# Unit 1 Energy Generation



# Unit 2 Hydrostatics

# Unit 3 Energy Transport

3.1 Radiation

- 3.1.1 Basics
- 3.1.2 Diffusion: Fick's Law, temperature gradient
- 3.1.3 Frequency dependence of radiation: Rosseland mean opacity
- 3.1.4 Opacity sources
- 3.1.5 Consequences
- 3.1.6 Eddington Luminosity
- 3.1.7 Final tools: introducing '$\nabla$', '$\nabla_{rad}$', and '$\nabla_{ad}$'

3.2 Conduction

3.3 Convection

- 3.3.1 The convective instability: considering $P$ and $\rho$ as a blob is displaced, Schwarzschild criterion
- 3.3.2 Another useful formulation
- 3.3.3 Semiconvection
- 3.3.4 One more useful formulation
- 3.3.5 Physical conditions for convection onset
- 3.3.6 Mixing length theory
- 3.3.7 Convective overshoot
- 3.3.8 Depth of outer convection zones

# Unit 4 The Main Sequence

4.1 Summary of stellar structure

4.2 Homology relations for stars in **radiative equilibrium**

- 4.2.1 Basic idea
- 4.2.2 Dependence on mass
- 4.2.3 Dependence on $T_{eff}$
- 4.2.4 Dependence on mean molecular weight ($\mu$)
- 4.2.5 Dependence on heavy metal abundances
- 4.2.6 Contracting stars in radiative equilibrium
- 4.2.7 Convective stars

4.3 Evolution on the main sequence

- 4.3.1 Low-mass stars
- 4.3.2 High-mass stars
- 4.3.3 A note about *very* low mass stars

4.4 Summary of Main-Sequence properties

# Unit 5 The Post Main Sequence