

Title: STOCHASTIC MODELS AND METHODS

Aim: The aim of this short course is to introduce the students to the world of the probabilistic modelization. Instead of developing systematically a single topic we will illustrate a bunch of models and techniques. Depending on time and the interest the number of topics may change.

Duration: 6 hours divided into 3 lectures

Arguments: The arguments developed during the course will be a suitable selection of the following ones. The choice may depend on the interests of the students

MODELS: Bernoulli schemes, random graphs, percolation, Markov chains, Particle systems, Ising model, point processes

METHODS: Coupling, the probabilistic method, large deviations, Monte-carlo method, scaling limits, entropy

Program: A possible effective program may be the following:

LECTURE 1: Bernoulli schemes, fluctuations, large deviations

LECTURE 2: Markov chains and the Montecarlo method

LECTURE 3: Particle systems and coupling

Bibliography: Some basic reference texts are the following:

G. Grimmett *Probability on graphs*

D. A. Levin, Y. Peres, E. L. Wilmer *Markov chains and mixing times*

F. den Hollander *Large deviations*

T. M. Liggett *Continuous time Markov processes: an introduction*

B. Bollobas *Modern graph theory*

T. M. Cover, J. A. Thomas *Elements of information theory*

Extended abstract: To be done