This is a required course for all bioengineering graduate students. The objective is to introduce/review mathematical methods common in bioengineering research in the context of biological system modeling. Assignments involve combinations of mathematical and numerical modeling in Matlab. Course grade is based on performance on homework (25%), weekly quizzes (50%) and modeling project (25%).

- Review of matrix algebra and Matlab
- Linear systems, convolution, Laplace and Fourier transform analysis
- Probability review: continuous and discrete random variables
- Expectation, conditional pdfs, Bayes’ theorem, functions of RVs
- Statistical design: hypothesis testing, error analysis, ML estimation
- Random processes in linear systems
- Mathematical representation of biological data
- ODE modeling of biological compartments, radioactive decay, blood flow
- Curve fitting, least squares methods, linear prediction
- Task-based performance assessments, ROC analysis, SNR
- Instrumentation design and evaluation using linear systems analysis
- Individual modeling project design: examples and planning
Resources:

Engineering Workstations are available throughout the College of Engineering buildings. For locations and hours see:  http://ews.uiuc.edu/labs/

The EWS User Guide including tutorials can be found at http://ews.uiuc.edu/userguide/

A nice listing of application software available in Window can be found at http://ews.uiuc.edu/ews-s/software/software.cgi?category=winapps