1) Title: An Introduction to Quantum Radar
2) Instructor: Dr. Marco Lanzagorta, US Naval Research Laboratory,
3) Abstract: It has been recognized for over half a century that quantum mechanics defines the ultimate limits for sensing devices, and products of that recognition are now on the horizon of practical implementation. One of the most promising of those products is quantum radar, which offers a capability to significantly improve the tradeoff between energy and detection sensitivity compared to classical alternatives. This tutorial uses an information-theoretic approach to identify and explain the basic design principles and potential applications of quantum radar. A primary goal of the tutorial is to describe those aspects of quantum phenomena that can be harnessed in order to design and develop quantum radar systems. To this end, the tutorial summarizes recent theoretical and experimental results that showcase the feasibility of quantum radar. In addition, the tutorial compares the theoretical performance of quantum radar with their classical counterparts. The outline of the course is as follows. After a short introduction, the course will offer a quick glance at quantum phenomena and quantum information science. Then, we will discuss the basic elements of quantum radar theory. Subsequently, we will present the current experimental results that show that quantum radar appears to be a feasible technology. Finally, we will review the most important theoretical and experimental challenges that need to be addressed in order to develop an operational quantum radar.
4) Target audience and assumed knowledge: Scientists, engineers, technicians, or managers who wish to learn more about the theory, technology, and potential applications beh1ind quantum radar. This is an introductory level tutorial and only basic undergraduate training in engineering or science is assumed (e.g., linear algebra and classical electrodynamics).