sources that reflect "attitude" such as class participation and my personal impressions.

Miscellaneous: The grade of "Incomplete" will be given only for fully documented medical conditions or other catastrophes as judged by me. You may drop the course without penalty up to the Friday of the eighth week of class. No special exams or assignments will be given at quarter's end for grade improvement. Students are responsible for all material, assignments and announcements made in class whether or not they attended the class. All exams must be strictly personal efforts. No collaboration is permitted on take-home exams either. You are expected to bring a working hand-held calculator to in-class exams. In-class exams may be open-book, open-notes type exams or they may permit the exclusive use of personally prepared fact sheets. In either case, I will inform you of the format for the exam at least two week prior to that exam. Where required, all work must be shown. No work=no credit. Solely I will determine partial credit. Of course you may discuss the basis of your grade with me but this discussion must take place in private and not in open class. Keep all graded exams and assignments. The final exam will remain in my possession for two quarters. I regard a student's attitude and interest to be a very important component in evaluation and I reserve the right to raise a grade based upon my impression. You are strongly urged to suggest any improvements in the teaching or classroom procedure. In case a notice of class cancellation is posted, you must remain in class for a period of ten minutes to confirm the validity of that notice.

Texts: The text will be Introduction to Mathematical Statistics, 6th Ed., by Hogg and Craig. This is a three year old edition, with major changes from the old edition. In QA 731, we will cover most of the first four chapters, and a little of the fifth. Reference texts are Introduction to the Theory of Statistics, by

Mood, Greybill and Boes, Statistical Theory, by Lindgren, and Modern Probability Theory and its Applications, by Parzen.

AIMS AND OUTLINE: This is the first of a two-quarter sequence in which the sequel course, QA 732 is entitled STATISTICAL INFERENCE. Together the two quarters are intended to provide a complete course in Mathematical Statistics, but QA 731 can be taken as a 'stand-alone' course. QA 731 and its sequel, QA 732 have been designed to provide a solid conceptual foundation for students who require a moderately rigorous treatment of Probability and Statistical Inference as a prerequisite for course work which presumes a familiarity with this material (as in the areas of e.g. Econometrics, Quantitative Analysis, Math, or Biostatistics). The topics covered can serve to justify and complement the material traditionally covered in statistical methods and data analysis courses and should aid practitioners of data analysis extend the techniques with which they are familiar. The prerequisite for the course is a good four-quarter calculus sequence or its equivalent. Exposure to statistical methods is highly desirable but not required. The topics covered in this course should be found useful to Masters and Ph.D. students in the College of Business Administration (particularly in the areas of Finance, Marketing, Accounting, Operations Research, and Business Statistics), College of Engineering, College of Medicine (particularly in Environmental Health) and in the social sciences (particularly in Economics), especially if their potential research demands a deeper conceptual foundation then is typically provided by a Statistical Methods course. The syllabus includes the topics in the outline below:

1. Probability functions
2. Random variables
3. Distribution functions, joint distributions, and probability models
4. Moments of random variables
   -special expectations and moment generating functions
5. Conditional probability and conditional moments
6. Stochastic independence
7. Special probability distributions including: binomial, negative binomial, multinomial, Poisson, gamma, chi-square, normal, mixture distributions, bivariate normal, multivariate normal
8. Distribution of functions of random variables
   -distribution function technique, change of variables technique and moment generating function technique
   -beta, t, and F distributions
   -order statistics
9. Asymptotic distributions
10. The Central Limit Theorem, convergence in probability, Slutsky's theorem.

Incidentally, the sequel course, QA 732 will contain topics in statistical inference such as confidence intervals, Bayesian inference, efficiency, sufficiency and completeness, minimum variance unbiased estimation, maximum likelihood estimation, method-of-moments estimation, hypothesis testing, likelihood ratio method, etc. for which the topics in the Probability course are prerequisites.