

Advanced Quantum Mechanics (PHY-412/512)**Credit Hours:** 3**Course Pre-Requisites:** Quantum Mechanics 1 (PHY 212) AND Quantum Mechanics 2 (PHY 312)**Instructor:** Adam Zaman**Schedule:** Monday to Friday (11 AM – 1 PM)

Course Description: The way that quantum mechanics is actually used in research is, generally speaking, a far cry from the courses currently offered. For example, 'second quantization' is not covered in the current courses on quantum mechanics (such as PHY 212 and PHY 312), but it is the basic tool in expressing the physics of interacting multi-particle systems quantummechanically. The density matrix formalism is essential in dealing with quantum systems dealing with noisy, extraneous fields. Path integrals, which find so many uses in many different areas of physics, are left completely uncovered in current courses. This course attempts to bridge the gap between the foundational quantum mechanics courses and actual research level work. Various students have indicated great interest in such a course (at least twenty), which supports the need that there is indeed great need for such a course. Moreover, with increasing interest in futuristic quantum technologies such as quantum computation and communication, this course should be of interest to students in CS and EE (who have taken the basic courses in quantum mechanics), but want to perform research in this area. It is important to have this course in the summer semester – one, in regular semesters, there is often not enough 'space' after taking into account the regular courses, and two, taking this course should be most useful for students going on to do their senior year projects/masters thesis