

# SSIE-523

## Take-Home Final Exam

**Due: 12:00pm (noon) Friday December 16th, 2016**

**Provide answers to the questions given in the following page. Write your answers in a concise, single PDF document (2 pages maximum, excluding the cover page) and submit it through the TurnItIn Assignment page on the Blackboard by the deadline given above. **No late submissions will be accepted.****

**NOTE: You MUST carefully read, understand, then include in the cover page, the following honor statement:**

*I hereby declare that I have prepared the answers provided in this report all by myself. I did not seek any help or hint from any other person, either offline or online. I fully understand that if any substantial part of my answers are found to be too similar to answers of other students in class, or to be plagiarized from any other offline/online materials, then I will receive a zero point for this midterm exam and I will also be subject to further investigation and disciplinary actions according to the Watson School's and the University's code of academic honesty and other regulations.*

**Any submission that does not have this statement will be rejected.**

**You can use your computer, Python, and/or any other programming language if needed. You can look at the textbook, the course slides, and any other offline/online materials to develop your answers. **However, you must provide full reference information of such materials if you used them.****

**If you need clarifications about these problems, email the instructor (sayama@binghamton.edu). No response will be given to questions that directly or indirectly seek answers to the exam problems.**

Choose one of the following phenomena:

- A. Marine pollution by a toxic chemical released from human activity and its accumulation through the food web in the marine ecosystem
- B. Spread of a computer virus on the Internet and the adoption of a countermeasure in response to it (e.g., installing new security patches)
- C. Evolution of various languages in different geographical areas through the world history

Then answer the following questions. (30 points total)

- Q1. What kind of modeling framework would you use to model the chosen phenomenon (e.g., cellular automata, agent-based models, partial differential equations, networks, or their hybrids), and why? (3 points)
- Q2. What are the components of the system? (3 points)
- Q3. What kind of dynamical states can each component take? (5 points)
- Q4. How do those components interact with each other? (5 points)
- Q5. How specifically do the states of the components change over time? You can answer this using equations, algorithms, description of procedures, etc. (8 points)
- Q6. What would be potential applications of your model? (3 points)
- Q7. What are the limitations of your model, and how could they be addressed in the future work? (3 points)

Note: No need to do literature review, data collection, justification or validation of your model in answering these questions. A toy model with very simplistic assumptions is perfectly acceptable, as long as the model captures the key feature of the chosen phenomenon you want to capture.