Graph Theory and Networks (MAD 5306)

Syllabus, Fall 2020

M,W,F 12:20–1:10 Zoom

Professor: Prof. Richard Bertram
Office Hour: Friday 3:00–4:00, or by appointment
Office: Zoom
E-mail: bertram@math.fsu.edu

Prerequisite: MAS3105 (Applied Linear Algebra) or some linear algebra course.

Textbook: Most of the topics in the course are from “Networks” (2nd edition) by Mark Newman, and “Networks, Crowds, and Markets” by David Easley and Jon Kleinberg. You can find them on Amazon.

Course Topics: Graph theory, information networks, biological networks, social networks, technological networks, generic properties of real-world networks, random networks, network centrality, graph diffusion, epidemics.

Course Objective: This introductory course examines the properties of networks from a mathematical perspective. The main objective is to demonstrate how this is done. A second objective is to present examples of large-scale networks that we rely on every day (e.g., transportation networks, the internet and world wide web) or are part of our bodies (e.g., gene transcription and intracellular signaling networks). A third objective is to familiarize students with computer software that is useful in the analysis of networks.

Computer Software: Much of what is done in this class involves operations with matrices. Matlab is the perfect software package for handling matrices, but it is not free. Scilab is a free variation of Matlab, and it can be downloaded onto any computer. You will need to have either one of these operational on your computer.

The Virtual Environment: This course will be done in a synchronous virtual environment. We will meet through Zoom on FSU Canvas on each class day, and go through slides that I have prepared. You are encouraged to ask questions throughout the presentation. I
will record each class meeting and make it available through the Canvas site. There will also be a Zoom “office hour”, scheduled through Canvas. If you want to participate, then please attend starting at the beginning, since if I am the only one in the Zoom room I will end the meeting after 5 min or so. You can also email me with questions. I won’t be in my office at the Love building during the pandemic.

**Assignments:** I will give assignments at approximately 2-week intervals. You will have a week to complete each assignment, and must turn them in on time. I will not accept late assignments, except in the case of medical issues (please let me know as soon as possible about any medical situation that makes it impossible to complete your work). You are expected to do your own work on these, and not collaborate with other students. It is okay to talk to others about the material, but not about the specific problems in the assignments.

**Student Lectures:** Each graduate student will present a lecture during the last couple of weeks of the semester. Each presentation will be by a team of two students, chosen randomly. This will be on a topic of his/her choice, and should be based on a research article(s) (not the textbook) that I have approved.

**Grading:** Assignment grades will make up 80% of the final grade. The remaining 20% will be based on the presentation, which will be graded. The final letter grade is determined according to the following scale:

- $90.1-100\% = A$,
- $88-90\% = A^-$,
- $84.1-87.9\% = B^+$,
- $80.1-84\% = B$,
- $78-80\% = B^-$,
- $74.1-77.9\% = C^+$,
- $68.1-74\% = C$,
- $66.1-68\% = C^-$,
- $58-66\% = D$,
- $0-57.9\% = F$

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