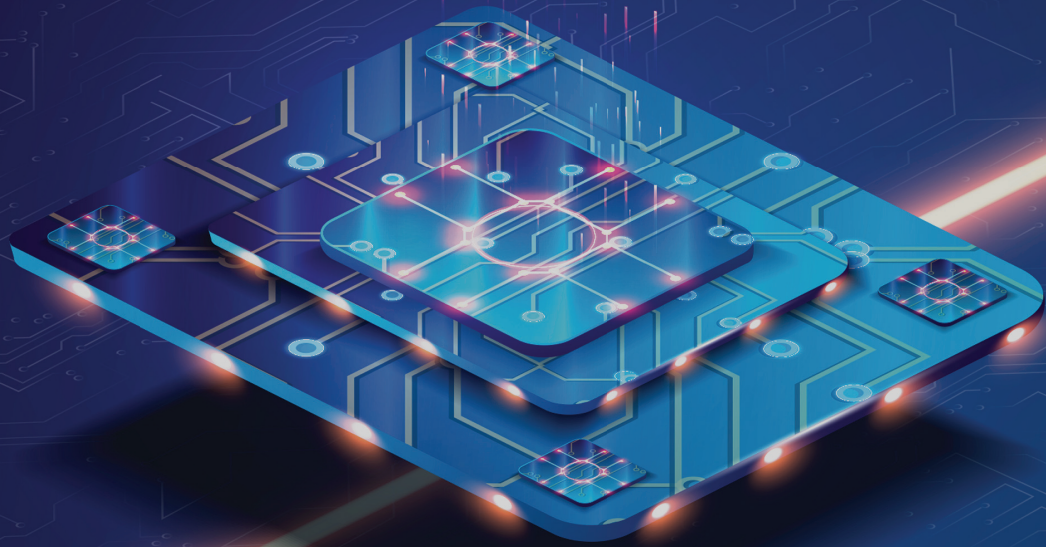




भारतीय प्रौद्योगिकी संस्थान दिल्ली
Indian Institute of Technology Delhi



PREPARE FOR THE FUTURE OF COMPUTING

Certification in
Quantum Computing & Machine Learning

05 Months | Starts 14th January, 2023 | Live Online Lectures + Tutorials

Quantum Computing

Quantum computing is a convergence of physics, mathematics, and programming to develop computer-based technologies centred around the principles of quantum theory. Quantum computing uses phenomena in quantum physics to create new ways of computing. It offers an ability to write programs in a completely new way. Quantum computing is made up of qubits that, unlike a classical computing bit, can be either 0 or 1, or a superposition of both 0 and 1. The power of quantum computers grows exponentially with more qubits.

Quantum Machine Learning (QML)

Quantum machine learning is the integration of quantum algorithms within machine learning programs. It commonly refers to machine learning algorithms for the analysis of classical data executed on a quantum computer, i.e. quantum-enhanced machine learning.

Potential Applications Of QML



Finance



Cryptology &
Intelligence



Drug Design
& Discovery



Aerospace
Design



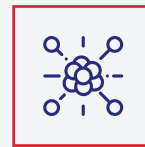
Polymer
Design



Big Data
Search



Digital
Manufacturing



Complex
Simulations
(Nuclear Fusion)

Certification in Quantum Computing & Machine Learning

Programme Highlights



5-month, online programme for engineering graduates with proficiency in math and programming



Comprehensive and contemporary curriculum



55 hours of live online teaching on weekends



Continuing Education Programme (CEP), IIT Delhi Certification

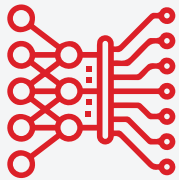
Who Should Attend?

- Engineering graduates with proficiency in Mathematics and Programming.
- Working computer science professionals who would like hands-on experience in technologies of the future
- Young engineering graduates wishing to be a part of the exciting and evolving future of computing

Learning Outcomes



Principles of Quantum Computing



Fundamental differences between Conventional Computing & Quantum Computing



Various Quantum Computing Algorithms



Applications of Quantum Computing in Machine Learning and Deep Learning

Programme Curriculum

The programme curriculum comprises of the following topics:

Introduction to Quantum Computing

Quantum Bits, Dirac Notation, Single and Multiple Qubit Gates, No Cloning Theorem, Quantum Interference

Postulates of Quantum Computing

Quantum State, Quantum Evolution, Quantum Measurement, Bell's Inequality Test, Density coding, Quantum Teleportation, BB84 Protocol

Introduction to Quantum Algorithms

Cirq, Qiskit, Deutsch-Jozsa Algorithm Implementation, Bernstein-Vajirani Algorithm, Simon's Algorithm

Quantum Fourier Transform and Related Algorithms

Quantum Fourier Transform, QFT Implementation in Qiskit, Quantum Phase Implementation, Quantum Phase Estimation in Qiskit, Shor's Period Finding Algorithm, Grover's Search Alogrithm

Quantum Machine Learning

Data Encoding, HHL, Algorithm, HHL Algorithm Implementation, Quantum Linear Regression, Quantum Swap Test Subroutine, Swap Test Implementation, Quantum Euclidean Distance Calculation, Quantum K-Means Clustering, Quantum Principal Component Analysis, Quantum Support Vector Machines, SVM Implementation using Qiskit

Quantum Deep Learning

Hybrid Quantum-Classical Neural Networks, MNIST Classification using Hybrid Quantum-Classification Neural Network, Quantum Neural Network for Classification on Near-Term Processors, MNSIT Classification using TensorFlow Quantum

Quantum Variational Optimisation and Adiabatic Methods

Variational Quantum EigenSolver, Expectation Computation, Ising Model and its Hamiltonian, Ising Model for a Quantum System, Implementation of the VQE Algorithm, Quantum Max-Cut Graph Clustering, Quantum Adiabatic Theorem, Quantum Approximate Optimisation Algorithm, Quantum Random Walk

Tutorials: 10 hours of tutorials teaching the attendants Programming of Quantum Machine Learning Algorithms in Python



Programme Details



Duration

- 5 Months
- 55 Hours of Learning (45 hours of live sessions & 10 hours of live tutorials/labs sessions)
- 90-Minute Sessions on Weekends



Delivery

Live Online Sessions delivered Direct-to-Device (D2D)



Class Schedule

Saturdays: 10:00 a.m. to 11:30 a.m.

Sundays: 10:00 a.m. to 11:30 a.m.



Evaluation

60% - Final examination conducted at the end of the programme

30% - Projects

10% - Attendance

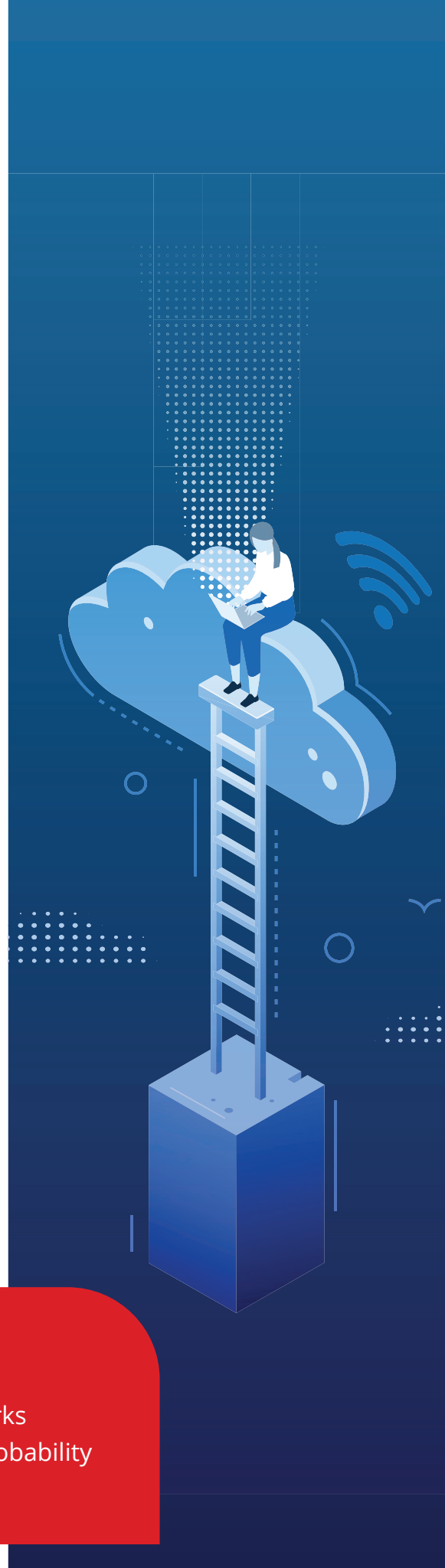


Admission Criteria

Selection is based on application review.

Eligibility

- B.Tech/BE; BSc (in all streams);
- BCA/MCA; BA in Mathematics with minimum 50% marks
- Understanding of the concepts in Linear Algebra & Probability
- Experience with any programming language





Certification*

Candidates who successfully complete the programme and meet the attendance requirements will receive a 'Certificate of Completion' from CEP, IIT Delhi.

The organising department of this programme is the Department of Electrical Engineering, IIT Delhi.

*Only e-certificates will be issued by CEP, IIT Delhi, as per the sample above.

Programme Coordinator



Dr. Abhishek Dixit
Assistant Professor,
Dept. of Electrical
Engineering, IIT Delhi

Dr. Abhishek Dixit received his M.Tech. degree in Opto-electronics and Optical Communication from Indian Institute of Technology (IIT) Delhi in 2010 and the Ph.D. degree in Computer Science Engineering from Department of Information Technology (INTEC), Ghent University, Belgium, in 2014. Since 2015, he has been an Assistant Professor at IIT Delhi where he has taught courses related to Optical Communications, Signal Processing, Communications Engineering and Networking. Recently, he started actively researching the use of Machine Learning to improve the performance of communications systems – conventional and quantum. He has also taken an NPTEL course on Principles of Digital Communications.

Before joining IIT Delhi in December 2015, he has served for a semester (July 2015 – December 2015) as an Assistant Professor at IIT Mandi and as a Post-doctoral Researcher (December 2014 – June 2015) at Ghent University, Belgium.

He is leading research activities at IIT Delhi in the area of Optical Communications and Networking. In this context, he has been involved in a large number of Indian projects. He has also carried out several consultation projects in the area of railway signalling.

He has published over 30 international journal articles (IEEE JSAC, IEEE Communications Magazine, Journal of Lightwave Technology, Journal of Optical Communications and Networking, IEEE Networks, IEEE Transactions on Network and Service Management, IEEE Access, IEEE Sensors, IEEE Open Journal of the Communications Society, etc.) and over 50 publications in international conferences.

Programme Fees

Particulars	Amount (₹)
Programme Fee	1,25,000
GST@18%	22,500
Total	1,47,500

Note: All fees should be submitted in the IITD CEP Account only, and the details will be shared post-selection.



Instalment Schedule

Instalment	Date	Amount (₹)*
I	To be paid within 7 days of offer rollout	30,000
II	10 th March, 2023	30,000
III	10 th April, 2023	30,000
IV	10 th May, 2023	35,000

*GST @18% will be charged extra in addition to the fee.

Programme Timelines

Last date to apply	13 th November, 2022
Shortlisted candidates will be informed by	18 th November, 2022
Last date to submit the fee	25 th November, 2022
Programme start date	14 th January, 2023
Programme end date	June 2023

APPLY NOW 



भारतीय प्रौद्योगिकी संस्थान दिल्ली Indian Institute of Technology Delhi



The Indian Institute of Technology Delhi (IIT Delhi) is one of the 5 initial IITs established for training, research and development in science, engineering and technology in India. Established as College of Engineering in 1961, the Institute was later declared as an Institution of National Importance under the “Institutes of Technology (Amendment) Act, 1963” and was renamed as “Indian Institute of Technology Delhi”. It was then accorded the status of a Deemed University with powers to decide its own academic policy, conduct its own examinations, and award its own degrees.

Since inception, over 48,000 students have graduated from IIT Delhi in various disciplines including Engineering, Physical Sciences, Management, and Humanities & Social Sciences.

For more details, please visit: www.iitd.ac.in

Continuing Education Programme (CEP)

Executive education is a vital need for companies to build a culture that promotes newer technologies and solutions and builds a workforce that stays abreast of the rapidly transforming needs in the technological, business, and regulatory landscape. Committed to the cause of making quality education accessible to all, IIT Delhi has launched Online Certificate Programmes under eVIDYA@IITD (ई-विद्या @IITD), enabling Virtual and Interactive learning for Driving Youth Advancement @IITD for Indian as well as international participants.

These outreach programmes offered by the Indian Institute of Technology Delhi (IIT Delhi) are designed to cater to the training and development needs of various organisations, industries, society, and individual participants at national and international levels with a vision to empower thousands of young learners by imparting high-quality Online Certificate Programmes in cutting-edge areas for their career advancement in different domains of engineering, technology, science, humanities, and management.

For more details, please visit: <http://cepqip.iitd.ac.in>

2nd
in NIRF Rankings
2022 (Engineering)

4th
in Outlook ICARE Rankings
2022 (Engineering)

3rd
in QS World University
Rankings 2023 in India

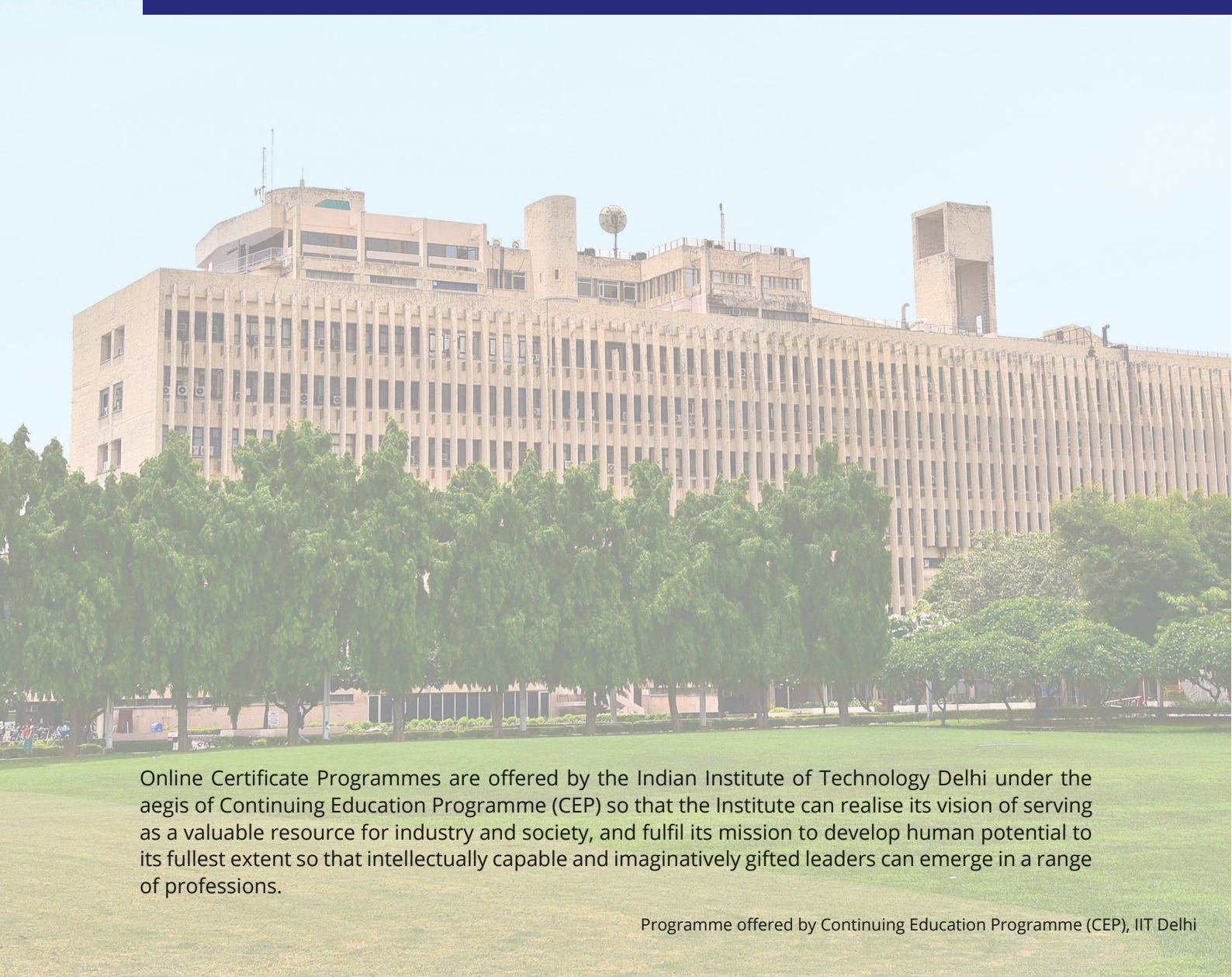
Services provided by:



TimesPro, 18th Floor, G-02 Wing,
Lotus Corporate Park,
Off Western Express Highway,
Jogeshwari (E), Mumbai – 400 063, India.

For any feedback, please write to:
Head CEP, IIT Delhi at
hodqipcep@admin.iitd.ac.in

1800-270-5400
admissions@timesgroup.com
www.timespro.com



Online Certificate Programmes are offered by the Indian Institute of Technology Delhi under the aegis of Continuing Education Programme (CEP) so that the Institute can realise its vision of serving as a valuable resource for industry and society, and fulfil its mission to develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.

Programme offered by Continuing Education Programme (CEP), IIT Delhi