Introductory Physics Labs and Teaching Assistantships @ Stony Brook Dept. of P&A

RICHARD LEFFERTS

1ST MEETING FALL 2017

AUGUST 21, 2017

(WITH THANKS TO KLAUS DEHMELT)

Stony Brook University | The State University of New York

Introduction

- Our department provides all physics instruction for our own majors and as a "service" to rest of campus.
  - Many students
  - Need for many teachers: faculty, instructors and Teaching Assistants
- Courses with associated teaching assistanceships
  - Introductory Physics 121, 122 , 133, 134
  - Other Courses
    - AST 112, 205, 248, 347, 443/547,
    - Physics 115, Physics of Sport
    - PHY 252, 277, 300, 301, 303, 335, 405
    - PHY 501, 503, 511, 445/515, 555, 611, 680
- Laboratory Teaching Assistant's duties
  - For "Other Courses", do what professor in charge asks
  - For Intro Courses … this is our main topic

Introductory Courses

- Four Levels of Intro Physics
  - 1 Service courses for other majors (Meteorologists, Phys Ed teachers)
- Introductory Physics Courses
  - 2 Pre-Med Introductory Physics 121, 122 (formerly labs were 123,124)
  - 3 & 4 Pre-Sci/Eng Introductory Physics: Two levels, three tracks, five couplings
    - Physics 125, 126, 127 + Labs Phy 133, 134
    - Physics 131, 132 + Labs Phy 133, 134
    - Studio Physics 131/133 & 132/134
    - Online Version 131/133 & 132/134
    - Honors Physics 141, 142 + Labs Phy 133, 134
- Laboratory Teaching Assistant's duties
  - What, when, how
  - Grading practices for labs
  - Help room, proctoring & grading exams

Lectures, Laboratory Sections & Recitations

- **Lectures:** All students meet together in a large class room
  - Principle instructor: Physics & Astronomy (P&A) Faculty
- **Recitation Sections or Workshops:**
  - Recitation Sections: (Smaller groups of ~24)
    - Meet with Physics & Astronomy faculty for about 1 hr per week
  - Workshops: Held in regular class room hours
    - Use of clickers in class rooms or special 1 hr/week

Students need to take:

- **Laboratory courses:** Class divided into groups of ~24-30
  - YOU will meet these sections weekly
  - Each Lab Experiment: ~2 - 2.5 hrs per week
  - You will supervise experiments, help students and grade them

Lectures, Laboratory Sections & Recitations

- **Lectures:** All students meet together in a large class room
  - Principle instructor: Physics & Astronomy (P&A) Faculty
- **Recitation Sections or Workshops:**
  - Recitation Sections: (Smaller groups of ~24)
    - Meet with Physics & Astronomy faculty for about 1 hr per week
  - Workshops: Held in regular class room hours
    - Use of clickers in class rooms or special 1 hr/week

Students need to take:

Your Main Task:

- **Laboratory courses:** Class divided in to groups of ~24-30
  - YOU will meet these sections weekly
  - Each Lab Experiment: ~2 - 2.5 hrs per week
  - You will supervise experiments, help students and grade them

Labs

- You will be assigned two Lab Sections in any of these labs with the principle instructor and others in the department office
- Labs run from Monday-Thursday
- Friday is the Change Over Day: Lab director Dr. Bent Nielsen will set up experiments for the following week.
- Friday is also YOUR DAY TO TRY OUT THE LABS
  - Typically by 3:00 PM labs for following week are ready
  - All TAs associated with labs will meet in the lab and perform the experiment, understand the issues and discuss the grading criteria with each other (and, when necessary, the principle instructor).
  - Each one of you will get to lead the discussions through the semester -> lead TA shows up earlier to practice the lab and prepare grading rubric

Grading the Labs

Pre-Med: LAB grade is part of PHY121/122 grade

Scientists & Engineers: PHY 133/134 are letter graded:

A, A-, B+, B, B-, C+,C, C-, D & F

Grades will be based on:

Lab Report: Students write a lab report and submit it to you for grading

Grading the Labs: Lab Report Method

- This applies to PHY121, PHY122, PHY133, and PHY134 !!!
- Title sheet
  - Name, lab section, TA name, partner name(s), name of experiment, date
- Introduction [10 points]
  - In their own words, brief description of the experiment
  - How to do it with a short sketch and short text
- Procedure [20 points]
  - Describe briefly what has been done during the session
- Data sheet [20 points]
  - Include data taken which has been analyzed, clear and neat
- Analysis of data [40 points]
  - Graphs, calculations, uncertainty estimates
- Conclusions [10 points]
  - Brief summary of results: physics implied by the data
  - Any caveats or comments

Grading the Labs: Lab Report Method

- Convey the message: quality is what counts, not quantity
- Grading philosophy

    1. Start from zero and add points
    2. Start from 100 and reduce points

- "1." is better: provide the student with a set of tasks and add points for each task performed properly
- Reward is better than punishment

Your Day in the Lab

- **Arrive in the Lab** 10 minutes before the beginning, then students arrive (often late)
- *Distribute the Lab Reports from the previous session*
- *Collect Introductions*
- 10-15 minutes (max) for Lab introduction
  - The students are supposed to read the laboratory manuals before they arrive at the Lab
- Lab work begins
- *At the end of the Lab, sign the data sheet*
- Go around the Lab and support students
- Students leave
- **You lock the lab when you leave**

Safety & Security

- You are responsible for the equipment in the laboratory
- Do not leave students unattended for long periods of time
- Always lock the doors prior to leaving the laboratory
- Report problems immediately to the Instructional Laboratory Directors (Bent Nielsen or Andrzej Lipski)

Important Details …

- Numbers should
  - Have units (always)
  - Be legible (always)
- Graphs should
  - Have axes labels with units (always)
  - Have reasonable range selections (always)
  - Fill the page
  - Data points should have uncertainty bars (always)
- Writing and grammar should be at university level
- EVERY student write their OWN report

Collecting Lab Reports for Grading

- After FIRST experiment (students need feedback!)
  - Students are given 48-72 hrs after the end of the Lab Section to write their lab report and submit into mail boxes
  - Lab Collection Cabinets are located in A-131
  - Students deposit their lab reports in the slot for THEIR course and THEIR section during the room's open hours
  - Mon-Thu 8:00AM to 10:00PM
  - Fri 8:00AM to 04:00PM
- After that
  - Students submit their lab reports in the following lab session

Grading Practices

- **Clarity:** Make it clear to students:
  - What you expect in lab report
  - Why they did not receive full credit if they did not
  - How can they do better next time
  - Rubric is very useful -> communicate orally in introduction; provide written form with lab report
- Set high standards
- Be consistent and fair
- Tune your grade to get 80% (?) average

Uncertainty Analysis

- Methods expected may vary in different classes
- Details to be discussed: http://www.ic.sunysb.edu/class/phy122ps/labs/dokuwiki/doku.php?id=phy123on:lab_1
- This is often the ***1st time*** the students are asked to do an ***uncertainty analysis***, and this happens to be the most difficult aspect of the Laboratory experience for them
- While uncertainty analysis is not the purpose of the laboratory, it is one of the important aspects of "measurement" and "our every day experience" – hence important and must not be neglected!

Equipment Failure

- Can and will happen
- Bring broken equipment in to the instructional laboratory for repair
- Label the equipment with a brief description of what is wrong with it

Cheating

- Bad for everyone: Make it clear to the students from the beginning

- Students should work in groups
- Similar conceptual mistakes will appear in different reports

- **Identical lab reports (copies) are forbidden**
- Warn students the 1st time, divide points by two

- Consult with your course instructor if the pattern persists

General Remarks

- It is your responsibility to ensure that the Lab Class goes well
  - If for any reason you can not make it to one lab section (illness, mandatory travel etc.) you
    - MUST find a substitute instructor and
    - Get the absence approved by Course Instructor
- Always make your expectations clear to the students
  - A handout detailing what is expected is much appreciated by students
- Maintain a positive friendly relation and helpful atmosphere in and out of the Lab section

Outlook

- PHY123/124/133/134 has a dedicated web-page:

  http://phylabs1.physics.sunysb.edu/

  is linked to

  http://phylabs1.physics.sunysb.edu/~physlab/Fall2017/Main.html

- Every lab experiment has a write-up

There might (will) be some (or more) flaws in any kind of existing write-ups: Please help us to make it better! Many changes will occur during the semester. But nothing serious.

- Blackboard to be used for
  - Announcements
  - Grading feedback for students

Communication

- Please be verbose
  - If there is any issue let us know
  - Communicate with your fellows
  - Communicate with your students
- Use Blackboard to read and give announcements
- Return feedback to your students in timely manner
- Keep your grade-sheet and common grade-sheet up-to-date, make backups!
- Perform your help-room hours, list to be provided

First Lab Meeting

- PHY121: Introduction and Uncertainty/Error Analysis/Graphing -> NO grade
- PHY122: Introduction and Uncertainty/Error Analysis/Graphing -> NO grade
- PHY133: Introduction and Uncertainty/Error Analysis/Graphing -> NO grade
- PHY134: Introduction and Uncertainty/Error Analysis/Graphing -> NO grade

First Lab Experiments

- PHY121: Pendulum
- PHY122: The Electric Field
- PHY133: Pendulum
- PHY134: Electric Field Plotting

Summary

- PHY121: Pendulum
- PHY122: The Electric Field
- PHY133: Pendulum
- PHY134: Electric Field Plotting