Stochastic Modeling

Topics for the exams 28.10.09 and 11.11.09

- **Probability space**
  probability , conditional probability,
  independence (sets $A_1, \ldots, A_n$ or random variables $f_1, \ldots, f_n$),
  σ - algebra,
  filtration,
  stopping time.

- **Maximum likelihood estimate**

- **Markov chain**
  definiton,
  Markov property and equivalent formulations,
  transition matrix and according graph,
  step-by-step-formula,
  Chapman-Kolmogorov-equations

- **Classification of states**
  absorbing states
  communicating states, irreducible Markov chain
  periodic and aperiodic states (find out the period in an example, not the definition explicitely)
  persistent and transient states

- **Branching process**
  the use of probability generating functions

- **persistent and transient states**
  definition,
  equivalent assertions,
  relation between a persistent state and its recurrence time.

- **Ergodic theorems and stationary distributions**
  ergodic Markov chain,
  Ergodic theorems (1. and 2. version),
  stationary distribution (how to compute, existence, uniqueness, examples),
  relation between the stationary distribution and the mean recurrence time (Thm 3.7.4.),
  computation of the mean recurrence time.

There will be questions like those in the exercises as well as questions to formulate important definitions and propositions.
No questions about Chapter 4 (no need to memorize the Gibbs sampler...).