Relativity - PHYS 141N Section 80 Spring 2008

Course Title:	Relativity: From Galileo to Einstein & Beyond
Instructor:	James Jacobs
Office:	Science Complex. Room 119.
Phone:	243-4986 or 243–2073
Texts:	*A Traveler's Guide to Spacetime*
	by Thomas A. Moore, Chapters 1 through 11.
	Selected Readings to be given out in class.
Lectures:	Mo,We,Fr, 10:10-11:00 AM. DHC Room 119.
Office Hours:	Tu 10-11AM, W 11-noon, F 9-10AM, and by appointment.
Course web site:	www.physics.umt.edu/phys141.html

Homework: I will assign 1-3 problems/questions per class period to be worked out carefully by each student which will be collected at the following class period. You should be prepared to hand them in at the beginning of each class period, but often we will discuss the solutions in class (see class participation below).

Class participation: In addition to the presentation of homework solutions to the class described above, all students will be required to participate in class discussions on assigned readings as well as topics presented in class. Attendance is therefore mandatory.

Exams: There will be 3 mid-term exams given during the semester (see schedule on page 2). Since each new topic will build on all previous concepts, a general working knowledge of previous material will be expected on all exams. The exams will be closed book except for a calculator and an equation card to be given out in class. Make-up exams will be given only in extreme situations and must be arranged IN ADVANCE. Please do not miss any exams. The *comprehensive* final exam is Friday, May 9$^{\text{th}}$ from 10:10 AM to 12:10 PM.

General Remarks

Einstein's Special Theory of Relativity is one of the great triumphs of the human mind in this century, yet most people have only a vague notion of what relativity is and what it means. In this course, industrious students with a working knowledge of algebra and trigonometry and a modest exposure to calculus will gain deep insight into the counterintuitive nature of space and time and will acquire a greater appreciation for the power and beauty of theoretical physics. We will begin with a brief historical view of the study of motion including some short writings by Galileo, and Newton. We will explore the necessity of introducing relativity theory to match known experimental results. Einstein's special theory of relativity is introduced from a modern, geometrically oriented perspective, using spacetime diagrams throughout, and emphasizing the deep connection between time and space. We will carefully develop the Lorentz transformation equations and use them to explore several of the apparent "paradoxes" of the theory. Finally, we will apply the results of relativity theory to the practical real world problems of high-energy particle physics, where the use of relativity is essential. Throughout the course, we will emphasize the logical structure of relativity to show how the unexpected and counter intuitive consequences of the theory follow directly and inevitably from the principle of relativity ("the laws of physics are the same in all inertial reference frames").

Relativity - PHYS 141N Section 80 Spring 2008

Prerequisites

Working knowledge of high school algebra and trigonometry. Some exposure to high school physics and calculus is preferred but not required.

Grading

In class mid-term exams:	30%	(3 @ 10% each)
Homework:	30%	
Class Participation and Attendance:	10%	
Final exam:	30%	

Notes on Attendance: Miss 2 or fewer classes 10%; miss 3-4 classes 5%; miss 5 or more courses 0%.

Notes on Homework: If you miss a class it is your responsibility to get the assignment from me or a classmate and turn it in on time (unless you have an extreme circumstance approved in advance). Check the class web site for all class materials.

Notes on Academic Misconduct: *All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code.* The Code is available for review online at www.umt.edu/SA/VPSA/index.cfm/page/1321.

Tentative Schedule – Topics – Important Dates

Note that the lecture schedule is tentative, but the exam dates are firm.

Week:	Chapters	Topics	Exams:
Week 1	Selected Readings	Galileo & Newton	
Week 2	Moore Chap. 1 & 2	Relativity & Einstein	
Week 3	Moore Chap. 2 & 3	Building the Base	
Week 4	Moore Chap. 3 & 4	The Nature of Time	Friday, Feb. 15
Week 5	Moore Chap. 4	The Metric Equation	
Weeks 6-7	Moore Chap. 5	Einstein's Relativity	Friday, Mar. 21
Weeks 8-11	Moore Chap. 6-9	Modern Relativity	
Weeks 12-14	Moore Chap. 10-11	Applications to Particle Physics	Wednesday, April 30

Comprehensive Final: Friday, May 9, 10:10 AM – 12:10 PM.

This will be an intensive course. Be sure to keep up on reading assignments and problem assignments. Some of the techniques covered in this course require determined study to master, but I believe you will find the material interesting and rewarding.