

## **Astronomy 150: Radiative Processes in Astrophysics**

**Time:** Tue/Thu, 9:30-11:00AM, Fall 201

**Location:** Classroom (A-101), Center for Astrophysics, 60 Garden Street

### **Course Instructors :**

Professors Daniel J. Eisenstein and Avi Loeb

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### **Teaching Fellow :**

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### **Course Requirements**

*Problem sets* (due every second week): 40% of grade

*Final Exam*: 60%

### **Course Texts**

#### **Required :**

- Rybicki, G. B., & Lightman, A. P. (1979), *Radiative Processes in Astrophysics* (Wiley-Interscience). [Provides a general overview of the fundamental concepts.]
- Loeb, A. (2010), *When Did the First Stars and Galaxies form?* (Princeton University Press). [Describes several research frontiers involving radiative processes in Cosmology.]

#### **Recommended :**

- Schneider, P. (2006), *Extragalactic Astronomy and Cosmology* (Springer). [Provides a comprehensive overview of the rich phenomenology of astrophysics and cosmology, where different radiative processes are realized.]

### **Schedule**

- Sep. 2 (Thu) ..... Specific Intensity and Its Moments [A.L.]
- Sep. 7 (Tue) ..... Fundamentals of Radiative Transfer [A.L.]
- Sep. 9 (Thu) ..... No class, **Rosh Hashanah holiday**

- Sep. 14 (Tue).....Black Body Radiation, CMB [A.L.]
- Sep. 16 (Thu) . Einstein Coefficients, Masers, Eddington Lum. [A.L.]
- Sep. 21 (Tue).....Line Broadening, Curve of Growth [D.J.E.]
- Sep. 23 (Thu) . Maxwell's Equations, Electromagnetic Waves [D.J.E.]
- Sep. 28 (Tue).....Spectrum, Polarization [D.J.E.]
- Sep. 30 (Thu)..... Liénard-Wiechert Potentials [D.J.E.]
- Oct. 5 (Tue)..... Larmor's formula, Thomson scattering [D.J.E.]
- Oct. 7 (Thu).....Special Relativity, Four Vectors [D.J.E.]
- Oct. 12 (Tue)..... Field Transformation [D.J.E.]
- Oct. 14 (Thu)..... Relativistic Beaming [D.J.E.]
- Oct. 19 (Tue)..... Plasma Frequency [D.J.E.]
- Oct. 21 (Thu)..... Faraday Rotation [D.J.E.]
- Oct. 26 (Tue)..... Pair Processes [D.J.E.]
- Oct. 28 (Thu)..... Scattering of Photons by Electrons [D.J.E.]
- Nov. 2 (Tue).....Inverse Compton Radiation, SZ Effect [A.L.]
- Nov. 4 (Thu).....Free-Free Emission (Bremsstrahlung) [A.L.]
- Nov. 9 (Tue)..... Synchrotron Radiation [A.L.]
- Nov. 11 (Thu)..... No class, **Vetern's Day holiday**
- Nov. 16 (Tue)..... Photo-ionization, Strömgren Spheres [A.L.]
- Nov. 18 (Thu)..... Cosmological Recombination [A.L.]
- Nov. 23 (Tue).....Reionization [A.L.]
- Nov. 25 (Thu)..... No class, **Thanksgiving holiday**
- Nov. 30 (Tue)..... The Lyman- $\alpha$  Line in Cosmology [A.L.]
- Dec. 2 (Thu)..... The 21-cm Line in Cosmology [A.L.]