## **PHYSICS OF THE DARK: IDEAS OF MODERN PHYSICS**

PHYS 1301 (SPRING 2006) SYLLABUS http://www.physics.smu.edu/~kehoe/1301

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Office hours: 11am-1pm Tuesday, or by appointment

<b>Texts: "</b> The World Treasury of Physics, Astronomy and Mathematics", ed. T. Ferris			
"From Paradox to Reality", F. Rohrlich			
Class Time:	MWF 1pm - 1:50pm	Lab Time: W 2pm, 4pm	
Teaching Assistant: Ana Firan		<b>Tutoring</b> : Th 6:30pm – 8:30pm	
Classroom:	Rm 124 Fondren Science (Rm	n 25 for labs, Rm 100 for tutoring)	

**Course Objectives:** We explore the modern quest to comprehend the universe at the micro- and macroscopic levels. Relativity and quantum mechanics will be examined and their implications will be discussed. Particle physics thru cosmology are covered at a descriptive level accessible to all SMU students. The course is designed to explore the concepts behind the calculations and findings.

**Method of Instruction:** Reading for the course will take from two texts. Ferris is an anthology of non-mathematical articles from major figures in modern physics. Rohrlich supplies relativity and quantum mechanics. Reading is a crucial element of your effort to acquire a firm grasp of the concepts in this course. The class will consist of lectures that provide the overall organization and coverage of the subject matter of the course. Lectures are given on Mondays and Wednesdays. The material for tests will be taken directly from lecture. A period is available Fridays at 1pm – 1:50pm in Rm 124 for discussion of key concepts and implications.

**Tests:** There is no graded homework for this class. There will be 3 tests on the lecture material during the semester, including the final exam. These will make up 50% of the class grade. The second test covers material since the first test. The final is cumulative over the whole course. Tests are closed book and will be a combination of multiple choice and short 'essay' questions. A book report is 20% of the grade. The lab portion of the class is 30% of the overall grade.

**Grading and Attendance Policy:** In general, it is crucial to be clear and concise in your answers to get full credit for test questions. Regrading requests must be well justified in writing. Anticipated absences resulting from religious observance or officially sanctioned extracurricular activity must be brought to the instructor's attention at least 2 weeks in advance. Affected tests will be given prior to the rest of the class. No other make-up tests

will be granted. Attendance and note-taking is a crucial way to obtain material in lecture which is not covered evenly by the texts.

**Book Report:** The book report is designed to provide an opportunity to explore in more detail one aspect of the scope of the course. The book must be chosen from the list below.

"In Search of Schrodinger's Cat", J. Gribbin "The Quantum World", Polkinghorne "Hyperspace", M. Kaku "The God Particle", L. Lederman "The Matter Myth", P. Davies, J. Gribbin "Fabric of the Cosmos", B. Greene "Black Holes, Wormholes and Time Machines", J. Al-Khalili "The New World of Mr. Tompkins", G. Gamow

The report is expected to be no less than 8 typed pages. Halfway thru the semester, the first half of the report is due for comments. A late mid-term submission will result in the report final grade being lowered by 10%. The final report is due on the last day of class, no late final submissions will be accepted.

Labs: The lab will consist of a combination of measurements, simulations and demonstrations relevant to modern physics topics. Lab reports for each lab will be due the Monday lecture following each lab. Your report will consist of a brief abstract, data tables, responses to questions, error analysis, and a conclusion. It is important that you acquire, and demonstrate thru your lab report, an understanding of the measurements being made and sources of uncertainties in your measurements. There are no make-up labs.

## PHYSICS 1301 SCHEDULE, SPRING 2006

Week	Торіс	Reading Assignments
Jan 17	Introduction	Rohrlich 1-48
Jan 23	Problems with Light Lab: Measurement and Error 1	Rohrlich 121-133
Jan 30	Quantum Mechanics Lab: Measurement and Error 2	Ferris 86-115; Rohrlich 134-189
Feb 6	Atomic Structure Lab: Probability	Ferris 50-55
Feb 13	Sub-nuclear Realm	Ferris 38-44, 80-85
Feb 20	Particle Spectrum Lab: Diffraction and Spectra 1	
Feb 27	Fundamental Interactions Lab: Diffraction and Spectra 2	
Mar 6	More Problems with Light Lab: Speed of Light; Test 1 Mon.; Book Report draft due Fri.	Rohrlich 49-52
Mar 13	Spring Break	
Mar 20	Special Relativity Lab: Special Relativity 1	Ferris 56-59; Rohrlich 49-88
Mar 27	General Relativity Lab: Special Relativity 2	Ferris 194-202, 346-359; Rohrlich 89-110
Apr 3	Stellar Collapse Lab: Bohr Atom 1	Ferris 203-240, 272-291
Apr 10	The Cosmos Lab: Bohr Atom 2; Test 2 Mon.	Ferris 170-183, 292-334, 360-364
Apr 17	In the beginning Lab: Radioactivity	Ferris 395-430
Apr 24	The Dark Lab: Cosmic Rays	Ferris 116-146
May 1 May 10	Review, Book Reports due Final Exam 3pm-6pm —	_