Math 60860: Stochastic Modeling
Spring 2006, 1:55 pm - 2:45 pm
MWF Hayes Healy Center 215
Andrew Sommese (Instructor)

This course is an introduction to stochastic modeling and stochastic differential equations, with application to models from biology and finance. The course presupposes the equivalent of Math 60850 (Applied Probability), i.e., familiarity with basic probability up to and including denumerable Markov chains, Poisson processes, and the rudiments of Brownian motion. The needed material from Brownian motion will be reviewed.

1. Martingales, including stopping times and optimal stopping.
2. Stochastic versus deterministic models
3. Markov chain models with applications
4. Poisson processes with applications
5. Diffusion processes
6. Brownian motion and related Processes
7. The Ornstein-Uhlenbeck Process
8. Numerical methods for stochastic processes

No book will be required; [1, 2, 3, 4, 6, 5, 7] are good references for topics that will be treated in the course.

References

[1] G. Grimmett and D. Strizaker, Probability and random processes, Oxford, 3rd edition, 2001.

[2] S. Karlin and H. M. Taylor, A first course in stochastic processes. Second edition. Academic Press, New York-London, 1975.

[3] S. Karlin and H. M. Taylor, A second course in stochastic processes. Academic Press, New York-London, 1981

[4] B. Oksendal, Stochastic Differential Equations : An Introduction with Applications, Sixth edition. Universitext. Springer-Verlag, Berlin, 2003.

[5] H. M. Taylor and S. Karlin, An introduction to stochastic modeling, 3rd ed., San Diego : Academic Press, 1998.

[6] L. Rogers and D. Williams, Diffusions, Markov processes, and Martigales, vol. 1, Wiley, 1987.

[7] D. Williams, Probability and Martingales, Cambridge, 1991.