Syllabus for PHYS 150X
Special Relativity and Spacetime

Instructor: Len Zane  Office: BPB – 202  Office phone: 895-1789
Email: len.zane@unlv.edu  Classroom: BPB – 248  Time: TR 10 to 11:15 a.m.
Office Hours: TR 11:15 to 1:00 p.m. or by appointment
Course Website: www.physics.unlv.edu/~lenz/

This course uses graphs and algebra to explore the way space and time are measured. The goal of the course is to develop Einstein's theory of Special Relativity by examining the results of a series of simple “thought” experiments, experiments that can be imagined but that are beyond our current technical abilities. Consequently, the experimental necessity of Special Relativity will be emphasized. The only prerequisite is curiosity about the natural world and some skill in algebra. A major theme of the course is to use graphs to help visualize the main features of special relativity. This course satisfies three credits of the Core Requirements in Science.

The text will be an Acrobat file sent out by email.

Material for the course is available at, www.physics.unlv.edu/~lenz/

The schedule below represents the topics that will be covered but the speed at which the topics are covered may be modified:

Week 1: A brief review of the History of Science from the Dawn of Time to 1905 with emphasis on the power of observation, logic, and mathematics including a discussion of the Scientific Method.
Weeks 2 and 3: Measuring Space and Time and displaying information on spacetime diagrams and the important properties of light. Chapters 1 and 2.
Weeks 3 and 4: The super bus and the breakdown of intuitive space and time. Chapter 3.
Weeks 4 and 5: Generalizing the results of the experiments done with the super bus. Chapter 4.
Weeks 6 and 7: Reviewing what has been learned about space and time and superluminal travel. Chapter 6 and midterm.
Weeks 7 and 8: The trigger and bomb and bus and garage paradoxes. Chapter 7.
Week 9: Leaving Earth and refining the idea of synchronization. Chapter 8.
Week 10: The twin paradox.  **Chapter 9.**  
Week 11 and 12: Space travel and the introduction of acceleration and the Equivalence Principle. Conservation of Momentum.  **Chapter 10.**  
Week 13: The Far Away Observer (FAO) and a look at why clocks run slow and rulers shrink.  **Chapter 11.**  
Week 14: The light clock and $E = mc^2$.  **Chapter 12.**  
Week 15: Review.

Final examination is on Tuesday, December 7, at 10:10 am.

The course grade will be based on assignments and the midterm and final examinations.

Assignments – 50%
Midterm Examination – 20%
Final Examination – 30%

**Objectives:**

1. Be able to explain in detail how the ancient Greek scientists determined the size of earth, moon, and sun and the distance from earth to moon and earth to sun.
2. Understand the characteristics that define a scientific theory as opposed to theories that are not “scientific.”
3. Be able to explain the Principle of Relativity and the role it plays in the development of Special Relativity.
4. Be able to explain the role of the velocity of light in the development of Special Relativity.
5. Be able to use spacetime diagrams to analyze “experiments” done in space and time.
6. Become more comfortable using algebra, geometry, and especially graphing to solve problems.
7. Be able to give a plausible answer to the questions: Do clocks really run at different rates and rulers measure different lengths?

**Statements of University Policy**

**Academic Misconduct** – “Academic integrity is a legitimate concern for every member of the campus community; all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility and professionalism. By choosing to join the UNLV community, students accept the expectations of the Academic Misconduct Policy and are encouraged when faced with choices to always take the ethical path. Students enrolling in UNLV assume the obligation to conduct themselves in a manner compatible with UNLV’s function as an educational institution.”
An example of academic misconduct is plagiarism: “Using the words or ideas of another, from the Internet or any source, without proper citation of the sources.” See the “Student Academic Misconduct Policy” (approved December 9, 2005) located at: http://studentlife.unlv.edu/judicial/misconductPolicy.html.

Copyright – The University requires all members of the University Community to familiarize themselves and to follow copyright and fair use requirements. You are individually and solely responsible for violations of copyright and fair use laws. The university will neither protect nor defend you nor assume any responsibility for employee or student violations of fair use laws. Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. To familiarize yourself with copyright and fair use policies, you are encouraged to visit the following website: http://www.unlv.edu/committees/copyright/.

Disability Resource Center (DRC) – It is important to know that over two-thirds of the students in the DRC reported that this syllabus statement, often read aloud by the faculty during class, directed them to the DRC office.

The Disability Resource Center (DRC) coordinates all academic accommodations for students with documented disabilities. The DRC is the official office to review and house disability documentation for students, and to provide them with an official Academic Accommodation Plan to present to the faculty if an accommodation is warranted. Faculty should not provide students accommodations without being in receipt of this plan.

UNLV complies with the provisions set forth in Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, offering reasonable accommodations to qualified students with documented disabilities. If you have a documented disability that may require accommodations, you will need to contact the DRC for the coordination of services. The DRC is located in the Student Services Complex (SSC), Room 137, and the contact numbers are: Voice (702) 895-0866, TDD (702) 895-0652, fax (702) 895-0651. For additional information, please visit: http://studentlife.unlv.edu/disability/.

Religious Holidays Policy -- Any student missing class quizzes, examinations, or any other class or lab work because of observance of religious holidays shall be given an opportunity during that semester to make up missed work. The make-up will apply to the religious holiday absence only. It shall be the responsibility of the student to notify the instructor no later than the last day at late registration of his or her intention to participate in religious holidays which do not fall on state holidays or periods of class recess. This policy shall not apply in the event that administering the test or examination at an alternate time would impose an undue hardship on the instructor or the university which could not be avoided. http://catalog.unlv.acalog.com/content.php?catoid=1&navoid=44&bc=1

Tutoring -- The Academic Success Center (ASC) provides tutoring and academic assistance for all UNLV students taking UNLV courses. Students are encouraged to stop by the ASC to learn more about subjects offered, tutoring times and other academic resources. The ASC is located across from the Student Services Complex, #22 on the current UNLV map. Students may learn more about tutoring services by calling (702) 895-3177 or visiting the tutoring web site at: http://academicsuccess.unlv.edu/tutoring/
UNLV Writing Center – The following statement is recommended for inclusion in course syllabi:

One-on-one or small group assistance with writing is available free of charge to UNLV students at the Writing Center, located in CDC-3-301. Although walk-in consultations are sometimes available, students with appointments will receive priority assistance.

Appointments may be made in person or by calling 895-3908. The student’s Rebel ID Card, a copy of the assignment (if possible), and two copies of any writing to be reviewed are requested for the consultation. More information can be found at: http://writingcenter.unlv.edu/