1) **Basic Scales, Ideas**
   Viscous flow in Cylindrical Geometry
   Viscous Stress

2) **Viscous Stress Model of Accretion in Thin Disk**
   a) Disk structure
   b) Velocity and time scales
   c) Surface density and angular momentum transport
   d) $\dot{M}$, ν, Σ relations, alpha model
   e) Viscous Heating and Luminosity

3) **Dynamics of Accretion**
   a) Relaxation
      - Fixed mass → solid body rotation
      - Accretion → mass to center + 1 particle at large radius end state
   b) Rayleigh
      - 2 particles
      - Interchange at constant angular momentum, each
      - Radial buoyancy
      - Rayleigh Discriminant/Epicyclic Frequency
   c) L-B + P
      - 2 particles → conserve **sum** of angular momentum, mass
      - $\Delta E < 0$ → accretion + angular momentum transport outward → end state
   d) "Donkeys", ala' Lynden-Bell
   e) Elastically coupled particles → to MRI

4) **Crash Course in MHD**
   a) Equations, especially induction
   b) Alfven Theorem, Freezing-in
   c) Stresses, Energetics
   d) Waves, especially Shear Alfven
   e) Magnetic Braking, Torsional Alfven Wave
   f) Virial Theorem for MHD
   g) Partially ionized MHD + Ambipolar Diffusion
   h) Energy Principle (Introduction)

5) **Magnetorotational Instability, Turbulence, Alpha, Saturation**
   a) Basic Physics of MRI, Toy Model of Basic MRI, Connection to Accretion
   b) Detailed Linear Theory MRI — resistivity, partial ionization, viscosity
   c) MRI-Induced Transport:
      - Intro to Mixing Length Theory, Application to MRI

- Alpha scalings and underlying physics issues

d) Open Issues in MRI Turbulence
e) Magnetic Buoyancy in Disks, Parker Instability
f) Magnetized Disk Coronae and Layered Disks, Nanoflares

6) Planetesimal Formation

a) Drag Mechanisms, Epstein-Stokes drag, dust particulate evolution
b) Sedimentation in Turbulence — Fokker-Planck → Subdisk thickness
c) Goldreich-Ward Model, including Toomre stability criterion for subdisk
d) Radical infall
e) Outlook on planetesimal formation

7) Basics of Galactic Dynamics

a) Scales, Phenomena → Collisionless Stellar Dynamics
b) Vlasov-Poisson system
c) Physics of Vlasov Equation
d) Jean Theorems — Weak and Strong
e) Stationary Solutions, mostly spheroidal
f) Jeans Equations, Virial Theorem
g) Landau Damping
h) Violent Relaxation and its foundations in phase mixing

8) Spiral Density Waves

a) Motivation, Lin-Shu Hypothesis
b) Basic Analysis
c) Resonances: Lindblad and Co-Rotation
d) Wave Action and Energy-Momentum Theorems
e) Amplification Mechanisms
f) Spirals and Angular Momentum Transport — return of L-B's "2 particles"
g) Spirals in Vlasov Theory
h) Outlook on spiral structure