

# Math 168, Networks, UCLA

## *Information Sheet (3/28/18)*

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### 1. *About the Course*

- (a) This is a project-based course about networks, which can be used to study complex systems of interacting agents. The study of networks — in terms of theory, computation, and applications — is pervasive in physics, biology, sociology, information science, and myriad other fields. The study of networks is also a major part of data science.
- (b) **Some Motivating Questions:** How should one describe the structure of social networks? How do diseases and rumors spread along different types of networks, and how does network structure affect the speed and reach of information, memes, and diseases? Using network structure only, how can one determine which Web pages are the most important ones?
- (c) **Learning Outcomes:** Students will develop a sound knowledge and appreciation of some of the tools, concepts, and computations used in the study of networks. The study of networks is predominantly a modern subject, so the students will also be expected to develop the ability to read and understand current research papers in the field. They will also have a chance to explore a topic in depth in a final project. Course topics include basic structural features of networks, generative models of networks, centrality, random graphs, clustering, and dynamical processes on networks.
- (d) **Online Class Description:** “Lecture, three hours; discussion, one hour. Requisites: courses 115A, 170A or Electrical and Computer Engineering 131A or Statistics 100A. Introduction to network science (including theory, computation, and applications), which can be used to study complex systems of interacting agents. Study of networks in technology, social, information, biological, and mathematics involving basic structural features of networks, generative models of networks, network summary statistics, centrality, random graphs, clustering, and dynamical processes on networks. Introduction to advance topics as time permits. P/NP or letter grading.”

### 2. *Coordinates*

- (a) **Classes:** Geology Building 4645, MWF 1:00–1:50 pm
- (b) **Discussion Sections:** Geology Building 6704, Tu 1:00–1:50 pm

### 3. *Main Texts*

- (a) Mark Newman, *Networks: An Introduction*, Oxford University Press, 2010 (primary text; buy a copy)
- (b) MAP and J. P. Gleeson, *Dynamical Systems on Networks: A Tutorial* (available for free through UCLA)
- (c) Supplementary material from other sources (e.g., review articles, other papers, etc.)

### 4. *TA*

- (a) Yacoub Kureh (jkureh@gmail.com)

### 5. *Office Hours*

- (a) **My office hours:** 2 weekly hours to be determined (upcoming Doodle poll), or by appointment
- (b) **Yacoub’s office hours:** to be determined

### 6. *Grading*

- (a) **Homework (25%):** There will be some number ( $N$ ) of homework assignments. No late assignments will be accepted, but the overall score from homework assignments will be a mean over  $N - 1$  assignments rather than  $N$  of them. Each of the  $N$  assignments will be worth 100 points, so for example, if  $N = 5$ , then the maximum overall homework score would be  $H := \frac{100 \times N}{N-1} = \frac{500}{4} = 125$ .
- (b) **Midterm and Quizzes (25%):** There will be one midterm (Friday 18 May), which is worth three quizzes. There will be some number ( $Q$ ) of quizzes, which will not be announced in advance and which can potentially occur either in class or in the discussion sections. (The TA can also choose on his own to give a quiz.) Analogous to homework assignments, I'll be dividing the total score by  $Q + 2$  rather than  $Q + 3$  (recall that the midterm is worth 3 quizzes) to determine the overall exam score. With the midterm and  $Q$  quizzes, the maximum overall exam score is  $E := \frac{100 \times (Q+3)}{Q+2}$ . For example, if there are  $Q = 3$  quizzes, this gives  $\frac{100 \times (Q+3)}{Q+2} = \frac{600}{5} = 120$ .
- (c) **Group Projects: Presentation and Report (50%):** The capstone part of the course will be a group project, which has a final submission in two forms: (1) a final report in the format of a paper for the scholarly journal *PNAS* (maximum 6 pages of main text + any amount of Supplementary Materials); and (2) a final presentation. The presentations will take place during week 10 (and, if necessary, starting during week 9). The final report is due on Friday 15 June at 5:00 pm. It should be submitted to me by e-mail and (in case of large file size) shared with me using Dropbox or something similar. The project gives an overall mark of  $P$ . The maximum possible project score is  $P = 100$ .

**Note:** I am away during finals week, so we won't be using our Friday slot that week. I will be available by e-mail during that time.

- (d) **Final Grades:** The final score is

$$S := \frac{1}{2}P + \frac{1}{4}E + \frac{1}{4}H. \quad (1)$$

Anybody with  $S \geq 90$  will get at least an 'A' (without the minus); anybody with  $S \geq 80$  will get at least a 'B' (without the minus); anybody with  $S \geq 70$  will get at least a 'C' (without the minus); and anybody with  $S \geq 60$  will get at least a 'D' (without the minus). I reserve the right to be more generous, but the above are guarantees.

For example, if  $H = 108$  (homework),  $E = 104$  (midterm and quizzes), and  $P = 60$  (final project), one gets

$$S = \frac{60}{2} + \frac{104}{4} + \frac{108}{4} = 30 + 26 + 27 = 83,$$

which guarantees a 'B' or higher.

- (e) **Note:** Exams must be taken during the scheduled times. There will be **no** make-up exams, with the exception of serious medical emergencies or university-approved absences. A grade of 'F' will be assigned to any student who misses the final presentation or does not submit a final report (even if  $S \geq 60$ , in the unlikely event that this occurs in this situation). Incompletes are reserved for those who have completed all of the work for the class, including exams and final project, but who, for a legitimate, documented reason, miss the final presentation.

## 7. Homework Format

- (a) Homework will be a mixture of many different formats and will be of varying difficulties. Assignments will include a mixture of reading, problems (including open-ended problems), "refereeing" of papers, milestone items for the project, and other items. Due dates and submission instructions will be indicated on each homework assignment.

## 8. Other Notes

- (a) **Late policy:** Late submissions will not be accepted. (Generosity, and allowing for life's circumstances, is already built into the denominator of  $H$ .)
- (b) **Appeals:** As a rule of thumb, you should only appeal on correctness (not on the amount of partial credit that you received). Any such requests will only be considered within 7 days of when I return the assignment or exam and no later than Friday 8 June.

- (c) Students needing academic accommodations based on a disability must contact the Center for Accessible Education (CAE) at 310-825-1501 or present in person at Murphy Hall A255. As the professionals delegated authority from the camps to determine reasonable disability accommodations, CAE will assess all requested accommodations and communicate appropriately with faculty. In the event that a student has approval for proctoring arrangements during exams, please inform your respective professors and/or Teaching Assistant(s) before the date of exam(s). When possible, students should contact the CAE within the first two weeks of the term, as reasonable notice is needed to coordinate accommodations. For more information, visit [www.cae.ucla.edu](http://www.cae.ucla.edu).