

**IE 3087: Network-based Optimization**  
**Fall 2015**

**Instructor:** Dr. Oleg A. Prokopyev

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**Lectures:** T/Th 4:45-6:00 PM, Benedum 543

**Office:** Posvar 4175

**Office hours:** By appointment (please contact me by e-mail)

**Course website:** <http://courseweb.pitt.edu>

**Textbooks:** We will primarily use

*Network Flows: Theory, Algorithms, and Applications*, R. K. Ahuja, T. L. Magnanti, and J. B. Orlin, 1993, Prentice Hall, NJ.

Some topics will be covered from research papers and from

*Networks: An Introduction*, M. Newman, 2010, Oxford University Press.

**Course description:** We will study various network-based optimization problems and related algorithms. Specifically, the following topics will be covered:

- 1) Intro to networks and graph theory, intro to algorithmic design and analysis (including polynomial solvability, NP-completeness and approximability)
- 2) Classical network flows and related problems on graphs, including shortest-path, maximum flows, minimum-cost flows, assignments and matchings, minimum spanning tree
- 3) Examples of “hard” combinatorial optimization problems on graphs, e.g., maximum clique (independent set) problem, clique relaxations
- 4) Elements of network analysis: measures and metrics (e.g., centrality), random graph models, social networks, large-scale structure of networks
- 5) Additional topics (we will discuss examples of the research work in the area and some related applications based on recently published papers)

**Prerequisites:** Knowledge of the C or C++ programming languages. This is not a programming course, but in order to discuss algorithms it is also necessary to have some programming proficiency.

**Grading:** There will be regular homework assignments and two exams (mid-term and final). Several homeworks will include some coding problems along with computational experiments. The final exam will have two parts (equally weighted): in-class and take-home. The mid-term will be in-class. Additional details will be provided. Tentative weighting is 35% homework, 25% mid-term and 40% final (20% each part).

**Attendance:** Attendance is not required but the students are responsible for the announcements made in the class.