UT Physics Graduate Teaching Assistants Training

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Director of Undergraduate Laboratories
Fall 2017
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

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<th>PHYS 135</th>
<th>PHYS 136</th>
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<td>Dr. Sorensen</td>
<td>Dr. Kamyshkov</td>
<td>Dr. Steiner</td>
<td>Dr. Breinig &amp; Dr. Gollapinni</td>
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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 (not taught 2017-2018)
- 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.

• 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).
• 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!
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!!
- 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

• 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 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 404 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; mercury thermometers
• Fire and burn hazards
  • Light sources are hot; water baths are scalding
  • Current through a wire is hot
  • Resistor heating produces hot water!
Radiation Safety

- Radiation hazards
  - Minimize exposure even though sources are small
  - Pregnancy declaration policy
    [http://radiationsafety.utk.edu/declare-pregnancy/](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 MSDS
- File of Safety Books
- Chemical Hygiene Plan
MSDS: Material Safety Data Sheet

I. Identification

- Chemical name: Acetone
- Molecular weight: 56.08
- Chemical family: Ketone
- Synonym: Dimethyl Ketone
- DOT gross shipping name: Acetone
- DOT hazard class: Flammable Liquid
- DOT identification no.: UN1093
- CAS no.: 67-64-1

II. Physical and Chemical Data

- Boiling point: 75.6°C
- Freezing point: -94.7°C
- Vapor density (air = 1): 2.0
- Specific gravity (H2O = 1): 0.929
- Solubility in water: 920°C complete
- % volatility by volume: 100
- Odor threshold: Not expected to occur.
- Appearance and odor: Clear, colorless liquid with a penetrating, sweet odor.
- Conditions to avoid: Heat, sparks, open flame, open containers, and poor ventilation.
- Materials to avoid: Strong oxidizing agents and strong acids and bases.
- Hazardous decomposition products: Incomplete combustion can generate carbon monoxide and other toxic vapors.

III. Fire and Explosion Hazard Data

- Flash point (closed cup): -18°C
- Autoignition temperature: 465°C
- Lower flammability limit: 4.6
- Upper flammability limit: 12.8
- Fire hazards: Very volatile and extremely flammable. Mixtures with water can be flammable.
- Extinguishing media: Carbon dioxide, dry chemical, alcohol foam, water mist or fog.
- Special fire-fighting procedures: Wear full protective clothing and self-contained breathing apparatus.
- Heat will build pressure and may rupture closed storage containers.
- Keep fire-exposed containers cool with water spray.

IV. Hazardous Components

- Acetone: 67-64-1

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MSDS: Material 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 404 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 612 SERF (Science and Engineering)