

# Limit theorems and large deviation theorems of probability, Spring 2024

NEPTUN CODE: **BMETE95MM10**

SPECIFICATIONS: 5 credit course;  $2 \times 90$  minutes per week

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WEBPAGE: [www.math.bme.hu/~rathb](http://www.math.bme.hu/~rathb), LANGUAGE OF LECTURES: English

DATES AND TIMES: see Neptun OFFICE HOURS: see webpage

## LECTURE NOTES:

- Prof. Bálint Tóth's typed lecture notes (see webpage)
- I will also post my hand-written lecture notes on the course web-page.

PREREQUISITES: We will routinely use basic facts of calculus and probability theory and assume that students already took an introductory course on these topics.

## COURSE OUTLINE:

- 1) Large deviations, Cramér's theorem, Hoeffding's inequality
- 2) Weak convergence of probability measures
- 3) Limit theorems with bare hands (e.g., arcsine laws for simple random walk)
- 4) Method of characteristic functions
- 5) Lindeberg's theorem (with applications)
- 6) Stable distributions and related limit theorems

MIDTERM: There will be two 45 minute midterm exams during (or maybe right after) the regularly scheduled class on *March 27* and *May 15*.

HOMEWORK ASSIGNMENTS: Weekly homeworks will be assigned, collected and graded. In total, there will be 9 homeworks. Homeworks that are handed in late will not be accepted. Handing in homeworks via e-mail (in PDF format!) is acceptable, but paper format is preferred – e.g., if you cannot hand in your solution personally, send it via e-mail by the homework deadline, but you will make the grading much easier for me if you hand in the same solution on paper a few days later. Thank you!

CLASS PRESENTATIONS: Students will be required to solve exercises at the blackboard. I will notify students via email well in advance about the exercise that they will solve.

GRADING POLICY: The students are required to collect 40% of the homework marks and 40% of the midterm (or the make-up midterm) marks for both midterms in order to enter the final exam. The students are required to collect 40% of the final exam marks in order to pass the course.

### *Ingredients of the final grade:*

50% : Final exam grade  
15% : First midterm grade  
15% : Second midterm grade  
15% : Weekly homework grade  
5% : Class presentation grade

### *Calculation of the final grade:*

0 – 39% : insufficient (1)  
40 – 54% : sufficient (2)  
55 – 69% : satisfactory (3)  
70 – 84% : good (4)  
85 – 100% : excellent (5)