BIOL/PHYS 497A Networks in Life Science (Fall 2013)

Instructor: Reka Albert **Office: 122 Davey Laboratory**
Time: M W F 11:15 AM – 12:05 PM **Location: 117 Thomas**
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Overview:

The course will cover examples of network analysis and modeling in biology and medicine, including methods of regulatory network inference from gene expression data; analysis of biological interaction networks; modeling the dynamics of signal transduction networks, gene regulatory networks, or the immune response. After taking this course students will be able to gather information to construct a network model corresponding to a biological system, to use graph theoretical measures to describe this network, and to use mathematical or computational methods to model the dynamic processes that take place in this system.

Main topics covered:

1. Elements of graph theory: node degree, distances between nodes, node betweenness, subgraphs, directed graphs
2. Graph algorithms and graph analysis/visualization software
3. Graph analysis of biological networks: gene regulatory networks, signal transduction networks, metabolic networks
4. Network resilience and vulnerability
5. Modeling the dynamics of biological networks: continuous, discrete and stochastic methods
6. Network inference from expression data: continuous, Boolean and Bayesian methods
7. Case studies at the molecular and cellular level

Textbook:

"A first course in Systems Biology", Eberhard Voit, Garland Science 2012. This will be supplemented by various recent review articles (copies will be provided).

Pre-requisites:

MATH 141, BIOL 110, BIOL 230 or instructor's permission