AY 202 – Radiative Processes

Fundamental processes underlying why we see what we see in astronomy, geared towards graduate students. Applications explicitly treated in class include: 21 cm radiation from hydrogen; thermal radiation from dusty protoplanetary disks; Sunyaev-Z'eldovich effect in galaxy clusters; synchrotron radiation from supernova remnants; cyclotron radiation from giant planets; bremsstrahlung in galaxy cluster cooling flows; and line driving in winds surrounding active galactic nuclei and massive stars.

TOPICS

A. Specific Intensity and Its Moments

B. Optical Depth and the Fundamental Equation for Radiative Transfer

C. Einstein Coefficients and Bound-Bound Absorption Cross-sections

D. Thermal Radiation and Local Thermodynamic Equilibrium

E. Spectral Line Formation and Broadening Mechanisms

F. Grains

G. Radiative Diffusion

H. Bremsstrahlung / Free-Free Absorption

I. Cyclotron and Synchrotron Radiation

J. Compton and Inverse Compton Scattering

K. Semi-analytic radiative transfer techniques: Eddington and the Grey Atmosphere

L. Numerical radiative transfer techniques: Monte Carlo

Required Text
Radiative Processes in Astrophysics by Rybicki & Lightman.

Attached: Problem Set Example with Solutions