<table>
<thead>
<tr>
<th>Lecture Number</th>
<th>Date</th>
<th>Topic</th>
<th>Associated Readings</th>
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<td>Shown in Lecture: Diagram of Known Galactic Black Holes</td>
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<td>Optional: Complete version of &quot;X-ray Properties of Black Hole Binaries&quot;</td>
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<td>Lecture handout</td>
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<td>Lecture handout on Iron Lines and BH Spin</td>
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<td>Required: &quot;A Gamma Ray Burst at a Redshift z~8.2&quot;, Tanvir et al., Nature 2009</td>
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<td>Required: &quot;The Most Energetic Explosions in the Universe&quot;, Gehrels et al., Scientific American, 2002</td>
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<td>Optional: International Astronomical Union (IAU) Circular, GRB 090423</td>
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<td>Optional/Useful: Web link to GRB observation information</td>
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<td>Printout of Prof. Berger’s Lecture</td>
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<td>L19: W (11/18)</td>
<td>&quot;Supermassive Black Holes, Extragalactic Jets, and the Death Star Galaxy&quot;</td>
<td><strong>ASSOCIATED READING:</strong></td>
<td>MK Chapter 19</td>
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<td>Optional: Popular science articles about the Death Star Galaxy</td>
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<td>Required: Clip discussing extragalactic jets from the History Channel’s show &quot;The Universe&quot;</td>
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<td>Required: Principles of Synchrotron Derivation</td>
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<td>Required: High Energy Electrons Outside the Solar System</td>
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<td>L18: M (11/16)</td>
<td>&quot;Black Hole Accretion&quot;</td>
<td><strong>ASSOCIATED READING:</strong></td>
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MK Chapter 12

L17: M (11/9) "Supernovae and Black Hole Formation"
ASSOCIATED READING:
- MK Chapter 10, 11
- Lecture Handout on Black Hole Formation

L16: W (11/4) "Sgr A*-The Supermassive Black Hole at the Center of the Galaxy"
ASSOCIATED READING:
- MK Chapter 13.3, 16.1-16.5
- Animation on course homepage.

L15: M (11/2) "Galaxy Classification and Normal Galaxies"
ASSOCIATED READING:
- MK Chapter 13.3, 16.1-16.5
- "Millennium Simulation" of galaxy evolution (related reading page, L14).
- Lecture handout on galaxy types.
- Extra: Lecture handout on timeline of the Universe.

L14: W (10/28) "Large-Scale Structure, Dark Matter, and Galaxies"
ASSOCIATED READING:
- "Millennium Simulation" of galaxy evolution (related reading page).
- Bullet Cluster Movie, related reading page.
- Lecture handout on dark matter and large-scale structure.

L13: W (10/21) "Big Bang 2: Inflation and Nucleosynthesis"
ASSOCIATED READING:
- MK Chapter 21, Section 4, 2, 3
- Lecture handout on the timeline of the universe.

L12: M (10/19) "Big Bang 1: Cosmic Microwave Background"

ASSOCIATED READING:
- MK Chapter 21, Section 1
- Lecture handout on CMB anisotropies.
- Links to illustrations on the WMAP website.
  - Illustrating what it means for something to be isotropic to 1 part in 100,000.
  - Illustrating the surface of last scattering, and why the CMB is free to propagate through the universe.

L11: M,W (10/14) "Cosmology 5: Dark Energy"

ASSOCIATED READING:
- MK Chapter 20, Dark Energy
- Lecture Handout on measuring the accelerating expansion of the universe with supernovae.

L9 & L10: M,W (10/5,10/7) "Cosmology 3 and 4"

ASSOCIATED READING:
- MK Chapter 20
- See related reading for illustrations of homogeneity, isotropy, and the geometries of the universe.

L7 & L8: M,W (9/28,30) "Cosmology 1 and 2"

ASSOCIATED READING:
- MK Chapter 20
- See related reading for illustrations of homogeneity, isotropy, and the geometries of the universe.

L5 & L6: M,W (9/21,23) "Special Relativity"

ASSOCIATED READING:
- MK Chapter 7

L3 & L4: M,W (9/14,16) "Gravitational Lensing"

ASSOCIATED READING:
- MK Chapter 8, Section 3
- Schutz, Chapter 23 (handout)
- Associated Articles
  - Microlensing Animation by Scott Gaudi (formerly at the CfA). See related reading page.

L2: W (9/9) "Gravity: Newton vs Einstein"
ASSOCIATED READING:

- MK Chapter 8, Sections 1-3
- Associated Articles
  - Max Planck page on Equivalence Principle/Elevator Thought Experiment. See related reading page.

L1: W (9/2) "Logistics & Short Lecture: "Angular Resolution" as applied to "Can we image a BH? Do they exist?"

ASSOCIATED READING:

- MK Chapter 4
- Nature Articles
  - REQUIRED: "Event-horizon-scale structure in the supermassive black hole candidate at the Galactic Centre" by Doeleman et al., 2008, Nature, 455, 78-80
  - Optional: Astrophysics News & Views: "Light on a dark place" by Reynolds, 2005, 438, 32-33