Study Guide for Probability Theory Exam

MATHEMATICAL FOUNDATION OF PROBABILITY IS ASSUMED:
Random variables (r.v.s), expectation and higher moments of r.v.s, Fatou's lemma, monotone and dominated convergence theorems; inequalities of Markov, Chebyshev, Holder, Minkowski, and Jenson.

Convergence; Distribution Functions and Characteristic Functions:

Weak convergence of probability measures, Alexandrov theorem, tightness and weak compactness, Prohorov theorem
Infinitely divisible distribution and Levy-Khintchine representation.

References: [1,3,4,5]

Laws of Large Numbers

Sums of independent r.v.s, Khintchine-Kolmogorov theorem
Kolmogorov's Three-series and Two-series theorems
Weak and Strong laws of large numbers

References: [1,2,3,4,5]

Central Limit Theorems

Various central limit theorems and rates of convergence
Convergence in distribution to infinitely divisible distributions

References: [1,2,4,5]

Discrete-time Martingales

Martingales and semimartingales
Doob's inequalities (including upcrossing inequality)
Optional sampling and convergence theorems

References: [1,2,4,5]

References

[1] K.L. Chung: *A Course in Probability Theory*, 2nd Edition, Academic Press, N.Y., 1978.
[2] Y.S. Chow and H. Teicher: *Probability Theory*, 2nd Edition, Springer-Verlag, N.Y., 1988.
[3] B.V. Gnedenko and A.N. Kolmogorov: *Limit Distributions for Sums of Independent Random Variables*, 2nd Edition, Addison-Wesley, Massachusetts, 1961.
[4] R.G. Laha and V.K. Rohatgi: *Probability Theory*, John Wiley, N.Y., 1979.
[5] A.N. Shiryayev: *Probability*, Springer-Verlag, N.Y., 1984.