

# ONLINE CSSTEAP SHORT COURSE

ON

Free-Space Quantum Communication

April 28 – May 2, 2025

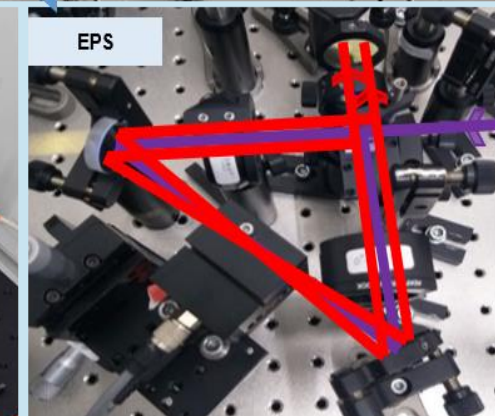
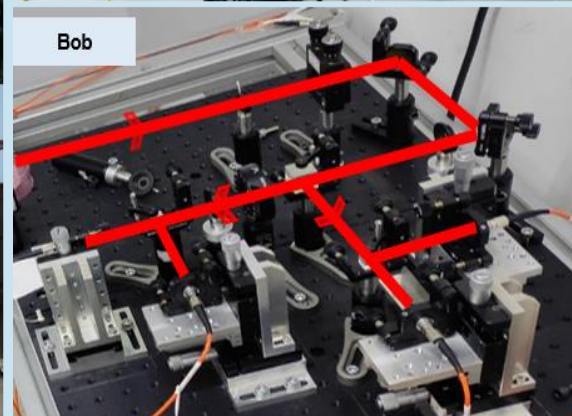
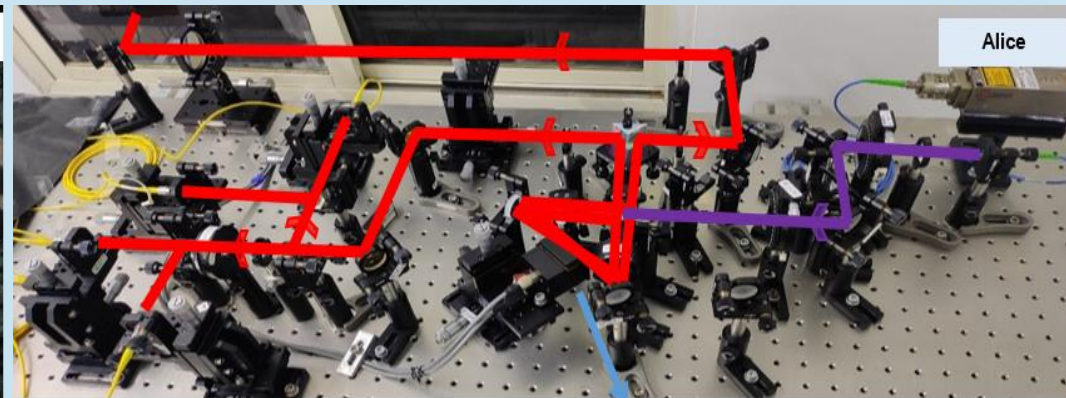
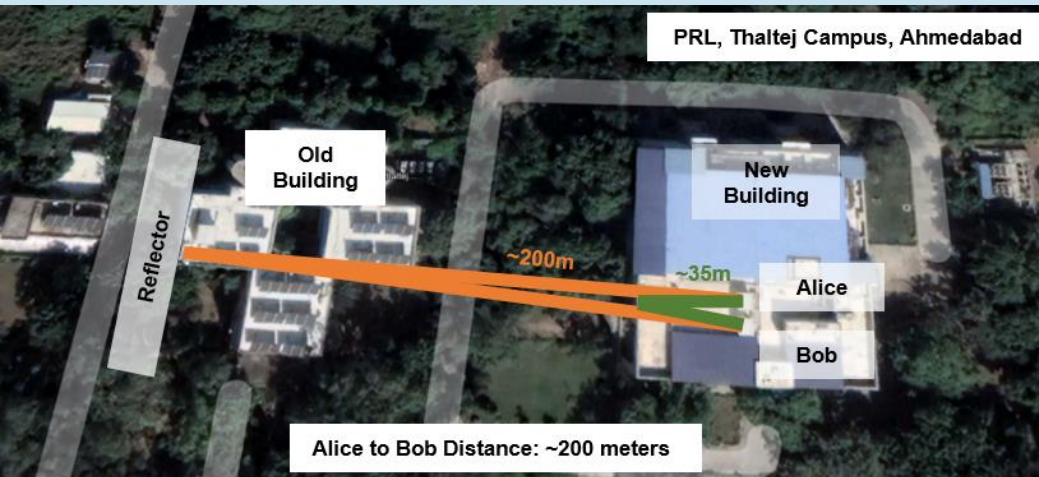
Organized by

Conducted by



Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP)  
(Affiliated to the United Nations)  
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[www.cssteapun.org](http://www.cssteapun.org)

Physical Research Laboratory (PRL)  
(A Unit of Dept. of Space, Govt. of India)  
Navrangpura, Ahmedabad, India  
[www.prl.res.in](http://www.prl.res.in)



## Introduction

Our present-day communication network and the internet are based on optical communication, which is not secure against hacking. The information and the encryption keys are sent as classical bits -- a stream of electrical or optical pulses representing 1s and 0s. Smart hackers can read and copy bits in transit without leaving a trace. However, using quantum communication and quantum key distribution (QKD), one can make it secure since the laws of quantum mechanics deny copying of quantum states used for communication.

The development of quantum communication over free space opens a pathway to the secure global quantum internet. Unlocking the full quantum advantage in global-scale networks is still an ongoing challenge, and capacity building of skill and human resource is highly required to extend the reach of individual quantum links.

In recent past, PRL has successfully demonstrated free-space quantum communication between two parties, separated by 200 m.

## Objective of the Course

The objective of the course is to create an awareness and develop an understanding of the fundamental and current technological trends in the field of free-space quantum communication. As the field continues to evolve rapidly, there is an increasing demand for professionals with the required knowledge and skills to tackle the complex challenges and opportunities it presents. The course is aimed towards highly motivated students who aspire for a career in scientific research and technology employing quantum science.

## Course Contents

1. Basics of quantum mechanics
2. Introduction to quantum optics
3. Quantum states and their superposition
4. Single photon sources
5. Producing entangled photons and verifying their entanglement
6. Quantum key distribution (QKD) and popular QKD protocols
7. Free-space quantum communication

## Eligibility & How to Apply

Applicants should have a Master's degree in Physics, Mathematics or other equivalent subjects, OR a Bachelor's degree (B.E/B.Tech.) in (Electrical, Optical, Electronics & Communication, Computer) Engineering, Information Technology or any other allied field. Since the whole course will be conducted in English, the applicant should have proficiency in the English language.

Applicants should apply online through the CSSTEAP website:

<https://admissions.cssteapun.org/login>

**Announcement of Course: February 17, 2025**

**Application Deadline: March 31, 2025**

In case of any difficulties while submitting the online application form, please contact [websupport@iirs.gov.in](mailto:websupport@iirs.gov.in) through e-mail.

Link for lectures will be shared with selected applicants in due course. Applicants are advised to check the website [www.cssteapun.org](http://www.cssteapun.org) regularly for further updates and information.

## About CSSTEAP

The CSSTEAP was established in India in November 1995 with its headquarters in Dehradun and is considered as the Centre of Excellence by UNOOSA. The 1<sup>st</sup> campus of the Centre was established in Dehradun, India and is hosted by Indian Institute of Remote Sensing (IIRS), a constituent unit of Indian Space Research Organisation (ISRO). The CSSTEAP has been imparting training and educational programmes related to RS & GIS, Satellite Communication, Satellite Meteorology, Space & Atmospheric Science, Global Navigation Satellite Systems, and Small Satellite Mission, helping participants in developing research skills through its Post Graduate and Certificate programmes.

## About PRL

Known as the cradle of Space Sciences in India, the Physical Research Laboratory (PRL) was founded in 1947 by Dr. Vikram Sarabhai. As a unit of the Department of Space, Government of India, PRL carries out fundamental research in selected areas of Physics, Space & Atmospheric Sciences, Astronomy & Astrophysics, Solar Physics, Planetary and Geosciences.

## Contact Details

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