PHYS 340: From Atoms to the Universe (Course for NON-SCIENCE Students)

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UBC Calender-COURSE DESCRIPTION: Ancient Greek ideas of form and substance, and modern concepts of forces and fields. The 20th century quantum revolution. The modern universe, from quarks and atoms to the big bang. Quantum paradoxes.

(Not for credit in the faculties of science and applied science)

NB: No Mathematical Knowledge Required.

PACS numbers:

The colloquial name for this course is "Physics for Poets", and it is indeed intended for students with no scientific or mathematical background. In fact the main emphasis will be on 3 things:

(i) To study some of the philosophical and historical background to our modern understanding of the physical world. We look at the very interesting history of the physics from the time of the Ancient Greeks, including milestones like the ideas of Newton, Einstein, and quantum theory, and the way these are bound up with the evolution of other intellectual movements. We also look at how the development of our modern ideas has influenced and been influenced by philosophical work. Emphasis will be given to the Greek atomists, to Plato and Aristotle, to renaissance rationalists (Descartes *et seq.*), and to some modern philosophers of science- looking at things from their perspective as well as our own.

(ii) To give students with no mathematical background a feeling for some of the really deep concepts of physics- particularly the idea of fields, of spacetime, and of quantum physics. We also look at the paradoxes of quantum mechanics, and their profound implications for common sense, and for deeply-held philosophical convictions about the nature of physical reality.

(iii) To survey how and why modern physics has changed our world and how we understand it. This covers both the extraordinary technological changes, and the way in which our intellectual horizons have suddenly expanded to cover all known physical processes, ranging from sub-nuclear quarks up to the entire universe. We will cover topics ranging from computers, lasers, and superconductivity, to atoms, stars, and the cosmos, showing the links between all these. To illustrate how things work there will be lots of hands-on demonstrations. The aim is to give students a feeling for how these things work, and for the unified nature of the underlying ideas. Some discussion of the future will also be given (ie, strings, quantum technology, space travel, etc), and of the "big questions" facing us.