Math 470-Spring 2021

Analytic Combinatorics

General information

Class zoom link: https://wustl.zoom.us/j/91037644856
Class time: TTh 2:30-3:45pm
Professor: Greg Knese
Office hour zoom link: https://wustl.zoom.us/j/94477927372
Office hours: MW 4-5pm, F 3-4pm or zoom appointment
Email: geknese at wustl dot edu

Course description

Analytic combinatorics is the study of counting sequences associated to combinatorial configurations. The course will be broken into two components. First, generating functions will be used to encapsulate counting sequences and their recurrence structures with a formal power series. Second, analytic methods will be used to obtain the precise asymptotic behavior of counting sequences. The informal prerequisites are: familiarity with basic discrete math objects: sets, permutations, combinations, graphs; power series; mathematical maturity (e.g. the ability to write rigorous proofs and to absorb new definitions quickly). Formal Prerequisites: Math 310 or CSE 240.

Course Format

The course will be conducted synchronously at the designated class time (TTh 2:30-3:50pm). Classes will be recorded and posted on zoom. On occasion it may be necessary for me to have an asynchronous class. In that case I will post videos to watch the day of class.
All course information will be available on the course canvas page.
Class zoom link:

https://wustl.zoom.us/j/91037644856

Office hour zoom link:

https://wustl.zoom.us/j/94477927372

Note that this link is shared with my other class.
The password is the same for both links and will be emailed out.

Textbook

Analytic Combinatorics by Philippe Flajolet and Robert Sedgewick.
Available here: http://ac.cs.princeton.edu/home/AC.pdf
The book is so big (and interesting) that it may be worthwhile to get a physical copy.
See also the extensive website with videos

http://ac.cs.princeton.edu/online/

Exams

There will be 3 non-cumulative take home exams that will be conducted through crowdmark and graded like homework. These will have a shorter time frame (2 days) to complete compared to homework, and you are not permitted to discuss these with anyone except the instructor (who will be available to mostly provide clarification). Your lowest take-home exam score will be dropped. The final exam will be a take home exam with the same rules.

Homework

There will be weekly homework assignments done through crowdmark:

app.crowdmark.com

Homework solutions should be written up clearly and in detail.

Collaboration: You may discuss the homework verbally with other students provided you have already given the homework a serious attempt. If you have already solved a problem and someone asks you about it, then any help you provide should consist of hints or suggestions and never complete solutions. In particular, homework should be written up independently and it should not be possible to tell who worked with whom. Do not search or post requests for solutions to HW. Do not post any course materials online. You may always post questions about homework via canvas discussions.

Homework Score

...will be computed as follows. If there are 10 homework sets with scores $a_1 \geq a_2 \geq \cdots \geq a_{10}$ then your final score will be

$$\frac{9a_1 + 8a_2 + \cdots + 2a_8 + a_9}{45}$$

In particular, your lowest score is dropped.

Grade breakdown

Homework exams: 60%
Take-home exams: 20%
Final exam: 20%
Letter grade breakdown: A+=(97,100], A=(93,97], A-=[90,93], similar for B,C,D, F=[0,60).

Course plan

Chapter I: Combinatorial structures and ordinary generating functions.
Chapter II: Labelled structures and exponential generating functions.
Chapter III: Combinatorial parameters and multivariate generating functions.
Chapter IV: Complex analysis, rational and meromorphic asymptotics
Chapter VI: Singularity analysis of generating functions
Chapter VIII: Saddle-point asymptotics
Chapter IX: Multivariate asymptotics and limit laws

Health Related information

If you become sick during the semester please let me know as soon as possible so we can make accommodations.