

SAAST Summer 2013  
Engineering Complex Networks

*Syllabus*

*Mathematics of networks*

- Networks and their representation
- The adjacency matrix
- Weighted and directed networks
- Hypergraphs. Bipartite networks, trees and planar networks
- Degree, paths, components
- Independent paths, connectivity, and cut sets

*Measures and metrics*

- Degree centrality, eigenvector centrality, katz centrality, PageRank
- Hubs and authorities, closeness centrality, betweenness centrality
- Transitivity, reciprocity, similarity, assortative Mixing

*The large-scale structure of networks*

- Components
- Shortest paths and the small-world effect
- Degree distributions. Power laws and scale-free networks
- Distributions of other centrality measures

*Random graphs*

- Random graphs
- Random graphs with general degree distributions
- Models of network formation