Course Objectives:
This course is for PhD and advanced undergraduate students who want to gain a solid understanding of the concept of coherence as well as its applications in modern quantum optics. The course will have two main parts. The first part, which will cover about 1/3rd of the course, will discuss the concept of coherence; the remaining part of the course will focus on Quantum Entanglement.

Course content:

(2) **Quantum Entanglement**: Basics of nonlinear optics, Two-photon field produced by parametric down-conversion, EPR paradox, Bell inequalities and its experimental violations, Quantum theory of higher-order correlations, Two-photon coherence and two-photon interference effects. Two-photon entanglement in the following variables: time-energy, position-momentum, and angle-orbital angular momentum; Introduction to Quantum Information: Quantum Cryptography, Quantum Dense Coding, Quantum Teleportation, Quantum Imaging.

(3) **Additional topics** (may be covered during the course or given out as small projects): Photoelectric detection of light, The Hanbury Brown-Twiss experiment, Photon-bunching and antibunching, Photon Statistics, Squeezed states of light.

Instructor:
Anand Kumar Jha; Office: Faculty Building 351; Lab: CL 104 D
Ph: (+91)512-259-7014(Off); (+91)962-142-3993(Mobile)  Email: akjha@iitk.ac.in ; akjha9@gmail.com

Course Webpage: http://home.iitk.ac.in/~akjha/PHY690G.htm

Lecture: Tuesdays & Wednesdays: 17:00 – 18:30

Office Hour: There will be no scheduled office hour. You could see me in my office/lab with questions/concerns as and when I am available there. Alternatively, you could email/phone me to setup a meeting time.

Evaluation: 25% Homework (5/6 homeworks); 25% Mid-sem exam or project; 50% End-sem exam.

Reference books: