



One Week AICTE-ISTE sponsored Online Faculty Development Programme on



# Quantum Computing Fundamentals

07.02.2022 – 12.02.2022



## INDERPRASTHA ENGINEERING COLLEGE

Approved by AICTE and affiliated to Dr. A.P.J. Abdul Kalam Technical University

*Shaping Engineers and Leaders for Future*

*Jointly Organized by:*

- Department of Electronics & Communication Engineering
- Department of Information Technology



NAAC accredited Institute,

NBA accredited Courses (CSE, IT, ECE & Civil Engg.)

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<https://www.ipec.org.in>



## About Inderprastha Engineering College

*IPEC* is one of the preferred destinations for technical education amongst the private engineering colleges in U.P. It was established in the year 2000, under the aegis of 'Shail Garg Shiksha Sansthan' – a non-profit making society. *IPEC* is continuously working to foster teaching, research, extension education, innovation, leadership and entrepreneurship.

It is a **NAAC** accredited institute with **NBA** Accredited Courses (CSE, ECE, IT & Civil Engg.). It is also **ISO 9001:2015** certified institute. It offers **M.Tech. in CSE and B.Tech in CSE, CSE(AI-ML), CSE (Data Science), IT, ECE and Mechanical Engineering** to fulfill the varied aspirations of its strength of over 3000 learners.

## About the ECE Department (NBA Accredited)

The objectives of **ECE** department is to produce graduates meeting the dynamic demands of industry and research. The students are inculcated with ample hands on training and industrial exposure to make them capable of applying the scientific and technical knowledge for the betterment of society. The Department is fully equipped with all the labs required for the curriculum and industrial demands. The notable asset of the department is the intellectual capital which comprises of highly motivated, technically qualified and well experienced faculty members.

## About the IT Department (NBA Accredited)

The Department of **IT** is committed to produce graduates meeting the dynamic demands of industry and research. The students are inculcated with ample hands-on training and industrial exposure to make them capable of applying scientific and technical knowledge for the betterment of society. Department is actively involved in publishing work in the fields of Machine Learning, IOT, and Data Science. The Department has published various research papers in the fields of Data Analytics, Image processing, Cloud computing, and Machine learning. The department is associated with sponsored projects from industries, CSIR & DST.

## Chief Patron

- **Shri S. S. Jain** (Chairman, *IPEC* Governing Council)
- **Shri A. N. Gupta** (Chairman, *SGSS*)
- **Shri R. C. Jain** (Vice Chairman, *SGSS*)
- **Shri Lalit Jaiswal** (Secretary, *SGSS*)
- **Shri Gaurav Jain** (Joint Secretary, *SGSS*)
- **Shri Rakesh Goel** (Treasurer, *SGSS*)

## Patron

- **Prof. (Dr.) Ajay Kumar** (Director, *IPEC*)

## Co-Patron

- **Dr. V. K. Gupta** (HOD, *ECE*)
- **Dr. Pooja Tripathi** (HOD, *IT*)

## FDP Coordinator

- **Dr. Ramendra Singh** (Dept. of *ECE*)

## Organizing Committee

- **Dr. Arti Sharma**, FDP Co-coordinator (Dept. of *ECE*)
- **Mr. Krishan Kumar**, FDP Co-coordinator (Dept. of *IT*)
- **Ms. Shalini Singh** (Dept. of *ECE*)
- **Mr. Vishal Gupta** (Dept. of *ECE*)
- **Ms. Deeksha Sharma** (Dept. of *ECE*)
- **Ms. Uma Randev** (Dept. of *ECE*)
- **Ms. Shefali Jagga** (Dept. of *ECE*)
- **Ms. Anchal Tyagi** (Dept. of *ECE*)

## Contact Person

- **Dr. Ramendra Singh** (FDP Coordinator)  
Mobile No. 9310878197, Email:- ramendra.singh@ipec.org.in

## About the FDP

**Quantum computing** is fast emerging as one the key disruptive technologies of our times. It is a fundamentally new computing paradigm that has the potential to efficiently solve certain challenging problems which cannot be solved efficiently in a classical setting. The **FDP** will provide introduction to Quantum Computation, starting with basic concepts to the quantum circuit model of computation and basic Quantum algorithms and Quantum Machine Learning and Quantum Neural Network.

## Objective of FDP

The **aim** of the course is to familiarize the faculty with both important quantum algorithms, variational quantum algorithms that utilize an interplay between classical and quantum computers and the Quantum Approximate Optimization algorithms and the intersection of quantum computing and machine learning. **Quantum computers** have the potential to efficiently solve certain problems that are intractable for ordinary, classical computers. This is a multidisciplinary subject. This **course** will cover basic concepts in theoretical computer science and physics in addition to introducing core quantum computing topics.

## Outcome of FDP

- Able to describe the differences between quantum computing and classical computing.
- Able to enumerate the pros and cons of various physical implementations of quantum bits.
- Able to describe the current landscape of quantum computing development in the industry and academia.
- Able to construct Quantum circuit and perform simulations.
- Analyze the behavior of basic quantum algorithms.
- Implement simple quantum algorithms and information channels in the quantum circuit model

## Who should attend?

- All faculty members of **AICTE** approved institutions.

## Topics to be covered

- Introduction to basics of quantum computing
- Introduction to **Qubits** and Operations
- Classical logic gates to Quantum Logic Gates
- **Photons** as a medium of secure communication
- Basic Quantum Circuits and their Simulation
- Quantum Algorithm
- **Qiskit** Programming
- Practical Quantum Computing
- High Performance Computing and Quantum Computing
- Introduction to **Quantum Machine Learning** and its application
- Implementation of "Quantum computing concepts using **MATLAB** and Quantum Neural Networks"
- Quantum Cryptography and Quantum Cryptanalysis

## Registration

- No Registration Fee. (Link:- <https://bit.ly/3f76Vwv>)
- Selection of participants will be done on **first come first serve basis**. Preference will be given to **ISTE** members.

## Important Dates

- Deadline for Online Registration: **31.01.2022**
- Notification of Acceptance: **04.02.2022**
- FDP Date: **07.02.2022 – 12.02.2022**

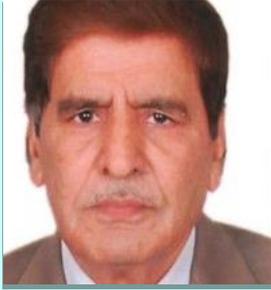
## Mode

- Through WebEx. The online link will be mailed on **04.02.2022** to the registered email ID with notification of acceptance.

## Course Certificate

- Random test on daily basis will be carried out with minimum 5 objective/multiple choice questions on the topic covered for the day. 5 such tests except last day will be conducted. For certification participant has to qualify in minimum 3 out of 5 with **60%**.
- Participant must have minimum **80%** attendance for the session.
- Minimum **60%** or more in final assessment test which will be objective type with **50 questions** on all topics covered in session with uniform distribution over topics.

# Resource Persons



**Prof. (Dr.) B. S. Rajput**  
**Ex Vice- Chancellor**  
Kumaun University, Nainital  
& HNB Garhwal University,  
Srinagar



**Prof. (Dr.) Michael M. Resch**  
**Ex Director**  
HPC Centre, University of  
Stuttgart, Germany



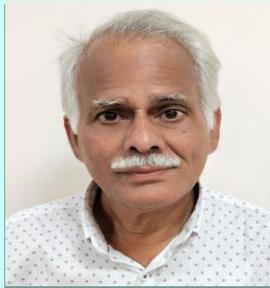
**Prof. (Dr.) Amlan Chakarborty**  
**Director**  
A.K.C. School of Information  
Technology, University of  
Calcutta



**Prof. (Dr.) Ajay Kumar**  
**Director**  
Inderprastha Engineering  
College, Ghaziabad



**Prof. (Dr.) Sanjay Kumar Singh**  
**Professor & HOD**  
Department of Computer  
Science, IIT BHU



**Prof. (Dr.) Pransanta K. Panigrahi**  
**Professor**  
Indian Institute of Science  
Education and Research (IISER)  
Kolkata



**Prof. (Dr.) Navneet Arora**  
**Professor**  
Department of Mechanical  
Engineering, IIT Roorkee



**Prof. (Dr.) T.S. Mahesh**  
**Professor**  
Indian Institute of  
Science Education and  
Research (IISER) Pune

# Resource Persons



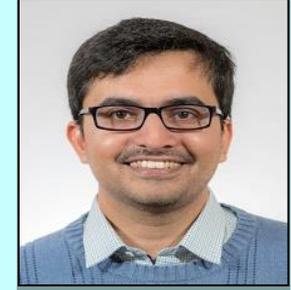
**Dr. M. Girish Chandra**  
**Principal Scientist**  
TCS Research



**Prof. (Dr.) Manu Pratap Singh**  
**Professor & HOD**  
Department of Computer  
Science, IET, Dr. B. R.  
Ambedkar University, Agra



**Dr. Sumit Pandey**  
**Assistant Professor**  
IIT Jammu



**Dr. Biswanath Chakraborty**  
**Assistant Professor**  
IIT Jammu



**Dr. Vivek Vyas**  
**Assistant Professor**  
IIIT Vadodara



**Mr. Amit Shah**  
**Principal Consultant**  
Atos Global IT Solutions and  
Services Private Limited, Pune



**Mr. Saikat Basu**  
**Associate Consultant**  
Atos Global IT Solutions and  
Services Private Limited, Pune



**Mr. Sayantan Pramanik**  
**Qiskit Advocate**  
Quantum Computing  
Research, Strategy and  
Consulting at TCS