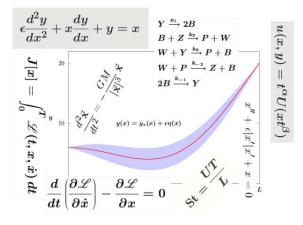# MATH 577: Mathematical Modeling

Spring 2025 [6595]
Prof. Thomas Witelski
Mon, Wed 1:25-2:40 pm   Room 235 Physics Bldg
`http://www.math.duke.edu/~witelski/577`

A course on analytical methods for math models
for students in applied math, engineering, and the applied sciences

Applications:

- **Mechanical systems, control theory**
- **Continuum mechanics, heat transfer, fluid flow**
- **Bio-chemical reactions**

Mathematical methods:

- **Dimensional analysis, non-dimensionalization**
- **Similarity solutions, traveling waves**
- **Perturbations methods, boundary layers, multiple-scales**
- **Calculus of variations**

Prerequisites:

Undergraduate-level background in ordinary differential equations (Math 353 or 356), basic physics (mechanics), and multi-variable calculus.

Textbook:　*Applied Mathematics*, **J. D. Logan, 4th edition, 2013.**