Instruction for the paper in the area of computational systems biology

For this area, three papers are given: One on simulation methods; one on a small synthetic biology system; and one on design principles of biological systems and the corresponding methods to conduct analysis on them.

In your write up, please first summarize the major contribution of each paper (one page per paper). Then please demonstrate that you can apply these methods to build an interesting biological model, simulate it and analyze it. Please follow these steps:

1. Write a simulation code (in either Matlab, Java, or C) to implement the SSA and the tau-leaping method (Paper 1). You may decide which solver option you'd like to use and please give a brief explanation for your choice.
2. Apply your simulation code to the Toggle Switch model (paper 2). Please note that the original model was written as a differential equation model. You need to first convert it to a discrete stochastic model and then apply your simulation code. Please generate plots from your simulation results and demonstrate features that stochastic models are different from deterministic models.
3. This is a difficult step and you may want to check papers referenced in paper 3. Using the toggle switch as a basic component, please extend it to an oscillation model. You may want to add one or two new species that can regulate the toggle switch. There are some ideas and practical examples provided in paper 3.