

# Teaching Systems Biology of the Circadian Clock with Journal Articles and Matlab

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I will describe a two course sequence that I teach in the computer science department at a small liberal arts college. The goal of the first course is to introduce students to the basics of mathematical modeling of biological systems. Students study topics including 1) modeling kinetics with ordinary differential equations, 2) motifs in biological systems, 3) numerical solution of ODEs, 4) parameter-fitting through optimization to match model output to data, and 5) parametric sensitivity analysis. To provide a theme, all projects are centered on the gene regulatory network controlling the circadian clock. Student read relevant journal articles, present them in class, and write Matlab code related to the topics in the course as well as to several of the articles. In the second course, students spend a semester extending the work of a recently published journal article. In this course, they engage in a literature search, design Matlab programs, and, in many cases, analyze circadian time-course data. By the end of the two courses, students are able to relate the mathematics to the biology in a meaningful way.