

# APM541 – Stochastic Modeling

## Contact information

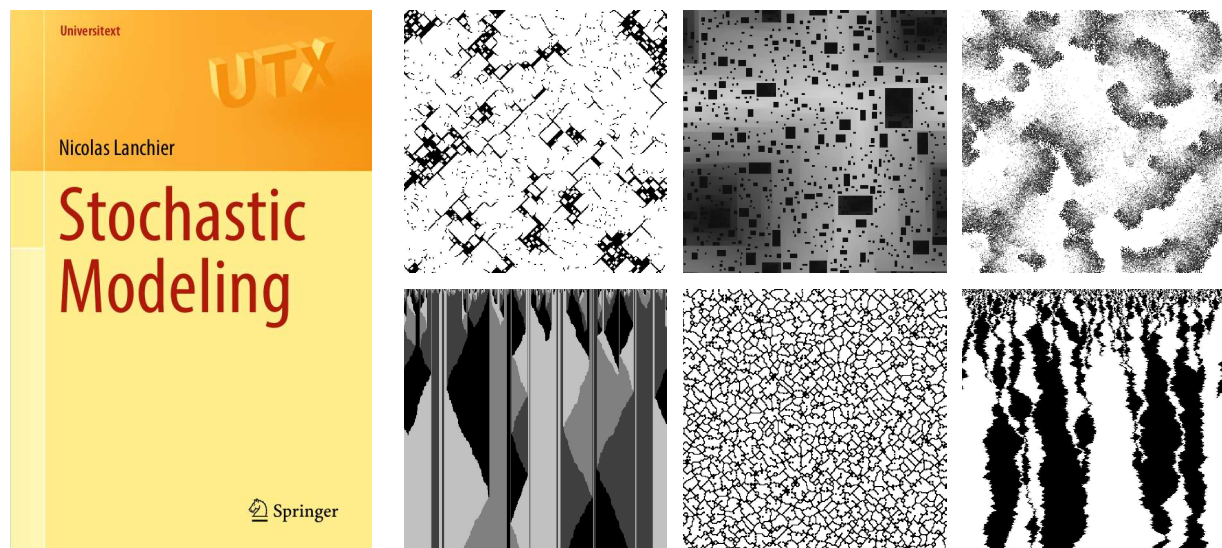
Instructor: Nicolas Lanchier (WXL R 628)

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Zoom: <https://asu.zoom.us/j/2978224465>

Time and location: Fall 2023, TTh from 12:00PM to 1:15PM, Tempe WXL R A111

**Course description:** This course starts with a brief overview of measure theory, and covers the main concepts of modern probability: random variables, conditional expectation and conditional probability, law of large numbers, and central limit theorem. Then, we will cover all the traditional topics of stochastic processes: martingales, branching processes, discrete-time Markov chains, random walks, Poisson (point) processes, continuous-time Markov chains, and queueing systems. The second half of the semester will deal with special stochastic models in physics, biology, and sociology: the logistic growth process in population ecology, the Wright-Fisher model and Kingman's coalescent in population genetics, bond and site percolation models in physics, the contact process in epidemiology, and the voter model in sociology. The course will also explain how to simulate these stochastic processes and create pictures like the ones below.



**Textbook:** My own book (Lanchier. Stochastic Modeling. *Springer, Cham*, 2017) that I wrote especially for this class. The students will receive the PDF file of the book along with some Beamer presentations and links to YouTube videos at the beginning of the semester.

**Prerequisites:** Undergrad probability class like STP421 or instructor approval.

**Grading:** No homework or exams. The grade will be based on a final project (about 5 pages not including simulation programs/pictures or bibliography) due the last day of class and on the topic of your choice but using some of the material covered in class. In case you are a Ph.D. student, the topic can be related to your Ph.D. in which case you are welcome to include your project for the class to your dissertation if your advisor thinks it is appropriate.