

PREFACE

This is, as appears in the title, a course for the "Applied Mathematics" section. Its main purpose is to construct and study examples of stochastic processes.

In order to have room for more details, we limited ourselves to homogeneous Markov processes with continuous time and at most denumerable state space, even to so called "minimal" ones. We give several characterizations of these processes in 9.4, 9.5, 16.2, 16.3 together with the corresponding applications.

In 18.2 we indicate a way to more general such Markov processes, which are not constant after an accumulation of jumps or which have such accumulations from the right.

We have a special chapter devoted to Poisson process, in order to avoid them being overshadowed in the minds of the students by more general ones.

§6 (the most mathematically pretentious one), on Poisson random measures, is motivated by applications as that in 13.6.

Other applications are the queuing processes in §17 (in which we gave a complete proof of the fact that some of them are homogeneous Markov in 10.3), the coalescent in 16.6, 16.7. About Poisson processes there are some problems inviting the reader to understand their occurrences in every day life (12.6, 12.7, 12.11), the use of the strong Markov property (12.4). The

compound Poisson processes appear in the corresponding chapter in view of their applications in describing traffic phenomena (12.8, 12.10).

The seminar problems do not pretend to completeness. Since the topic "invariant measures" relies on the same one about homogeneous Markov chains (presented in the preliminary chapter in §2), we placed it in the "seminar". Also the (rather tricky) deduction of the forward Kolmogorov differential equations is "moved" to the "seminar".

§3 about general stochastic processes is a must for such a course which is the first one; but we insisted on the material from §5 (the Poisson process) on. At the beginning one gets an idea about the construction of processes with sample paths in a certain class (5.2) and of the use of the Kolmogorov theorem in constructing processes (4.4).

We insisted in making the book completely mathematically rigorous and self contained; the preliminary chapter contributed to it.

There are many books devoted to the topics in this one. The choice of the material here does not coincide with any of those we know, so a bibliographical list will be long and necessarily accompanied by long comments.