Crash course on numerics for SDEs

Course Description.
The recent years has seen a growing interest in stochastic modeling as stochastic differential equations (SDEs) started to play a more and more important role in divers branches of science and industry. This includes, for instance, applications areas from biology (population growth models), mechanics (Langevin equation), or finance (Cox-Ingersoll-Ross model). Furthermore, as exact solutions to SDEs (basically an ordinary differential equation with the right hand side perturbed by a white noise) are rarely known, one must simulate SDEs numerically. It is therefore essential to understand basic concepts of convergence of numerical methods for SDEs.

The mini-course is designed to give a concise and accessible introduction to numerical discretisations of stochastic differential equations (SDEs). We assume only a basic competence in calculus and probability theory. Topics: Basics of stochastic processes and SDEs. Numerical methods for SDEs. Strong and weak convergence. Applications. Computer labs.

Main References.
The mini-course is inspired by some parts of the following references:

E. Allen: *Modeling with Itô stochastic differential equations* (introductory text)

L.C. Evans: *An introduction to stochastic differential equations* (lecture notes based on a book with the same name),
https://pdfs.semanticscholar.org/d66c/a1516e1a9a9247f94841ccfbb262cf26d5e4.pdf

D.F. Griffiths and D.J. Higham: *Numerical methods for ordinary differential equations* (some chapters offer a nice introduction to stochastic differential equations),
http://www.springer.com/gp/book/9780857291479

D.J. Higham: *An algorithmic introduction to numerical simulation of stochastic differential equations* (very nice and accessible reference for matlab implementation),
http://dx.doi.org/10.1137/S0036144500378302

P.E. Kloeden and E. Platen: *Numerical Solution of Stochastic Differential Equations* (classic reference on the subject),
http://www.springer.com/us/book/9783540540625

G.N. Milstein and M.V. Tretyakov: *Stochastic Numerics for Mathematical Physics* (classic reference on the subject),
http://www.springer.com/gb/book/9783540211105

B. Øksendal: *Stochastic Differential Equations: An Introduction with Applications* (classic reference on the subject),
http://th.if.uj.edu.pl/~gudowska/dydaktyka/Oksendal.pdf