ILS 251 – FALL 1992 – SYLLABUS

Prof. – Robert March TA – David Reid

Textbook:

PFP *Physics for Poets (3rd Ed.)*, R. March, Chapters 7-18

Articles in *Scientific American:*

QP " Quantum Philosopy," John Horgan, July 1992, pp. 94-101

CO "How Cosmology Became a Science," S.G. Brush, Aug. 1992, pp. 62-70

"The Golden Age of Cosmology," Corey S. Powell, July 1992, pp. 17-22

$\star n - m$ Page reference to supplementary notes in this packet

Dates	*Lecture Topics*	*Readings*	*Discussion*
Sep 3	Newton's *predictable* world	$\star 6 - 7$	*no meeting*
Sep 8	Interference and other wave phenomena	PFP 7	get-acquainted
Sep 10	The Michelson-Morley experiment	PFP 8	
Sep 15	The Postulate of Relativity	PFP 9	Practice problems
Sep 17	Space-time (qualitative)		
Sep 22	Space-time (quantitative)	PFP 10	OPEN
Sep 24	....continued	$\star 8 - 9$	
Sep 29	$E = mc^2$	PFP 11	*Problem set 1*
Oct 1	The twin paradox	PFP 12	
Oct 6	The Principle of Equivalence		OPEN
Oct 8	The worldview of general relativity		
Oct 13	Black holes and the Big Bang	$\star 10 - 12$	Review for
Oct 15	Chaos out of order	$\star 13 - 15$	midterm exam
Oct 20	Are atoms "real?"	PFP 13	Discussion of
Oct 22	**EXAM**		midterm exam
Oct 27	Probing the atom	PFP14	OPEN
Oct 29	Planck, Einstein, and the quantum	PFP 15	
Nov 3	Bohr's flawed but succesful model	PFP 16	OPEN
Nov 5	De Broglie's "matter waves"	PFP 17	
Nov 10	Wave Mechanics		*Problem set 2*
Nov 12	The probability interpretation	PFP 18	
Nov 17	Uncertainty and "tunneling"		Interpreting the
Nov 19	Schrödinger's Cat	QP	quantum theory
Nov 24	The Pauli principle and chemistry	$\star 16$	*Thanksgiving*
Dec 1	Nuclear physics & astrophysics	$\star 17 - 18$	*Paper due*
Dec 3	The Cosmic Background	CO	
Dec 8	Reactors and nuclear weapons	$\star 19 - 23$	Review &
Dec 10	Technology in the "New World Order"	$\star 24 - 25$	Recapitulate
Dec 15	Final remarks – **TAKEHOME DUE**		

INFORMATION ABOUT THE COURSE

OFFICE HOURS – Your professor is **Bob March**. Office hours are held in 4289 Chamberlin Hall Tuesday and Wednesday from 1:30 to 3:30, or call **262-5947** for an appointment at another time. Your TA is **Dave Reid**, who holds office hours on the third floor of Meiklejohn House (228 N. Charter) Monday 1:15 to 3:00, Tuesday 2:00 to 3:00, telephone **263-3964**.

EXAMS – There will be an exam in the lecture hour on *Thursday October 22*, and a takehome exam due in the final lecture, Tuesday December 15. For the in-class exam, you may bring two sheets (four pages) of notes. A study guide will be distributed a week before, describing the exam in detail. You will have a full week for the takehome.

PROBLEMS – There are three problem sets on p. 4 of this syllabus. The "Practice Problems" will be discussed in class, but are not to be handed in. Problem sets 1 and 2 are due in discussion *October 1/2* and *November 12/13. You may be called upon to work problems at the board on the due date.*

PAPER – Write a paper of length 7 to 14 pages, connecting a *concept* or *discovery* discussed in this course to something *outside* of natural science. The connection may be *conceptual* (show how they are related, analogous, or antagonistic), *historical* (discuss the science in its historical and cultural context), or *personal* (connect them through their impact on your own thinking). It will be judged for *creativity* more than for scholarship. *Due in discussion, December 3/4.* Abstracts of some excellent papers are given on the following page. A review of a book or article is acceptable, but it must be a *critical* review, one that takes and defends a stand on the validity of the author's position.

GRADING – Grades in this course are a *performance weighted* average of four scores: the two exams, the term paper, and a discussion grade based in part on the problem sets. The *best* score counts 40%, second best 30%, third 20%, worst 10% of your grade.

SOME UNITS, CONSTANTS, AND SYMBOLS

Quantity	*Symbol*	*Value*
speed of light:	c	3×10^8 m/s = 300,000 Km/s = 1 ft/nsec
electron-volt:	eV	1.6×10^{-19} joules
Planck constant	h	4.15×10^{-15} eV-seconds

PREFIXES FOR UNITS

prefix	*symbol*	*multiplier*	*prefix*	*symbol*	*multiplier*
kilo	K	10^3 (thousand)	milli	m	10^{-3} (thousandth)
mega	M	10^6 (million)	micro	μ	10^{-6} (millionth)
giga	G	10^9 (billion)	nano	n	10^{-9} (billionth)
tera	T	10^{12} (trillion)	pico	p	10^{-12} (trillionth)
peta	P	10^{15} (quadrillion)	femto	f	10^{-15} (quadrillionth)