

SciComp@UNC Courses

1. Undergraduate courses

1.1. Differential equations (MATH383, MATH528)

- [Exact differential forms](#): definition and *Mathematica* examples
- [Direction fields and phase portraits](#): definition, Maxima examples and plots
- [Commented test solutions](#)
- [Webinar on differential systems](#): Infection screening clinics; Susceptible, Infectious, Recovered model; Coupled oscillators
- [Homework on first-order differential equations](#): mathematical typesetting, Maxima verification of solutions

1.2. Linear algebra (MATH547, MATH547DS)

- [Matrix spaces](#)
- [Least squares](#): normal equations, polynomial interpolation with Octave examples
- [Singular Value Decomposition](#)
- [Concept synopsis](#)

1.3. Modeling (MATH564, MATH590)

- [Modeling reproduction](#)
- [Stochastic model theory](#)
- [Topology used in cell type identification](#)

2. Graduate courses

2.1. Scientific computation

- [Finite difference formulas](#): embedded *Mathematica* generation, analysis
- [Gibbs phenomenon in shock propagation](#)
- [Eigenvalue problem](#): theory, webinar showing simple cytoskeleton model construction

2.2. Continuum mechanics

- [Tensors](#)
- [Large deformation theory](#)
- [Elastic media](#)

2.3. Kinetic models

- [Theory of lattice Boltzmann methods](#): *Mathematica* evaluation of moments, Hermite polynomial expansions