

SYLLABUS FOR M8803 – GRADUATE TOPICS COURSE IN CONCENTRATION OF MEASURE PHENOMENON AND CONVEXITY

Course Number and Name: Math 8803, graduate topics course in Concentration of measure phenomenon and convexity, Fall 2023.

Course website: All the relevant information will be posted on the course webpage: <https://glivshyts6.math.gatech.edu/Conc-course.html>.

Lecture: MW 9:30-10:45am, Skiles 006. In extreme circumstances one may alternatively attend online: <https://gatech.zoom.us/j/96455139758>, but students are generally expected to attend in-person.

Instructor: Galyna Livshyts; office: Skiles 108C; e-mail: glivshyts6@math.gatech.edu.

Office hours: Monday 3-5pm online via Zoom: <https://gatech.zoom.us/j/96635274506> or in-person by appointment.

Prerequisite: Recommended: Math 6337 (Measure and integration theory); Math 6241 (Probability I).

Recommended textbooks and resources: the resources topic by topic are listed on the class schedule: <https://glivshyts6.math.gatech.edu/Concentration-schedule.pdf>. Here is also a more detailed list of relevant books:

1. Artstein-Avidan, Giannopoulos, Milman, Asymptotic Geometric Analysis part 1, 2015.
2. Bakry, Ledoux, Gentil, Analysis and Geometry of Markov Diffusion Operators, 2014.
3. Artstein-Avidan, Giannopoulos, Milman, Asymptotic Geometric Analysis part 2, 2022.
4. Vershynin, High-Dimensional Probability, 2018.
5. Bogachev, Gaussian measures, 1998.
6. Milman, Schechtman, Asymptotic Theory of Finite-Dimensional Normed Spaces, 1986.
7. Pisier, The Volume of Convex Bodies and Banach Space Geometry, 1989.
8. Brazitikos, Giannopoulos, Valettas, Vritsiou, Geometry of Isotropic Convex Bodies, 2014.
9. Ledoux, The Concentration of Measure Phenomenon, 2001.
10. Villani, Topics in Optimal Transportation, 2003.

Homework: The problems will appear here throughout the semester, please keep checking the file for new problems (although you will be notified when some new problems appear): <https://glivshyts6.math.gatech.edu/Concentration-HW.pdf>.

Important dates: Last day to make schedule changes – August 25 by 4pm
Last day to withdraw with W – October 28 by 4pm

Grading: The grade for this class will be based on completing 5 points from the home works <https://glivshyts6.math.gatech.edu/Concentration-HW.pdf> (therefore, the majority of the problems will be optional).

The letter grades will be based on the standard cut offs: A 90-100%, B 80-89%, C 70-79%, D 60-69%, F 0-59%.

Attendance and electronics: You are expected to attend all the classes and to arrive on time. Please be respectful of your peers and keep your phones in silent regime and out of reach during class unless it is a serious emergency.

Academic Honesty: All students are expected to comply with the [Georgia Tech Honor Code](#). Any evidence of cheating or other violations of the Georgia Tech Honor Code will be submitted directly to the Dean of Students.

Learning outcomes: Basic convexity methods, Brunn-Minkowski inequality, Isoperimetric inequality, concentration for Lipschitz functions, Blaschke-Santaló inequality, Brascamp-Lieb inequality, B-theorem, Ehrhard inequality, Gaussian concentration, Gaussian isoperimetry, Log-Sobolev inequality, Poincaré inequality, method of convex localization, method of mass transport, L₂ method, Semigroup method, Stochastic Calculus method.

Material covered: <https://glivshyts6.math.gatech.edu/Concentration-schedule.pdf>

Remarks: This syllabus is a subject to minor changes during the semester.