Description of the Course:
This is an advanced course focusing on several topics in logistics with a network design perspective. The emphasis will be on mathematical modelling, analysis and efficient solution methodologies. Background in optimization (linear and integer programming) and some programming experience, preferably with C++, are required.

There are three components of this course:
The first involves lectures in which the instructor covers several fundamental models, exact and heuristic solution algorithms, and analysis. Topics include facility location-allocation, production/distribution system design, multi-commodity flow network design, vehicle routing, location/routing, etc. Once this component is finished, an exam is given on the material.

In the second component, you are first required to identify three topics from the course outline (your choice of three, but the final decisions will be made with the instructor). Then, you will need find three published research articles (preferably recent and/or seminal articles) on each topic. For this purpose, you should utilize the “Topics and Some Literature” section below which provides you only a starting point to search the literature to find recent articles. This component is also initiated with the first component, and by the end of the fourth week of semester, you should provide the instructor with a list of your 9 papers for approval. Following a template provided by the instructor, you prepare short summaries of these 9 papers (at most 2 pages each). Then, we pick 2 or 3 papers from your 9 papers (either from the same topic or from two different topics) and you prepare and deliver a presentation of these two papers.

The third component involves implementations of some of the algorithms covered in the previous components. This will be conducted as a group project. Your implementations should be able to read the input data (using available data or synthetic data you generate) from an input file, execute the algorithm to solve the associated problem and present the results in an easily understandable output file. For an implementation, you are also required to prepare a short documentation outlining the problem and the algorithm first, and then presenting the data structures and components (procedure, subroutines, etc) of the whole program.

Grading: The grading for the class will be based on a
Component 1: Midterm Exam (35% - based on approximately the first half of the semester),
Component 2: Term Paper and Presentations (35% - topics selection, preparation, presentation, report, must use \LaTeX (templates provided),
Component 3: Projects (30% - completeness, correctness, efficiency, documentation).
Course Outline:

1. Review of Facilities Location Problems
2. Discrete Facilities Location-Allocation Problems
3. Production/Distribution System Design
4. Closed-Loop Supply Chain Network Design
5. Multi-commodity Flow Network Design
6. Hub-and-Spoke Network Design Problems
7. Routing Problems
8. Integrated Location-Routing Problems
9. Applications in Supply Chain Logistics and Communications

References (No textbook):


Methodologies:
Commonly used solution procedures for the topics above include Branch-and-Cut Methods, Benders Decomposition, Lagrangian Relaxation, Dual-based Methods, Heuristic Techniques.