Observational Techniques

AST 443
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Course Focus: Observational Astronomy

- learn the basic tools of astronomical research
- practice applying these tools to data
  - IDL, Iraf/pyraf
- design and implement research projects
- present research to others
  - conference-style poster
- evaluate others’ work
Course Organization

• weekly lectures + 1-hour lab
  – MWF 11:40am–12:40pm (TBD)
  – lab: TBD
• lecture notes
  – available on course site after each lecture
• weekly readings
  – read before lecture
• 4 problem sets
• midterm
• 4 research projects
  – final paper + poster
Items of Business

• Decide upon meeting time
  – 2-hour lecture + 2-hour lecture/lab
  – MW: 8:20–10:10pm

• Access to computers
  – ESS undergrad lab
  – Math SINC site
  – personal
Description of Labs

• Lab 1: Photometry
• Lab 2: Astrometry

• Proposal + observations
  – Tenagra Observatory, AZ

• Lab 3: Spectroscopy
• Lab 4: Analysis of received data
  – a research paper + poster
  – peer reviews of papers
# Lecture Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics</th>
<th>Lab</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 31</td>
<td>Introduction; Spherical Trig, Coordinates, Time</td>
<td>no meeting</td>
<td>B: chapters 2,3,4</td>
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<tr>
<td>2</td>
<td>Sept 7</td>
<td>Atmospheric Refraction Telescopes and Optics Charge Coupled Devices</td>
<td>no meeting</td>
<td>B: 5, 6.3</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>WJ: chapters 1-2</td>
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<td>H: chapters 1-3</td>
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<tr>
<td>3</td>
<td>Sept 14</td>
<td>Other kinds of photon detectors</td>
<td>UNIX; IDL programming</td>
<td>B: chapter 6</td>
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<tr>
<td>4</td>
<td>Sept 21</td>
<td>Statistics I; basic CCD data analysis</td>
<td>IDL programming</td>
<td>B: 6.4</td>
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<td>WJ: chapters 3-5</td>
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<tr>
<td>5</td>
<td>Sep 28</td>
<td>Astronomical data resources and archives</td>
<td>Searching the Archives</td>
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<td>Observing proposal peer review</td>
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<tr>
<td>6</td>
<td>Oct 5</td>
<td>Photometry</td>
<td>Reducing your data: images</td>
<td>B: chapters 8,10</td>
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<td>H: chapters 4-5</td>
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<tr>
<td>7</td>
<td>Oct 12</td>
<td>midterm exam</td>
<td>no meeting</td>
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<tr>
<td>8</td>
<td>Oct 19</td>
<td>Spectroscopy</td>
<td>Reducing your data: spectra</td>
<td>B: chapter 11</td>
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<td>H: chapter 6</td>
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<td>9</td>
<td>Oct 26</td>
<td>The Hubble Space Telescope Astronomy from Space</td>
<td>nothing scheduled</td>
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<tr>
<td>10</td>
<td>Nov 2</td>
<td>Introduction to Astrometry More Astrometry</td>
<td>LaTeX: how to fill in the blanks</td>
<td>H: 5.5-5.6</td>
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<tr>
<td>11</td>
<td>Nov 9</td>
<td>X-ray and Gamma Ray Astronomy Infrared Astronomy</td>
<td>nothing scheduled</td>
<td>B: 6.3,6.4</td>
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<td>H: chapter 7</td>
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<td>Nov 16</td>
<td>Statistics II Timing analysis, Smoothing</td>
<td>no meeting</td>
<td>WJ: Chapters 6-8</td>
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<td>12</td>
<td>Nov 23</td>
<td>no lecture</td>
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<tr>
<td>13</td>
<td>Nov 30</td>
<td>Interferometry Oral Presentations</td>
<td>no meeting</td>
<td>B: chapter 7</td>
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<tr>
<td>14</td>
<td>Dec 7</td>
<td>Sub-mm and radio astronomy The future of observational astronomy HST mock proposal review session</td>
<td>no meeting</td>
<td>WJ</td>
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Evaluation of Coursework

• **research projects** (40% of grade)
  – collaborative, but shown own work
  – including poster and paper

• **homework assignments** (30%)
  – collaborative, but shown own work

• **midterm examination** (20%)
  – closed book, formula sheet

• **evaluations of peers’ work** (10%)
  – i.e., “an evaluation of your evaluations”
Prerequisite Knowledge

- AST203 or AST205

- PHY 125–127 or PHY 131/132 or PHY 141/142

- desirable: AST341 or AST346
  - can be taken concurrently