

COMP 572: Bioinformatics - Network Analysis
Luay Nakhleh
Fall 2013
<http://www.cs.rice.edu/~nakhleh/COMP572>

Synopsis. In 21st century biology, networks have emerged as a powerful tool to model biological processes across all scales, from interactions among mutations at the genome level to interactions among species. Further, it is now clear that a network is much more than the sum of its individual components, as many emergent properties, organizations principles, etc., of biological systems are elucidated only once the network of interactions among entities is assembled and analyzed. The goal of this course is to introduce students to networks, their modeling and analysis in biology.

Staff.

- Instructor: Prof. Luay Nakhleh, nakhleh@rice.edu, Duncan Hall 3119.
- Teaching assistant: Mr. Nikola Ristic, nr10@rice.edu, Duncan Hall 3117.
- Office hours: by appointment (send an email).

Grading.

- Homework: 50%.
- Midterm exam on October 8, 2013 (in class, only one A4 sheet of notes is allowed): 25%.
- Midterm exam on November 26, 2013 (in class, only one A4 sheet of notes is allowed): 25%.
- Letter grades will be assigned based on the following rules:
 - 90-100 : A
 - 80-89 : B
 - 70-79 : C
 - 55-69 : D
 - < 55 : F
- If you're taking the class on a Pass/Fail basis, you get a 'P' if numerical grade is ≥ 55 , and an 'F' otherwise.

Course text. The course will not adhere to any textbook, but the following texts are highly recommended and cover different aspects of networks:

- A First Course in Systems Biology, by E. Voit. Garland Science, 2012.
- Systems Biology: A Textbook, by E. Klipp *et al.* Wiley-Blackwell, 2009.
- Principles of Computational Cell Biology, by V. Helms. Wiley-Blackwell, 2008.
- Networks: An Introduction, by M.E.J. Newman. Oxford University Press, 2010.
- Computational Modeling of Gene Regulatory Networks - A Primer, by H. Bolouri. Imperial College Press, 2008.
- An Introduction to Systems Biology, by U. Alon. Chapman & Hall/CRC, 2006.
- Biological Networks, by F. Kepes (ed.). World Scientific, 2007.

Students with disability. Any student with a documented disability needing academic adjustments or accommodations is requested to speak with me during the first two weeks of class. All discussions will remain confidential. Students with disabilities will need to also contact Disability Support Services.

Honor code. The Honor Code of Rice University applies. In particular, the solutions to homework and exam problems submitted by a student must be the work of that student and written in that student's own words.

Topics. (*This is a tentative list*)

1. Networks in biology
2. Graph-theoretic modeling/analysis
3. Discrete dynamic modeling
4. Continuous dynamic modeling
5. Probabilistic modeling
6. Network inference
7. Genome-scale modeling and network integration
7. Evolution of molecular networks
8. Networks as guiding tools