

# POLITICAL SCIENCE 900 SYLLABUS: SOCIAL AND POLITICAL NETWORK ANALYSIS

Spring 2019

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Additional information and materials in relation to the class will be posted on D2L.

## Course Description:

Data structures that define relations between pairs of actors are ubiquitous in political science examples include the study of events such as legislation cosponsorship, trade, conflict, and the formation of international agreements. Interest in studying relations such as these through a network perspective has existed for a long time across statistics, computer science, and the social sciences. However, with significant advances in statistical computing our ability to actually satiate these interests by collecting and quantitatively studying networks has become feasible.

This class will cover network data collection, description and visualization, and methods for the statistical analysis of networks. Throughout the topics listed above we will try to draw from examples across political science and economics, and students will work with actual data using network software in R.

## Grading

Your final grade will be comprised of the following:

Methods Presentation	10%	Mini Projects	20%	Final Project	40%
In-Class Midterm	20%	Class Engagement	10%		

The grading scale will be as follows:

- 4.0 (92-100 percent)
- 3.5 (87-91.9 percent)
- 3.0 (80-86.9 percent)
- 2.5 (76-79.9 percent)
- 2.0 (70-75.9 percent)
- 1.5 (65-69.9 percent)
- 1.0 (59.5-64.9 percent)
- 0.0 (<59.5)

## Lectures

Each class will involve me giving a lecture and then will conclude with how to handle the discussed topics programmatically in R. Throughout each class I will ask you to apply the tools and techniques that I have introduced with your team. Learning to work in a statistical computing language like R involves doing more than listening. As such this will also require me to enforce a fairly rigorous class attendance policy. If you are unable to attend a class, you must let me know ahead of time and have a valid reason. Please note that class engagement comprises ten percent of your final grade.

## Mini Projects

Twenty percent of your grade will be determined by your performance on two take-home mini projects that you can complete completely individually or with at most two other classmates. If you are operating as a team everyone should contribute equally to each assignment, and at the end of each assignment you may be asked to evaluate your team members. Mini projects will be assigned roughly every other week and are expected to be completed by the due date. Late assignments will be penalized as follows:

- Late, but same day: -10%
- Late, next day: -20%
- 2 days or later: no credit

## Methods Presentation

Each student will be responsible for presenting a detailed review of one of the methods pieces (10-15 minute presentation given to the class). Worth 10% of grade.

## Midterm

There will be one in-class midterm on Feb 27<sup>th</sup> that you are expected to complete individually and will comprise twenty percent of your grade.

## Final Project

Another forty percent of your grade will be determined by your final project. This will be a somewhat open-ended exercise BUT the end product of it must be a 10-12 double-spaced research paper that involves the collection and analysis of network data (could also be a replication of a study through a network perspective). You will be allowed to form your own team of up to 3 students for this paper. Use this final project to your advantage in terms of your prelims, dissertation, or a manuscript you're planning on submitting with colleagues. You must submit a proposal describing what you're doing by February 20. Following the delivery of the proposal, I will meet with you to discuss whether the proposal is satisfactory. Not turning the proposal in on time will lead to a -10% reduction in the grade for your final project. Final project and all code must be submitted by May 1<sup>st</sup> at 2:45pm on D2L.

## Presentation of the Final Project

Presentation of the final project will take place either at the last class or in a poster session open to the faculty. If we do a poster session, I will let you know details by the second class.

Each student will create a poster summarizing their research paper. A poster session will be held jointly with Nazita's class on April 25, 2018 from 3 to 5pm. Faculty and students will be invited to attend. Presenters should stay near their posters to take questions and comments and explain their findings to attendees.

A draft of the poster should be presented to the instructor on (or before) April 10, 2018. On April 17, 2018, there will be a workshop during class in which students can work on their posters and papers: they can receive assistance from the instructor or other classmates, discuss questions or problems with their projects, seek suggestions on how to improve their work, etc. To take full advantage of the opportunity students need to have a complete draft of their project.

Take into consideration that posters should go into print at least 2 or 3 days before the poster session. The poster can be landscape or portrait, but no larger than 36 x 48 inches. The following provides helpful advice about structuring and organizing a good poster: [Designing Effective Posters, Jeff Radel at the University of Kansas](#). There are a variety of software packages that can be used to design posters including Microsoft Power Point, TeX, and Adobe Illustrator.

## Helpful Resources

No required books. Here are some canonical references that most network analysts have on their shelves:

- [Social Network Analysis: Methods and Applications by Wasserman & Faust](#)
- [Social and Economic Networks by Jackson](#)
- [Networks: An Introduction by Newman](#)
- [Statistical Analysis of Network Data with R by Kolaczyk & Csárdi](#)

## Class Equipment

You will need a computer that has some specific software on it. You should be able to do everything we do in class using modern Mac :), Linux :) and even Windows :( operating systems. If you have questions, ask me. In the course, we will be using free, open-source software. It will be necessary to have a computer with multiple cores and  $\approx$  128gb hard drive in class.

- R: This is a free program, available [here](#).
- Many people find [RStudio](#) a very useful to interact with R.

## Policies

Missing class or midterm: If you know that you are going to have to miss a class or the midterm, let me know at least 48 hours beforehand. If you simply skip the midterm, you will get a zero and no make-up will be offered.

## Academic Integrity

Don't cheat ... <https://ombud.msu.edu/academic-integrity/student-faq.html>:

"Academic honesty and integrity are fundamental values in a community of scholars. As stated in the MSU [Student Rights and Responsibilities](#) and [Spartan Code of Honor](#), students and faculty share a commitment to and responsibility for "maintaining the integrity of scholarship, grades, and professional standards." To abuse these values is to assault one's own personal integrity and character.

Don't take without attribution ... [http://www2.stat.duke.edu/~cr173/Sta323\\_Sp17/syllabus/](http://www2.stat.duke.edu/~cr173/Sta323_Sp17/syllabus/):

"A note on sharing / reusing code - I am well aware that a huge volume of code is available on the web to solve any number of problems. Unless I explicitly tell you not to use something the course's policy is that you may make use of any online resources (e.g. StackOverflow) but you must explicitly cite where you obtained any code you directly use (or use as inspiration). Any recycled code that is discovered and is not explicitly cited will be treated as plagiarism. The one exception to this rule is that you may not directly share code with another team in this class, you are welcome to discuss the problems together and ask for advice, but you may not send or make use of code from another team."

## **Fixed Dates**

**Proposal for Final Project due on 2/20**

**Midterm on 2/27**

**No Class: Spring Break on 3/6**

**No Class: Traveling for a conference on 3/27**

**Poster Draft Due on 4/10**

**Present Posters on 4/25**

**Final Project Due on 5/1 by 2:45pm**

## ***Approximate Class Schedule***

Readings will be assigned at the beginning of every week's lecture.

### **Section 1: Hi Networks!**

- Introduction to the Syllabus
- Basic network terminology and examples of data
- Network analysis in R.

### **Section 2: Mapping Relations & Describing Networks**

- Centrality
- Reciprocity
- Transitivity
- Communities
- Homophily

### **Section 3: Statistical Inference with Networks**

- Exponential Random Graph Models (ERGMs)
- Stochastic Actor Oriented Models (SAOM)
- Latent variable models
  - Latent class model
  - Latent distance model
  - Latent factor model
- Additive & Multiplicative Effects Model (AME)
- Longitudinal and multilayer networks

### **Section 4: Machine Learning and Networks**

- Recommender Systems
- Networks + Text