# Math 271: Free probability, random matrices and random partitions

January 19, 2021

We will discuss some fundamental aspects of free probability theory, and its connections/applications to random matrix theory. In the last part of the course, I will discuss the asymptotic representation theory of unitary groups and related topics of current research interest.

**Course meeting times:** The course will meet twice per week, Tuesdays and Thursdays between 1:30 – 2:45pm EST. The first class meets on Tuesday, Jan 26. All of the lectures are in the Zoom link:

`https://harvard.zoom.us/j/91382989516?pwd=SHl5WGtYbUQyZWgrSU5nOVErSGhzUT09`

**My contact information:**
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My office hours will probably be on Tuesdays between 3:30 – 4:30pm EST. These times (or replacements) will be confirmed during the first week of classes. All of my office hours are in the Zoom link:

`https://harvard.zoom.us/j/93632893663?pwd=RGpDWDVwSnZlY2dOV2tzZklvbGNHdz09`

**Course website:** The course website will be the Canvas website for Math 271:

`https://canvas.harvard.edu/courses/79145`

but I don't expect to use it much.

**Syllabus:** I hope to cover most of Chapters 1 – 5 from the textbook:
*James A. Mingo, and Roland Speicher. Free probability and random matrices. Volume 35. New York. Springer, 2017.*
This will be complemented by material from other research articles or books, especially towards the end of the course. I will give the references during class.

**Assignments:** If you need a letter grade for the course, you will need to complete a few assignments throughout the class (currently, I'm planning on 3 homework sets).

Since this is a topics class, I want to be flexible, especially for those of you who do research on random matrix theory or related areas. If you prefer to do something other than homework, let me know and we can think of something else, e.g. you can read a couple of papers on a topic that interests you and present it to the class, or write up a summary.

Lastly, if you're a PhD candidate in Mathematics at Harvard, who has already passed his/her qualifying exams, then you don't need to submit anything (but you're welcome to do as much as you want).

If you do the homework, you have to submit it as a pdf file. That means that if you type your homework, you must convert the file into a pdf before submitting it. If you write your solutions by hand, you will have to scan it first and then submit the pdf. Please use a scanner or a scanner app, if you have a smartphone — a recommended one is Fast Scanner:

`https://www.coolmobilesolution.com`