Class schedule: Algebraic Biology, 2020

WEEK 1

Monday. Course overview. Lecture on *What is algebraic biology?* slides.

READ The case for algebraic biology, from research to education, by Macauley and Youngs.

Tuesday. Lecture on *Modeling the lac operon in E. coli*, pp. 1–18.

READ Robeva/Hodge, Chapter 1: *Mechanisms of Gene Regulation: Boolean Network Models of the Lactose Operon in Escherichia coli*, by Robeva, Kirkwood, and Davies.

Wednesday. Lecture on *Modeling the lac operon in E. coli*, pp. 19–33.

Thursday. Lecture on *Modeling the lac operon in E. coli*, pp. 34–45, and *Local models and finite dynamical systems*, p. 1–6.

Friday. Finish reading the section of *Local models and finite dynamical systems*, pp. 7–23.

WEEK 2

Monday. No lecture.

READ Robeva/Macauley, Chapter 4: *The Regulation of Gene Expression by Operons and the Local Modeling Framework*, by Macauley, Jenkins, and Davies.

Tuesday. Lecture on *Chemical reaction networks*, pp. 1–7. HW 1 due.

READ Robeva/Hodge, Chapter 2: *Bistability in the Lactose Operon of Escherichia coli: A Comparison of Differential Equation and Boolean Network Models*, by Robeva and Yildirim. Section 2.3 only.

Wednesday. Lecture on *Chemical reaction networks*, pp. 8–10, and *Bistability in ODE and Boolean models*, pp. 1–8.

READ Robeva/Hodge, Chapter 2, Sections 2.1–2.2.

Thursday. Lecture on *Bistability in ODE and algebraic models*, pp. 8–28.

READ Robeva/Hodge, Chapter 2, Section 2.4.

Friday. Lecture on *Dilution, degradation, and time delays in algebraic models*, pp. 1–18.

READ Robeva/Hodge, Chapter 2, Section 2.5.

WEEK 3

Monday. Lecture on *Reduction of algebraic models*, pp. 1–14.

READ Robeva, Chapter 6: *Steady state analysis of Boolean models: A dimension reduction approach*, by Veliz-Cuba and Murrugarra.

Tuesday. Lecture on *Reduction of algebraic models*, pp. 15–18, and *Reverse engineering the wiring diagram*, pp. 1–11. HW 2 due.

READ Robeva/Macauley, Chapter 6: *Inferring interactions in molecular networks via primary decompositions of monomial ideals*, by Macauley and Stigler, pp. 175–198.

Wednesday. Lecture on *Reverse engineering the wiring diagram*, pp. 11–26

READ Robeva/Macauley, Chapter 6: *Inferring interactions in molecular networks via primary decompositions of monomial ideals*, by Macauley and Stigler, pp. 198–210.

Thursday. Lecture on *Reverse engineering the wiring diagram*, pp. 26–39, and *Reverse engineering the model space*, pp. 1–10.

Friday. Lecture on *Reverse engineering the model space*, pp. 11–28.

READ Robeva/Hodge, Chapter 3: *Inferring the topology of gene regulatory networks: an algebraic approach to reverse engineering.* By B. Stigler and E. Dimitrova, pages 75–100.