2 - Heat Equation, Brownian Motion Interpretation, 1D gas

3 - The continuum limit (heat eq)

4 - Taylor formula, Heat (Diffusion) Equation, advection diffusion, Fokker–Planck equation

5 - Wave Equation (Discrete model)

6 - The continuum limit (wave eq)

7 - Solving PDEs

8 – Fundamental solution (heat eq)

9 – Heat IVP solution, Convolution integral, IVP ( heat eq)

10 - The Transport Equation, Traveling waves

11 - The nonhomogeneous Transport IVP

12 - Wave eq, d'Alambert's Formula

13 - Linear IVPs and the Fourier Transform

14 - Heat eq IVP example

15 - Lp spaces, dense in Lp, L2 is a hilbbert space, Brezis

16 - Convolution product and the Fourier Transform, fundamental property of convolution, inverse

17 - Fundamental properties of f, plancherel

18 - The Fourier Approach, heat ivp, apply fourier

19 - Heat Kernel

20 - Linear PDEs in bounded(spatial) domains, Heat Initial Boundary Value Problem, Dirichlet Boundary Condition, heatflow

21 - Fourier Approach with BC

23 - eigenvalue

24 - Classical Dirichlet BVP

25 - Classical integral calculus results, Divergence (Gauss-Ostrogradski), Green's Formula, Gauss

26 - Harmonic functions with radial symmetry, Riemann-Green Formula

27 - Mean Value for Harmonic functions, The Strong Maximum Principle, The Weak Maximum Principle

28 - Boundary Value, Poisson Formula, Dirichlet fresh Idea

29 - Dirichlet energy functional, The Dirichlet Principle

30 - Courant's CounterExample, Modern theory 3 reasons

31 - Weak (Generalized) solutions, Sobolev, H01(omega), Hilbert space, the energy norm

32 - Poincare Inequality, Dirichlet Principle in H01, Existence & Uniqueness of a weak sol

33 - Riesz

34 - Wave, Damped Wave, Visco-elasticity(linear), Visco-capillarity(1D), Euler-Bernoulli Beam, wave equations on omega bounded

35 - Reaction Diffusion, Fisher KPP, Allen-Cahn, Fisher's model(spatially distributed), classical population models, malthus, Verhulst

36 - Fisher's Eq

37 - Travelling wave sols for fisher eq, TWS, Logan

39 - Reaction diffusion Eq & systems,Examples: Allen-Cahn Eq, Brusselator system, GRDE(general raction diffusion equilibria), Equil

40 - Lyapunov Theory, state space(Hilbert space), is an equilibrium for if , strict Lyapunov function

41 - La Salle's Invariance Principle, strict Lyapunov + rel, compact trajectory

42 - Allen-Cahn Model, Neumann BC, equilibrium eq

43 - Allen-Cahn Energy, allen cahn energy is a Lyapunov func

44 – Allen Cahn converge to equilibrium

45 - Turing instability, GRDS(general reaction diffusion system)

46 – Alan turing, turing model

47 - Turing instability, with diffusion, without diffusion

48 – turing instability

49 – turing instability pde system