

MC738 - Algoritmos Probabilísticos / Randomized Algorithms - 2019

Prof. Flávio Keidi Miyazawa

Informations about the course

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- [Knuth talking about Randomized Algorithms](#) (made available by [Hsueh-I Lu](#))
- [Theoretical Computer Science Cheat Sheet](#) by [Steve Seiden](#)
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• Links about randomized algorithms

- [Wikipedia](#)

• Topics

- Basic concepts in probability.
- Moments and Deviations.
- Tail Inequalities.
- Ball, Bins and Random Graphs.
- The Probabilistic Method.
- Markov Chains and Random Walks.
- Applications in graphs, data structures, optimization, game theory, etc.

• Classes

Tuesday and Thursday, from 16:00 to 18:00.

● Evaluation

- The final grade is calculated from grades T , A and L .
- The grade T is the average score of six small tests (one for each given chapter).
- The grade A is obtained from two parts. One part, corresponding to 80% of the grade A , is obtained from the oral presentation and short text detailing the contents of the presentation, about a paper using the techniques considered in the course. The second part, corresponding to 20% of the grade A ; is obtained from the average grade of tests for each presentation.
- The grade L is the average score of six lists of exercises. To obtain the score of a list of exercises, the professor will correct the same exercise of the list (randomly selected) for all students.
- The final letter grade is obtained converting the numerical value N , where $N=(2T+A+L)/4$, using the following table conversion.

Value of N	Final grade
$N \geq 8.5$	A
$7.0 \leq N < 8.5$	B
$5.0 \leq N < 7.0$	C
$N < 5.0$	D

● Important dates

- Tests: will occur in the next class after the deadline of the corresponding list of exercises.
- Lists of exercises: at least one week after the list is published.
- Presentations: Will occur in the last two weeks of the course.

● Bibliography

- To learn about proof techniques and other aspects of discrete mathematics
 - Daniel J. Velleman . [How to Prove it: A structured approach, Second edition](#), 2012.
 - G. Polya . [How to Solve it: A New Aspect of Mathematical Method, Second Edition](#), 1973.
 - E. Lehman, F.T. Leighton, A. R. Meyer . [Mathematics for Computer Science, 2012](#).
 - A. Gomide, J. Stolfi. [Elementos de Matemática Discreta para Computação, 2014](#).
 - K. H. Rosen. [Discrete Mathematics and its Applications](#).
 - S. Seiden. [Theoretical Computer Science Cheat Sheet](#) by Steve Seiden
- A good book to learn probability
 - Dimitri P. Bertsekas and John N. Tsitsiklis. [Introduction to Probability, 2nd Edition](#), 2008.
- M. Mitzenmacher and E. Upfal. Probability and Computing : Randomized Algorithms and Probabilistic Analysis. Cambridge University Press, New York (NY), 2005. [Errata of the first printing](#), [second printing](#). **This is the main book used in this course.**

- R. Motwani and P. Raghavan. Randomized Algorithms, Cambridge, 1995.
- J. Michael Steele. Probability Theory and Combinatorial Optimization, SIAM, 1997.
- V. Vazirani. Approximation Algorithms. 2001. Springer-Verlag.
- D.S. Hochbaum (ed). Approximation Algorithms for NP-Hard Problems, PWS Publishing Company, 1997.
- Papers on the subject.

