Course outline

Measure theoretic foundations of probability (3 weeks):

- σ-fields

- Measurability arguments

- Formal definition of expected value

- Fatou's lemma, monotone convergence theorem, dominated convergence theorem.

- Modes of convergence: in probability, in mean square, almost sure.

Course outline continued:

- Statements of some of the following famous theorems of probability:

  - Weak law of large numbers

  - Strong law of large numbers

  - Lindeberg central limit theorem

  - Martingale convergence theorems

  - Ergodic theorems

  - Renewal theorem

Course outline continued:

- One week introductions to each of:

  – Markov Chains

  – Poisson Processes

  – Point Processes

  – Birth and Death Processes

  – Queuing Theory

  – Brownian motion and diffusions

  – Simulation

- Student presentations (one week)