

**UNIVERSITY OF PUERTO RICO  
RIO PIEDRAS CAMPUS  
DEPARTMENT OF MATHEMATICS**

**PROBABILITY  
M.S. QUALIFYING EXAM  
SYLLABUS**

The qualifying exam in Probability will cover the following topics:

1. The definition of probability, finite sample spaces, counting methods, combinatorial methods, multinomial coefficients. The probability of the union of events. The definition of conditional probability, independent events, Bayes' theorem.
2. Random variables and discrete distributions, continuous distributions, the distribution function, bivariate distribution, marginal distributions, conditional distributions, multivariate distributions, functions of a random variable, functions of two or more random variables.
3. The expectation of a random variable, properties of expectations, variance, moments, the mean and the median, covariance and correlation, conditional expectation, the sample mean.
4. The Bernoulli and binomial distributions, the hypergeometric distribution, the Poisson distribution, the negative binomial distribution, the normal distribution, the central limit theorem, the correction for continuity, the Gamma distribution, the Beta distribution, the multinomial distribution, the bivariate normal distribution.
5. Elements of Stochastic Processes. The Poisson Process. Connections among the Poisson, Exponential, and Uniform Distributions. The Poisson Renewal Process. Conditioning on the Poisson Distribution.

## References

1. DeGroot, M.H. and Schervish, M.J., *Probability and Statistics, Third Edition*, Addison Wesley, 2002.
2. Solomon, F., *Probability and Stochastic Processes*, Prentice-Hall, 1987.