UT Physics Graduate Teaching Assistants Training

Dr. Christine Cheney
Director of Undergraduate Laboratories
Fall 2018

THE UNIVERSITY OF TENNESSEE
KNOXVILLE
Outline

• Welcome & Introductions
• UT Physics & Astronomy Lab Structure
• Laboratory Goals
• Attitudes and Professional Conduct
• Recitation and Teaching Strategies
• General Laboratory Safety/Radiation Safety
• General Procedures
Structure of Laboratory Courses
Styles of Teaching

• Traditional
• Hybrid
• Studio
# Class Summary

<table>
<thead>
<tr>
<th></th>
<th>PHYS 135</th>
<th>PHYS 136</th>
<th>PHYS 137</th>
<th>PHYS 221</th>
<th>PHYS 221</th>
<th>PHYS 222</th>
<th>PHYS 231</th>
<th>PHYS 232</th>
<th>PHYS 250</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Who</strong></td>
<td>Physical Science &amp; Math Majors</td>
<td>Physical Science &amp; Math Majors</td>
<td>Physics Majors</td>
<td>Life Science Majors</td>
<td>Life Science Majors</td>
<td>Life Science Majors</td>
<td>Engineering Students</td>
<td>Engineering Students</td>
<td>Physics Majors</td>
</tr>
<tr>
<td><strong>Taught by</strong></td>
<td>Dr. Elston</td>
<td>Dr. Zhou</td>
<td>Dr. Sorensen</td>
<td>Dr. Abdelrazek</td>
<td>Dr. Fomin</td>
<td>Dr. Breinig &amp; Dr. Liu</td>
<td>Dr. Handler &amp; Dr. Kamyshkov</td>
<td>Dr. Madurga</td>
<td>Dr. Greene</td>
</tr>
<tr>
<td><strong>Where</strong></td>
<td>207</td>
<td>510</td>
<td>508</td>
<td>508</td>
<td>203</td>
<td>207</td>
<td>510</td>
<td>508</td>
<td>203</td>
</tr>
<tr>
<td><strong>Style</strong></td>
<td>Studio</td>
<td>Traditional</td>
<td>Traditional</td>
<td>Traditional</td>
<td>Hybrid</td>
<td>Hybrid</td>
<td>Traditional</td>
<td>Traditional</td>
<td>Hybrid</td>
</tr>
<tr>
<td></td>
<td>Calculus Based</td>
<td>Calculus Based</td>
<td>Calculus Based</td>
<td>Calculus Based</td>
<td>Calculus Based</td>
<td>Calculus Based</td>
<td>Modern Physics</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Students/section</strong></td>
<td>45</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>22</td>
<td>45</td>
<td>20</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td><strong># TAs/section</strong></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Recitation?</strong></td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Astronomy Labs

• A153 (goes with A151 course taught by Dr. Abdelrazek and Dr. Lindsay) A Journey through the Solar System Lab

• A154 (goes with A152 course taught by Dr. Lindsay) Stars, Galaxies, and Cosmology Lab

• A217 (Spring A218) Honors Astronomy Lab

• General Education Course to help fulfill Science Requirements

• Minimal Math Required

• Traditional lectures with traditional 2 hour labs

• Incorporates planetarium instruction

• Requires roof-top telescope observation sessions at night

• Several sections with about 14 students/section
The Laboratory Manual

- Contemporary Introductory Physics Experiments 2nd Edition by Dr. James Parks
  - For use in Physics 136, 137, 221, 231, and 232 courses
  - Errors and suggestions need to be reported
Hybrid Studio Physics 221, 222, and 250 Labs

- [http://labman.phys.utk.edu/phys221/studio_sessions.html](http://labman.phys.utk.edu/phys221/studio_sessions.html)
- [http://labman.phys.utk.edu/phys222core/studio_sessions.html](http://labman.phys.utk.edu/phys222core/studio_sessions.html)
References

• Department Home Page
  • http://www.phys.utk.edu/

• Lab Schedules
  • http://www.phys.utk.edu/physlabs/schedules.html

• Tutorial Center
  • http://www.phys.utk.edu/labs/Fall%202017%20Tutorial%20Schedule.pdf

• Labs and Demos
  • Coming soon

• Teaching Assistants' Manual
  • http://www.phys.utk.edu/physlabs/ta/tamanual.pdf

• TA Laboratory Set-Up Manual
  • http://www.phys.utk.edu/physlabs/ta/setup-manual.html
Syllabi

• Laboratory syllabi for each course will be formulated by the lecturers for that course and the GTAs assigned to teach the laboratory sections. Follow the UT template to make sure that required information is included.

• GTAs should submit syllabi to Catherine Longmire to post on our Web site.
Responsibilities

• Teach 2 labs (may include recitation).
• Grade laboratory reports.
• Take one time slot for the tutorial center (office hours).
• Mandatory weekly meetings planning lab
• Turn in a lab report and example problems during the weekly meeting which occurs before the next lab.
• Proctor and grade tests for professors.
• READ and RESPOND to my emails in a timely manner.
• Talk to your fellow TAs to find out who can substitute for you in an emergency!
• Report ANY problems to Dr. Cheney ASAP.
Notes

• Each student should turn in an individual lab report.
• GTAs should be consistent across all sections. You should require the same amount of work from the students and grade consistently.
• Do not blame equipment.
• Do not say disparaging remarks about other students, professors, or material.
Proctoring and Grading Procedures

• Report to your assigned professor at the beginning of the semester to receive instructions
• Adhere to appointments
• Unreasonable requests should be brought to my attention
• Lack of work should be brought to my attention
Laboratory Objectives and Goals
Introductory Physics Laboratory
Goals

From:
Learning Outcome Focus Areas

• Constructing Knowledge
  • collect, analyze, and interpret real data from personal observations of the physical world

• Modeling
  • develop abstract representations of real systems studied in the laboratory, understand their limitations and uncertainties, and make predictions using models

• Designing Experiments
  • develop, engineer, and troubleshoot experiments to test models and hypotheses
Learning Outcome Focus Areas

• Developing Technical and Practical Laboratory Skills
  • become proficient using common test equipment in a range of standard laboratory measurements while being cognizant of device limitations

• Analyzing and Visualizing Data
  • analyze and display data using statistical methods and critically interpret the validity and limitations of these data and their uncertainties

• Communicating Physics
  • present results and ideas with reasoned arguments supported by experimental evidence and utilize appropriate and authentic written and verbal forms
Laboratory Objectives and Goals

- To learn by doing--reinforce lectures
- To gain experience in preparation for lectures
- To learn physical concepts
- To learn measurement techniques
- To learn how to use equipment
- To learn data analysis
- To provide a “hands-on” experience
Improving the quality of laboratory instruction

• The KASH Formula
  • K: Knowledge
  • A: Attitude
  • S: Skills
  • H: Habits
Laboratory Objectives and Goals: Students' Expectations

- Education is a business and we are expected to deliver a quality product.
- Student performance will rise to the instructors' expectation: little is received from those from whom little is expected.
- Reports should be graded so that they can be returned by the next lab period (especially the first two).
Laboratory Objectives and Goals: Perceptions and Reality

• Present a positive attitude
• Body language is responsible for 75% of what is communicated
• “Never let them see you sweat”
  • Show confidence backed up by good preparation
Laboratory Objectives and Goals:
Perceptions and Reality

• Think about the implications of what you say and do
  • If you cancel a lab, cancel an experiment, or shorten an experiment, what are you saying to the student by your action?
• What values are implied by your actions?
Laboratory Objectives and Goals: Perceptions and Reality

• The purpose of the laboratory
  • to train doctors and health professionals who will treat YOU in the future
• To train engineers who are going to design bridges that YOU drive over and buildings that YOU occupy
Attitudes and Professional Conduct
Preparation

• Be prepared!!
  • Do not blame the equipment!
  • It is good equipment!
• Complete every experiment before class
Professional Conduct

• Treat students the way you would like to be treated.
• Be punctual, courteous, understanding, helpful, and forgiving.
• Do not cheat the students – provide them with the education that they are paying for.
• Maintain your office hours and be available!
Professional Conduct (cont.)

• **Sexual harassment**: Don’t do it!
  • If you are being harassed or one of your students is being harassed by another student, come talk to me.

• Be aware of your behavior and attitude toward others.

• Do not talk about other TAs or professors in front of the students.
Tutorial Center Conduct

• Show up!
• Maintain a professional demeanor during the tutorial center.
• Make yourself available.
• Look for students who need help.
• Wear your name tag.
Recitation Guidelines
Recitation Procedures

- Survey of current status and experience
- Grading procedures
- Attendance requirements
- Do not shorten recitation!!!
Teaching Attitude

• Teaching is a business
• The student is our customer
• Teach problem solving skills as opposed to working the problem
Salesman’s Attitude

- Have a good product and believe in it
- Be enthusiastic about the recitation sections
- Make the recitation sections attractive to the student
- Encourage the students to seek your help
Team Attitude

- Communicate with the lecture professor
- Coordinate your activities with the lecture
- TA should know the topics being studied
Problem Solving

• Read the problem
• Extract the given information
• Make a realistic diagram
• Determine the correct dimensions and units
• Determine the applicable physics principle(s)
• Write the applicable equations
Problem Solving (cont’d)

• State the unknown parameters to be solved
• Organize the problem neatly and logically
• Process/calculate the information
• Perform a reality check
• Perform a dimensional analysis
• Teach the methods and organization
Laboratory Equipment
Laboratory Equipment

• Do not change the equipment.
• Do not move equipment from table to the table.
• Make sure each table is left the way you found it. Check that all the equipment is there.
• Have students recycle their paper.
• If equipment gets broken, place it on the front table with a note stating the problem.
• If there are computer and data acquisition issues, let me know!
• Do not take things without letting me know!
Laboratory Equipment (cont’d)

• Needs for additional supplies and equipment should be reported to Dr. Cheney

• Needs for computer supplies including paper (available outside my office) and printer cartridges should be reported
Computers and Data Acquisition

• Opportunities for improving communication and instruction
• Adhere to all copyright laws
• Use care in connecting external sources to PASCO box
• Report any malfunctions or software problems to Dr. Cheney
General Information: Safety, Laboratory Report, and Attendance
Student Responsibility

• Absolutely no gum in lab!!!!!
• No food or drink.
• Wear closed-toed shoes.
• Do not mix equipment from table to table.
The Laboratory Report

- Use guidelines in lab manual: grade carefully
- Return graded labs at next lab period
- Grading of first two lab reports is important
- Coordinate grading scale with lecture professor
- Maintain a uniform and consistent grading procedure
Attendance

• Maintain attendance records: long-term absences will be handled differently

• Lab is a “hands-on” experience
  • DO NOT cancel lab or experiments!
  • Avoid a stated policy where students can miss one lab
Laboratory Make-Ups

- A make-up session will be held the last week of labs

- Labs can be made up the same week in another section if arrangements are made by the student’s TA with another TA
TA Feedback

• Your input is appreciated and considered
• You are on the front line and are best informed
• Share your information
• NOW IS AS GOOD A TIME AS ANY!
TA Feedback (cont’d)

• My Contact Information:
  • Office: Room 404B Physics
  • Office Phone: 974-9811
  • Cell Phone: 705-3356
  • E-mail: ccheney@utk.edu
Thinking Ahead to Spring

• We will have a meeting about a week before classes start in January to finalize schedules!!!!! BE THERE!
• Please register and answer my email about scheduling in a timely manner!!!!
Laboratory Safety
Laboratory Safety

• General hazards
  • Mechanical hazards
    • Furniture
    • Weights
    • Glass cuts
  • Electrical hazards
    • AC frayed cords
    • High voltage sources
Laboratory Safety (cont’d)

• AC outlet box on lab bench is hot, be careful
• Laser and light hazards
• Laser light
• UV light sources
Laboratory Safety (cont’d)

• Chemical hazards
  • Acid in eluate for minigenerator;
• Fire and burn hazards
  • Light sources are hot; water baths are scalding
  • Current through a wire is hot
  • Resistor heating produces hot water!
HAZARDOUS MATERIALS CLASSIFICATION

HEALTH HAZARD
4–Deadly
3–Extreme danger
2–Hazardous
1–Slightly hazardous
0–Normal material

FIRE HAZARD
Flash Points
4–Below 73 F
3–Below 100 F
2–Below 200 F
1–Above 200 F
0–Will not burn

SPECIFIC HAZARD
Oxidizer OXY
Acid ACID
Alkali ALK
Corrosive COR
Use NO WATER 
Radiation Hazard ▲

REACTIVITY
4–May detonate
3–Shock and heat may detonate
2–Violent chemical change
1–Unstable if heated
0–Stable
Radiation Safety

• Radiation hazards
  • Minimize exposure even though sources are small
  • Pregnancy declaration policy
    http://radiationsafety.utk.edu/declare-pregnancy/
Radiation Safety (cont’d)

For Cesium 137 Sources:

• At 25 cm, the exposure is 0.024 mrem/hour.

• It would take 20,000 hours of exposure to receive a dose of 500 mrem.
Radiation Safety: Limiting Exposure

• Time:  Limit Time of Exposure
• Distance:  Maximize Distance to Source
• Shielding:  Maximize Amount of Shielding
Laboratory Security

- Locking and unlocking labs
- Do not keep room 509 open during lab.
- No admission of students to closed labs
- Opening/closing windows
  - Effect of adverse weather on equipment
  - Unbalancing of temperature control
  - Windows do not close easily.
- Last man rule or transfer of responsibility
- Don’t borrow equipment!!!!!
- Report any strange occurrences, situations, or breaches of security
Special Considerations for the Physically Impaired

• Report classes that have students with special needs
• Special problems can be addressed and we want to do so
• Be sensitive—be aware—think
• Anticipate and report forthcoming problems and needs
Basic Safety Issues

• Location of first aid kid
• Emergency reporting procedures: Dial 911
• Balance hazard with over-concern
• Right to know station outside Nielsen 404
Right to Know Station

• Located in Room 404 Nielsen Physics Building
• File of SDS
• File of Safety Books
• Chemical Hygiene Plan
SDS: Safety Data Sheet

- Identification
- Hazards Identification
- Composition/Information on Ingredients
- First Aid Measures
- Firefighting Measures
- Accidental Release Measures
- Handling and Storage
- Exposure Controls/Personal Protection
- Physical and Chemical Properties
- Stability and Reactivity
- Toxicological Information
- Ecological, Disposal, Transport, Regulatory and Other Information
SDS: Safety Data Sheet

• Identification
  • Chemical and common names
  • Hazard class
• Physical and Chemical Data
  • Appearance and odor
  • Conditions to avoid
• Fire and Explosion Hazard Data
  • Unusual fire and explosion hazards
• Hazardous Components
Preparation for Emergency Situations

• Learn the location of emergency exits and the shortest routes to these locations

• Learn the location of emergency alarm activation stations.

• Learn the procedures for reporting emergencies -- Dial 911.
Preparation for Emergency Situations (cont’d)

• Learn the sound of emergency alarm systems
• Learn the location of fire extinguishers.
Chemical Hygiene Officer

- Dr. Christine Cheney
- Cell: 865-705-3356
- Office Location:
  Room 404B Nielsen Physics Building
  974-9811
- Lab Location:
  Room 303 Nielsen Physics Building
Departmental Radiation Safety Officer

- Dr. Kate Jones
  - Office Location:
    Room 407B Nielsen Physics Building
    974-4022
  - Lab Location:
    Room 303 Nielsen Physics Building
    Room 310 SERF (Science and Engineering)