Advanced Labwork in Astronomy and Astrophysics – Guidelines

The following guidelines will help you to successfully complete the advanced labwork course. The central webpage of the course is http://uni-tuebingen.de/en/4203. You will find all important information on this webpage. Moreover, there is a detailed instruction for each experiment of the course. The organization of dates, protocols and protocol corrections is also operated there.

Students of the specialized course in Astronomy and Astrophysics have to carry out 4 experiments of the section Astronomy and one experiment of the section Computational Physics. Within the section Astronomy the experiment Photometry and Spectroscopy is obligatory. Students of Master Astro and Particle Physics have to carry out 2 experiments of the section Astronomy, one experiment of the section Computational Physics and 2 experiments of the section Nuclear Physics.

Preparation

Be sure to read the instructions in order to be prepared for each experiment before lab day. If you do not understand some parts of the instructions, contact the tutor. The tutor can provide more material for the specific experiment, e.g., another textbook that you can use for the preparation or can clarify open questions.

The day of the lab work

Before you are allowed to start the experiment, the tutor will ask you questions about the experiment and its underlying theory. If you are not prepared and cannot answer the questions, the tutor is obliged to abort the experiment leading to a fail. Some experiment instructions contain exercises and questions in the theoretical part, which should be solved and presented during this oral test. In case of insufficient preparation the students may also be excluded from the experiment. Be sure to take detailed notes during the day in the lab, especially of the measurements. You will need this information for the protocol. If you cannot attend the experiment, be sure to contact the tutor and the other group members in good time. If you do not show up on lab day, please hand in a doctor’s certificate.

Protocols

A protocol for each conducted experiment has to be written and sent to the specific tutor. The purpose of a protocol is to make the experiment and its results understandable to an outside person, that has not read the experiment instructions. A standard protocol consists of the following sections: abstract, introduction including theory and experimental procedure, tabulated results, graphs, analysis and discussion and finally conclusion. If the instructions include questions, you add the answers to the protocol. The original measurements have to be included in the protocol. If you provide only an electronic submission of the protocol, add scans of the original data sheets.

1. Abstract (max. 1/2 page).

2. Theory: A short overview over the most important points of the experiment, including the answers to the questions (2 to 3 pages plus questions).

3. For each experimental part:
   a) Description of setup and of experiment execution (1 to 3 sentences each).
   b) Tabulated measurement results.
   c) Analysis and graphs (including detailed calculation, giving all formulae and values with units used).
   d) Discussion of result (1 to 3 sentences).
Error Analysis

Special care has to be taken for the error analysis: Each measurement has an error that has to be known in order to interpret the data correctly. A complete error analysis of the measured data is crucial and part of an experiment protocol (where explicitly requested in the instructions or by your tutor). A complete introduction into the propagation of errors is over the scope of these guidelines, please consult standard textbooks or wikipedia\(^2\).

Deadlines

The deadline for the first protocol is four weeks after you have conducted the corresponding experiment. The deadline for corrected protocols (two times maximum) is two weeks after you have received the annotations by the tutor. For example: If you have conducted the experiment on 3 March, the deadline for the first protocol is 31 March. If you get comments or correction requests by your tutor on 10 April, the deadline for the corrected protocol will be 24 April. If you do not hand in the protocols on time or if the second correction still is significantly wrong or incomplete, the specific experiment is considered as failed.

Failed experiments

If you have failed one experiment, you have the opportunity to complete the course in the following term. If the failed experiment was one of the elective ones, you have to choose a different one. If the failed experiment was one of the obligatory ones, you have to conduct it again.

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\(^1\)What is plagiarism: [https://libguides.sjsu.edu/plagiarism/home-page](https://libguides.sjsu.edu/plagiarism/home-page)