



# Analysis of Biological Networks

## Course Description

**Network biology is an emerging discipline that studies complex cellular processes by modeling them as networks of interactions between molecules. The analysis of biological networks presents exciting graph-theoretic and statistical problems with important applications in biology. The course will review the state-of-the-art algorithms and analysis techniques in the field, and demonstrate their applications to the study of real biological networks.**

**The course requires no prior knowledge in biology. All background will be provided in the lectures.**

**The course is open to all graduate students in computer science. Interested undergraduate students, as well as non-CS students, should contact the instructor.**

## Course Outline

- Introduction: basic biological and graph theoretic concepts.
- Network properties: degree sequence, connectivity, clustering coefficient.
- Network models: random graph, degree-preserving graph, scale-free graph, geometric model.
- Components of a network: motifs and modules.
- Algorithms for network searches: greedy, color coding, branch and bound, bicluster analysis.
- Evolution of networks: conservation analysis, network queries.
- Protein-protein interaction networks.
- Metabolic networks: constraint based modeling.
- Regulatory networks: promoter sequence analysis.
- Advanced topics: integration of networks, network robustness.

**Prerequisites:**

**“Efficiency of Computations (Algorithms)” (mandatory),**

**“Computational Genomics” (recommended).**