The tentative list of topics (roughly in order) to be discussed include:

1. General overview of clustering. Preliminaries: $L_p$-norms, metric spaces, computational complexity, approximation factors
2. The k-means/ k-centers/ k-medians problems and algorithms
3. Approximation factors and computational complexity
4. *The expectation maximization (EM) approach
5. *Deterministic annealing
6. Spectral clustering: introduction
7. *Spectral clustering: Normalized cut and related algorithms
8. *Aggregation of Markov chains (MCs)/Stochastic matrices
9. *Graph clustering and graph comparisons
10. Deterministic annealing for MCs and graphs
11. *Sparse graph clustering and the planted partition model
12. *Dynamics: The coverage control problem
13. Dynamic clustering/dynamic deterministic annealing
14. *Additional topics, for example:
   - Model approximation, identification and reduction methods for dynamic systems: e.g., Karhunen-Loeve, Proper Orthogonal Decomposition, Balanced Truncation and Principal Component Analysis (PCA) methods for dynamic systems
   - General PCA and Robust PCA
   - Matrix completion problems

Each topic will be covered in 1-3 lectures

NOTE: A * indicates student-led discussion
An incomplete list of potential papers:

- Papers: graph comparisons
Assignments and grading

- There will be 3-4 computational assignments totaling 40 – 45% of the final grade.

- Each student will be required to participate in presenting and leading one topic in the discussion list. This assignment will involve mastering the associated article(s), preparing a summary presentation of the material and leading the discussion. This will comprise 30% of the final grade.

- Each student will be expected to read the articles to be discussed prior to the class meeting on that topic, and participate in the discussion; participation will contribute to approximately 15 – 20% of the final grade.

- There will be occasional homework problems given throughout the course that will contribute 10–15% of the final grade.