Fall 2001

Math 371 – Elementary Probability Theory (3)

Sets, discrete sample spaces, problems in combinatorial probability, random variables, mathematical expectations, classical distributions, applications.

Pre: 216 or 242 or 252A or consent.

The heart of the course is contained in Chapters 5–12. Of the remaining chapters (13–18), the Law of Large Numbers (Chapter 13) and the Normal Distribution and Central Limit Theorem (Chapter 18) are most important, particularly since many of the students will also study statistics. The first four chapters are a mixture of review and informal discussion of definitions of probability. Not too much time should be spent here, in particular, the geometric definition of probability seems pretty irrelevant to the rest of the course.

Chapter 5. Definition of probability space, examples, and the simple theorems. Needs to be done in toto.

Chapter 6. Counting techniques. Only really need the multiplication principle, permutations (theorem 1), permutations with repetition (theorem 2), combinations (theorem 4), and the binomial theorem (theorem 7).

Chapter 7. Examples of counting techniques. None of us liked example 10 and we all liked examples 11 and 12 but the selection is up to the instructor.

Chapter 8. Conditional probability an independence. Very important.

Chapter 9. Examples of conditional probability and independence. Make your own selection, some of them are rather complicated.

Chapter 10. Random variables. Very important.

Chapter 11. Distributions. The binomial and hypergeometric distributions should be done but the distribution of runs and the Polya distribution can be skipped.

Chapter 12. Expectations. The material on covariances can be ignored as can the runs example but the rest should be covered.

Possible text: M. Nosal, *Basic Probability and Applications*, W. B. Saunders Co.

Course Objectives. Upon successful completion, the student will have a foundation in the basic topics of the theory of Probability listed above in the syllabus. Emphasis on rigor will provide students the understanding needed for graduate work, and in the study of the logical foundations of mathematics.

Program Objectives. Math 371 is a junior level course in Probability, an important subject with many applications in Statistics, the physical and biological sciences, and Engineering. This course promotes our goal that our students learn, understand, and be able to apply several mathematical topics at the junior and senior level, and that our students acquire the ability and skills to apply mathematics to other fields