Mathematical and Computational Biology II

(Math 227B, Winter, 2019, MSTB122, 11am. Office hour: 10-11am WF)

Qing Nie and John Lowengrub

Part 1 (Nie)

Grading is based on 1) 3-4 sets of homework; 2) one project; and 3) attendance.

1) Errors and foundation of computing
2) Approximations to functions and integrals
3) Solving nonlinear equations (bisection, fixed point theorem, Newton's method)
4) Numerical methods for initial value ODE systems: order of accuracy and stability
5) Stability regions: explicit and implicit methods
6) Applications to systems biology

Part 2 (Lowengrub)

Grading is based on 1) Homework assignments (including a final project) and 2) Attendance

- Methods for reaction-diffusion equations
- Turing instability and patterning
- Numerical methods for reaction-diffusion systems
    1. Finite difference methods
    2. Finite element methods
    3. Von Neumann stability analysis
    4. Iterative methods for solving linear and nonlinear systems
- Applications to morphogen patterning/Turing instabilities
- Application to tissue growth