AST 112-J7 – Astronomy of Stellar Systems Lab

Summer 2006 Syllabus

Tuesdays at 5:30-8:30pm, in CH460

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Office Hours By appointement

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Objectives

- Perform experiments relevant to topics in astronomy and planetary science
- Apply standard techniques in astronomy and planetary science to interpret images and other data from inter-planetary probes and telescopes
- Gain quantitative literacy with complicated numerical and graphical data
- Effectively communicate topics in astronomy

Materials Instructions for each experiment or exercise will be distributed at the beginning of the lab period. There is no textbook. You may find it helpful to bring the text for the lecture, but it is not required. Bring a scientific calculater, paper, pencil and pen. Additional materials may be provided by the lab instructor, as necessary. Your lab instructor is a resource. Ask your instructor to clarify difficult instructions or to give advice for writing your report.

Reports You will be required to write a brief report for each lab exercise, due at the beginning of the next lab period. The report should contain the following three sections:

- **Abstract** – A concise description of the goals, methods, and results of the lab. Answer each of these three questions or statements in about one or two sentences each: What was the purpose of the lab? Breifly describe the experimental procedure used in the lab. What were your most important results? *Summarize*; detail should be avoided in this section.
- **Data** – Data include measurements as well as the results of computations performed on measurements. Illustrations and graphs are also considered data. Organize your data appropriately; for example, large amounts of related numerical data should be arranged in tables and graphic information should be placed in figures. All tables and figures should be numbered and have captions that indicate what the data represent. Table headings and graph axes should be labeled and units indicated.
- **Discussion** – Analyze your data verbally. Point out any trends you observed in your data and what they mean. State the conclusions that can be drawn from your data. Explain your reasoning carefully. Indicate probable sources of error when applicable. Note the size and scale of the error, and how it affects your results and conclusions. You may be given a list of questions to answer to help you understand your data. DO NOT MERELY WRITE THE ANSWERS TO THESE QUESTIONS! Your responses should be written in such a way that they flow naturally and continuously with the rest of your analysis.

The sections are worth 20%, 40%, and 40% of the report grade, respectively. Points may be deducted for poor legibility, improper grammer, and lack of relevance.

Grades There will be 12 regular labs and one make-up lab. Because the summer semester is so short, two lab exercises must be completed each time the lab meets. A list of labs is given on the back of this syllabus. The make-up lab is provided to make-up an absence; it cannot be used to replace the grade of another lab. Your grade for the course will be the 12-lab average of your lab report grades. Missing lab reports will count as zeros.

Honesty Copying information from a book, web site, someone else's report, or any other source, into your report without citation is considered *cheating*. This pertains to sentences as well as pictures and illustrations. Quoting short passages is OK, but you must reference the source. Violations will be handled as stated in the UAB Academic Honor Code.

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Summer 2006 List of Labs

1. 06/06 Review of Relevant Mathematical Concepts
   Lenses: Properties, Abberations, and Applications
2. 06/13 Spectroscopy I: Identifying the Elements
   Spectroscopy II: Stellar Classification
3. 06/20 Stellar Distance Determination: Parallax
   Hertzsprung-Russell Diagrams
4. 06/27 Binary Stars: Stellar Mass Determination
   Observing Lab I: Saturn and M44 (The Beehive Cluster)

   07/04 Summer Break, Independence Day (No Lab)

5. 07/11 Scattering of Light in the Interstellar medium: Stellar Extinction and Reddening
   Observing Lab II: Jupiter and Mars
6. 07/18 Cepheid Variables as Distance Indicators
   Pulsars
7. 07/25 Location of the Galactic Center (Make-up Lab)
   The Crab Nebula: Age and Distance (Make-up Lab)

Writing Scientific reports

A scientific report is not meant to be an exciting work of literary non-fiction. Its primary purpose is to communicate information. There is no sense of drama or personal involvement. This often makes such a report seem dull – difficult to read and write – especially when one has little or no interest in the information being communicated. This section may serve as a style guide to writing a decent scientific report.

Scientific reports are normally written in the third-person passive voice. The passive voice is strongly discouraged in ordinary writing, but it is highly recommended in scientific and technical discourse. Rather than writing "I did this" or "she did that", write "This was done" or "That was done". Ocassionally, the first person plural "we" may be used – "We did this or that" – but third person passive is always preferred.

Omit subjective qualificatons. Avoid words that imply a personal opinion like "fun", "simple", "beautiful", or "confusing". Do not write how much you enjoyed or hated the lab. Comments and criticisms about the labs may be voiced directly to an instructor, to the lecture professor, or through e-mail but they should not be included as part of the report. Remain as objective as possible throughout the report.

Scientific reports always contain an abstract and usually have a main body of five general sections: introduction, experimental methods, results, and discussion. The reports for the laboratory exercises in this course will have a more condensed format that omits or combines several of these sections.

The abstract is typically very short and always comes first. It is a concise summary of the entire experiment and normally includes a statement of the purpose, methods, results, and conclusions. The abstract should be detailed enough for the reader to know what kind of information the report contains, but breif enough to be read quickly. Researchers read the abstract to determine if the report contains information they may be seeking or that may be relevant to their field of study. Most of the time, the astract is the only thing that a researcher may read as they search the literature.

The discussion is the most important part of your report. It should contain a detailed analysis of your data. You may state which data were obtained, the amount of variation in the data, and whether any of your data may be untrustworthy. Note any trends or relationships that may be evident in your data and what they mean. Graphs are particularly useful for identifying relationships. Be as specific and complete as possible. Identify sources of error. Quantitate your error whenever possible. State your conclusions. Was the goal of the lab acheived? How do your results relate to your objectives and the broader astronomical context of the study? Explain your reasoning. Remember that the focus of your discussion should be your data; introductory material and experimental procedures do not belong here.