Course Outline — SPRING 2021

MATH 412

INTRODUCTION TO GRAPH THEORY

Sections X13 and X14: 12 Noon MWF, 141 Loomis Laboratory.
Instructor: A. Kostochka, 234 Illini Hall, 265-8037, kostochk@illinois.edu.
Office hours: tentatively MF 2–3pm and by appointment.
Web page: http://www.math.uiuc.edu/∼kostochk/math412-12
Final Exam: 7:00-10:00 p.m., Thursday, May 13.

TEXT: **Introduction to Graph Theory**, D. B. West (Prentice Hall), Second Edition, Chapters 1–7.

This is a serious introductory course about properties and applications of graphs. We study graph-theoretic concepts such as paths, Eulerian circuits, trees, distance, matchings, connectivity, network flows, colorings, planarity, and spanning cycles. A secondary goal is to improve students' clarity of thought and language when writing proofs in discrete mathematics.

Famous applications include the *Minimum Connector Problem* (building roads at minimum cost), the *Assignment Problem* (filling n jobs in the best way), the *Committee Scheduling Problem* (using the fewest time slots), the *Four Color Problem* (coloring maps with four colors so that adjacent regions have different colors), and the *Traveling Salesman Problem* (visiting n cities with minimum cost).

REQUIREMENTS: Weekly problem sets (20 points each) require 4 from a choice of 5 problems; graduate students registered for 1 unit do all 5 problems. The 8 highest homework grades out of 9 count. There are 3 short quizzes. There are three tests plus a final examination. The tests are currently planned to be evening exams from 7pm to 8:30pm on Thu., March 4, April 1 and April 29.

Weighting: homework 160 points (plus up to 16 points in total for typing the assignments), quizzes 30 points, tests 100+100+100 points, final exam 200 points, participation in class activities up to 20 points, total maximum 726 points. The homework provides practice finding proofs and writing proofs; writing up the solutions is among the most effective ways of keeping up with the material in the course. The threshold for A$^+$ is 665 points, for A is 630 points, for A$^-$ is 600 points, for B$^+$ is 550 points, for B is 500 points, for B$^-$ is 450 points, for C$^+$ is 400 points, for C is 350 points, for C$^-$ is 300 points, for D^- is 200 points. The scale for graduate students registered for 1 unit (4 hours) is different: it is by 40 points larger for every grade.

RESOURCES: Electronic mail is a medium for announcements and questions. The course webpage also can help. The due dates for homeworks will be normally Wednesdays. So, we plan collaborative study sessions to aid students in understanding the material and solving problems on Tuesdays from 4pm to 5:30pm in Room 1060 Lincoln Hall.

Homework Submission and Guidelines:
Gradescope: All homework will be turned in electronically to **Gradescope** (www.gradescope.com). If you do not already have a Gradescope account, you should create one immediately, and at least 48 hours in advance of the first homework deadline. Once you create an account, you need to add this course. To add yourself to the course, once you sign up for gradescope, navigate to your

Account Dashboard by clicking the Gradescope logo in the top left, and click Add Course in the bottom right corner, then use the course code: **N8PP2Z**. For help with using gradescope to submit assignments, please visit **help.gradescope.com**.

Homework Expectations: All assignments being turned in must be clear, legible and well-organized. All work must be shown and well-explained; a final answer without supporting work and explanation may be worth nothing. All assignments must be turned in in order. Failure to abide by the homework expectations may result in the homework not being accepted or only receiving partial credit. If two homeworks have identical solutions to a problem, both works are discarded.

Typing Homework: For each homework, additional 2 points will be added for typing it (apart from pictures).