SYLLABUS PHYS 1301 IDEAS OF MODERN PHYSICS

You will learn about particles that go backwards in time or even stop time; how we can pass through solid objects; detect and treat cancer; about the beginning and end of space and time; how past, present, and future, mass and the force of gravity are all illusions; that there is no objective reality or absolute certainty in science. You will measure the age of the universe, the speed of the fastest thing in the universe, the structure of the smallest atom, and interpret data from the world's

Math requirements: Arithmetic (no algebra or calculus).

Physics requirements: None.

Language requirement: A good command of academic English.

Satisfies: Science requirement of the General Education Curriculum. Level I Pure & Applied Science Pillar and a Quantitative Reasoning Proficiency & Experience of the University Curriculum.

The QR proficiency is taught through practical lab work; no advanced math is needed and all training in data analysis is provided on the course

lecture: MW 1pm 158 FOSC lab: F 1pm/3pm 060 FOSC

Text: Ideas of Modern Physics (Kendall-Hunt, 2013)

by S. Dalley ISBN 978-1-4652-2633-4

Objectives: *Upon successful completion of this course, students will be able to*

1) demonstrate basic facility with the methods and approaches of scientific inquiry
2) explain how the concepts and findings of modern physics shape our world
3) collect, organize and analyze data from a variety of sources
4) communicate and represent quantitative information or results numerically, symbolically, aurally, visually, verbally, or in writing.
5) test hypotheses and make recommendations or predictions based on results

Date	HW	Pre-class Reading
Fr 1/16		LAB - **1.1 Numbers in Science**
Mo 1/19		*MLK Day - no class*
We 1/21		**Scientific Discovery**
Fr 1/23		LAB - **Measurement and Error** (manual)
Mo 1/26		**Classical Physics** **2.1** Space, Time, Motion
We 1/28		**Classical Physics** **2.2** Gravity
Fr 1/30		LAB - **Magnetic Particle Accelerator**
Mo 2/2	A	**Classical Physics** **2.3** Electricity & Magnetism
We 2/4		**Classical Physics** **2.4** Light: Into the Modern Era
Fr 2/6		LAB - **Speed of Light**
Mo 2/9	B	**Special Relativity** **3.1** Space, Time, Motion, Revisited
We 2/11		**Special Relativity** **3.2** Paradoxes (not)
Fr 2/13		LAB - **Introduction to Special Relativity**
Mo 2/16	C	**Special Relativity** **3.3** Energy and $E = mc^2$
We 2/18		**Special Relativity** **3.4** Space-Time
Fr 2/20		LAB - **More with Special Relativity**
Mo 2/23	D	**General Relativity** **4.1** Equivalence Principle
We 2/25		**General Relativity** **4.2** Time Dilation and Light Bending
Fr 2/27		LAB - **Free Fall**
Mo 3/2	E	**General Relativity** **4.3** Curved Space-Time
We 3/4		**General Relativity** **4.4** Structure of the Universe
Fr 3/6		LAB - **Hubble's Law**
		Spring Break - no classes
Mo 3/16	F	**Quantum Mechanics** **5.1** Wave-Particle Duality of Light
We 3/18		LAB **- Probability** (short lab done in lecture room)
Fr 3/20		*Essay preparation sessions*
Mo 3/23		**Mid-term Essay**
We 3/25		**Quantum Mechanics** **5.2** Probability & Uncertainty
Fr 3/27		LAB - **Diffraction**
Mo 3/30	G	**Quantum Mechanics** **5.3** Matter Waves
We 4/1		**Quantum Mechanics** **5.4** Quantum Measurements
Fr 4/3		*Good Friday - no class*
Mo 4/6	H	**Atoms** **6.1** Structure and Properties
We 4/8		**Atoms** **6.2** Quantized Energy
Fr 4/10		LAB **- Hydrogen Spectrum**
Mo 4/13	I	**Atoms** **6.3** The Nucleus
We 4/15		**Atoms** **6.4** Condensed Matter
Fr 4/17		LAB **- Radioactivity**
Mo 4/20	J	**Synthesis** **7.1** Space-Time Revisited
We 4/22		**Synthesis** **7.2** Particles and Force-Fields
Fr 4/24		LAB - **"Copenhagen" movie**
Mo 4/27		**Final Essay**
We 4/29		**Synthesis** **7.3** The Standard Model
Fr 5/1		LAB - **Particle Identification** (webpage)
Mo 5/4	K	**Synthesis** **7.4** Unsolved Mysteries
Sat 5/9		**Final Exam 11:30am-2:30pm**

* Drop