Aim and Scope:

Urn models provide a way to visualize probability. They reinforce a deeper understanding of discrete probability and the continuous distributions that appear as limits. They connect the theory of probability to physical processes, such as migration, exchange of heat, gas diffusion, epidemiologic contagion, elections, markets, and the growth of the Internet, random trees, graphs, and mappings, among many other combinatorial objects of interest in computer science, informatics, engineering and economics.
The methods of analysis delve in Markov chains, martingales, Poisson processes and other stochastic processes. Exchangeability will be presented in the context of Pólya urns and Friedman's urn. A fascinating variety of urn models will be discussed.

**Prerequisites:**

A first course in probability (GW Stat 6201 or equivalent) is expected to be in your background. It is assumed that everyone already knows all the basic distributions (discrete: Bernoulli, Binomial, uniform, Poisson, etc., and continuous: uniform, exponential, normal, gamma, beta, etc.). For example, I expect everyone to know how to derive $E[X]$, the expectation of $X$, for $X$ say a binomial $\text{Bin}(n, p)$ random variable. We shall rederive many of these distributions and their limits from associated urn processes.

**Textbooks:**


We shall try to cover chapters 2 to 7 and some selected applications in informatics and biosciences (Chapters 8 and 9).

**Learning outcomes**

As a result of completing this course, students will be able to think of probability models for processes underlying physics, economics and various fields of engineering, and will develop an appreciation for stochastic thinking.

**Grading Policy**

1 Midterm (25%)

1 Final (30%)

4 Quizzes (5% each)

about 6 homeworks (15%)

Class project presentation (20%)

Note that these add up to a total of 110 percentage points!
Here is an example of what constitutes an A grade in this class. You score 95% or above: all homeworks and tests are solid and well done and the project topic is creative and shows a good advance in understanding various aspects of probability. You can miss a couple of test or homework problems here and there and still get an A.

**Class Policy:**

Late work: Will not be accepted.

Makeup exams: Except for medical cases (with proper documentation), there will absolutely be no makeups, you missed a test, you failed it.

**Blackboard:**

Please check Blackboard frequently, as there may be assignments, announcements, and material passed to the class via this electronic medium during the week. You can find it at

http://blackboard.gwu.edu/webapps/portal/frameset.jsp

You need to login using your GW user ID and password.

For university policies on teaching, see

http://www.gwu.edu/~academic/Teaching/main.htm

**Academic Integrity**

I support the GW Code of Academic Integrity. It states: “Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information.” For the remainder of the code, see:

http://www.gwu.edu/~ntegrity/code.html

Any case of the slightest hint of cheating will be prosecuted to the fullest extent of the university Academic Integrity Policy. You will receive an automatic F, and the case will be taken to the proper administrative channels.
Support for students outside the classroom

DISABILITY SUPPORT SERVICES (DSS)

Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Marvin Center, Suite 242, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to:

http://gwired.gwu.edu/dss/

UNIVERSITY COUNSELING CENTER (UCC) 202-994-5300

The University Counseling Center (UCC) offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include:

- crisis and emergency mental health consultations
- confidential assessment, counseling services (individual and small group), and referrals

See

http://gwired.gwu.edu/counsel/CounselingServices/AcademicSupportServices

Security

In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.