Swihart Ch. 8 Main Concepts

Stellar structure equations (hydrostatic equilibrium), central temperature and pressure estimates

Virial theorem, PE and thermal energy U

      Average temperature of star
      Conversion of PE to radiation and internal/thermal energy U
      Contraction rate of star, time for contraction to present size

Nuclear fusion

      Hydrogen burning (H to He), efficiency of conversion
      Minimum temperature for H fusion
      Stellar lifetime estimate from fusion considerations

Main sequence of stars

      Protostar formation, H burning ignition
      Mass-luminosity relation (low-mass and high-mass main sequence stars)
      Evolution of low-mass star to red giant

Degenerate gas (electrons)

      Fermi temperature, Fermi energy, Pauli exclusion principle
      Degeneracy pressure (non-relativistic case)
      White dwarf mass-radius relationship, density
      Chandrasekhar mass, physical origin of mass limit
      Minimum mass of H burning star (degenerate brown dwarf mass upper limit)

High-mass star evolution

      Onion model of shell burning
      Binding energy curve, fusion and fission, Iron limit
      Type II supernovae, energy of supernova radiation and KE of ejecta

Pulsars and neutron stars

      Minimum density for rotational stability
      Neutron star mass-radius relation, density
      Gravitational PE of neutron star and supernova energy, neutrinos
      Pulsar rotational KE and energy loss rate

Black Holes
      Schwarzschild radius
      Gravitational redshift and time dilation