Syllabus for Wesley Cowan's Oral Qualifying Exam

Wednesday, December 19, 2012 at 2:00 PM
Rutcor Room 139

Committee Members.

- Adi Ben Israel
- Michael Katehakis, chair
- Daniel Ocone, co-advisor
- András Prékopa,
- Andrzej Ruszczyński
- Isaac Sonin, Department of Mathematics, University of North Carolina at Charlotte.

Probability and Stochastic Processess

- Foundations
  Probability Spaces, Random Variables, Independence, Conditioning
- Results
  Markov, Tchebyshev, Borel-Cantelli Lemma, Kolmogorov's 0-1 Law
  Central Limit Theorems
  Large Number Laws
- Discrete Processes
  Martingales in Discrete Time, Optional Stopping
  Markov Chains
  Random Walks
- Continuous Processes
  Existence
  Filtrations
  Stopping Times, Optional Times
- Continuous Processes Levy Processes, Poisson, Brownian Motion
  Martingales in Continuous Time, Doob-Meyer
  Quadratic Variation
  Stochastic Integrals, Ito's Rule, Applications
  Stochastic Differential Equations
  Renewal Theory

References:
Professor Ocone's Lecture Notes on Probability Theory and Stochastic Analysis, 642-591, 642-592
Ross, Sheldon M. Applied Probability Models with Optimization Applications.

Controlled Markov Processes and Optimization

- Models Schema, Values, Measures
  Homogeneous, Heterogeneous
  Discrete, Semi-Continuous, General Borel Models
  Finite Horizon, Infinite Horizon (discounted)
  Complete vs Incomplete Knowledge

- Strategies Simple Optimal, epsilon-Optimal, existence
  Sufficiency of Simple Strategies
  Construction/Solution

- Multi-armed Bandit Problems
  Bernoulli Rewards
  Deterministic Reward Sequence
  Markov Chain Rewards

- Classic Problems
  Replacement, Stabilization, Allocation

- Dynamic Programming
  Optimality Conditions, Fundamental Equations
  Value Iteration, Policy Iteration

- Linear Programming
  Simplex Method, Dual Method
  Duality Farkas' Lemma, Linear Inequalities

References: Dynkin, E. B., and A. A. Yushkevich. Controlled Markov Processes.
Bellman, Richard. Dynamic Programming.
Professor Prekopa's Lecture Notes on Linear Programming