SYLLABUS PHYS 1301 IDEAS OF MODERN PHYSICS

The strange ideas of modern physics explained for all

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 mass and the force of gravity are illusions, and 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 largest and most complex

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
Mo 8/25		**Scientific Discovery**
We 8/27		**Classical Physics** **2.1** Space, Time, Motion
Fr 8/29		LAB - **1.1 Numbers in Science**
Mo 9/1		*Labor Day - no class*
We 9/3		**Classical Physics** **2.2** Gravity
Fr 9/5		LAB - **Measurement and Error** (manual)
Mo 9/8	A	**Classical Physics** **2.3** Electricity & Magnetism
We 9/10		**Classical Physics** **2.4** Light: Into the Modern Era
Fr 9/12		LAB - **Speed of Light**
Mo 9/15	B	**Special Relativity** **3.1** Space, Time, Motion, Revisited
We 9/17		**Special Relativity** **3.2** Paradoxes (not)
Fr 9/19		LAB - **Introduction to Special Relativity**
Mo 9/22	C	**Special Relativity** **3.3** Energy and $E = mc^2$
We 9/24		**Special Relativity** **3.4** Space-Time
Fr 9/26		LAB - **More with Special Relativity**
Mo 9/29	D	**General Relativity** **4.1** Equivalence Principle
We 10/1		**General Relativity** **4.2** Time Dilation and Light Bending
Fr 10/3		LAB - **Free Fall**
Mo 10/6	E	**General Relativity** **4.3** Curved Space-Time
We 10/8		**General Relativity** **4.4** Structure of the Universe
Fr 10/10		LAB - **Hubble's Law**
Mo 10/13		*Fall Break - no class*
We 10/15	F	**Quantum Mechanics** **5.1** Wave-Particle Duality of Light
Fr 10/17		LAB **- Probability**
Mo 10/20		**Mid-term Essay**
We 10/22		**Quantum Mechanics** **5.2** Probability & Uncertainty
Fr 10/24		LAB - **Diffraction**
Mo 10/27	G	**Quantum Mechanics** **5.3** Matter Waves
We 10/29		**Quantum Mechanics** **5.4** Quantum Measurements
Fr 10/31		LAB - **Magnetic Particle Accelerator**
Mo 11/3	H	**Atoms** **6.1** Structure and Properties
We 11/5		**Atoms** **6.2** Quantized Energy
Fr 11/7*		LAB **- Hydrogen Spectrum**
Mo 11/10	I	**Atoms** **6.3** The Nucleus
We 11/12		**Atoms** **6.4** Condensed Matter
Fr 11/14		LAB **- Radioactivity**
Mo 11/17	J	**Synthesis** **7.1** Space-Time Revisited
We 11/19		**Synthesis** **7.2** Particles and Force-Fields
Fr 11/21		LAB - **"Copenhagen" movie**
Mo 11/24		**Final Essay**
We 11/26		*Thanksgiving Break*
Fr 11/28		*No Classes*
Mo 12/1		**Synthesis** **7.3** The Standard Model
We 12/3	K	**Synthesis** **7.4** Unsolved Mysteries
Fr 12/5		LAB - **Particle Identification** (webpage)
Mo 12/8		Review for Final Exam
Mo 12/15		**Final Exam 11:30am-2:30pm**

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