常微分和偏微分方程数值解法，Numerical methods for ordinary and partial differential equations, 3, Spring semester, Department of Mathematics, Undergraduate, Lei Zhang,

1, Numerical method for ordinary differential equations, Euler method and its convergence proof, truncation error, consistency and stability, multistep method, Runge-Kutta method, symplectic method
2, Finite difference method for elliptic problems, consistency and convergence, higher order finite difference method, treatment of curved boundary.
3, Finite element method for elliptic problems, variational formulation, Lax-Milgram theorem, error estimate for conforming finite element
4, Finite difference method for time dependent problems, Lax equivalence theorem, consistency, stability, convergence, truncation error, CFL condition, Fourier stability analysis, von Neumann condition, maximum principle, amplitude and phase errors, group velocity, modified equation analysis, Fourier and eigenvalue stability of systems
5, Possible selected topics: Fast Fourier transform, multiscale finite element methods for elliptic problems with multiscale coefficients, level set methods for multiphase flows, boundary integral methods, fast summation algorithms, pseudo-spectral and spectral methods.

Prerequisite: ordinary differential equation, introduction to partial differential equations, introduction to numerical analysis,