This short-term course, “Fundamentals of Quantum Computing,” several significant and hands-on experiences await participants. This course is strategically designed to ensure that participants acquire comprehensive knowledge and practical skills in quantum computing. First and foremost, participants will dive deep into the fascinating world of quantum mechanics, where they'll grasp fundamental concepts like superposition and entanglement. Through engaging lectures and interactive discussions, they will build a solid foundation in quantum principles. One of the course's highlights is the practical component, where participants will gain hands-on experience in quantum programming using Qiskit, a versatile open-source quantum computing framework. They will learn how to construct, simulate, and execute quantum circuits, enabling them to apply their knowledge in a real-world context. Furthermore, participants will explore the realm of quant um algorithms, including renowned algorithms like Deutsch-Jozsa, Grover's, and Shor's. They will not only understand the theoretical aspects but also learn how to implement and run these algorithms on quantum hardware. Throughout the course, participants will be encouraged to engage in discussions and share their insights, fostering a dynamic and collaborative learning environment. Our expert instructors will provide guidance, ensuring that participants get the most out of each session. Moreover, the course will touch upon the vital topic of ethical considerations and societal implications related to quantum technologies, allowing participants to contemplate the broader impact of quantum advancements. By the end of this short-term course, participants will be well-equipped with both theoretical knowledge and practical skills in quantum computing, positioning them as valuable contributors in a rapidly evolving technological landscape, where quantum computing holds the potential to drive innovation across various industries.

Course Coverage:

- Introduction to Quantum Mechanics
  - Superposition, Entanglement, and Quantum States
  - Quantum Gates and Circuits
- Quantum Computing Fundamentals
  - Qubits and Quantum Gates
  - Quantum Algorithms: Deutsch-Jozsa, Grover's, Shor's
- Quantum Programming with Qiskit
  - Setting up Qiskit
  - Constructing and Simulating Quantum Circuits
- Quantum Algorithms and Applications
  - Quantum Machine Learning, Cryptography, and More
- Quantum Computing Platforms and Future Directions
  - Current Quantum Hardware
  - Ethical and Societal Implications

Key Speakers:

- **Prof. Kishor Chandra Pati, NIT Rourkela**
- **Prof. Shyamapada Mukherjee, NIT Rourkela**
- **Prof. Bibhu Datta Sahoo, NIT Rourkela**
- **Prof. Arun Kumar Pati, IIIT Hyderabad**
- **Prof. Indranil Chakrabarty, IIIT Hyderabad**
- **Dr. Manish Modani, NVDIA**
- **Prof. Amlan Chakraborty, CU**
- **Dr. Mrityunjay Ghosh, HCLTech**
- **Dr. Amit Saha, AToS**
- **Dr. Saikat Basu, LTIMindtree**

National Institute of Technology Rourkela

Short Term Course (Hybrid Mode) On

Fundamentals of Quantum Computing (FQC 2024)

15th – 19th January 2024

Patron

Prof. K. Umamaheshwar Rao Director NITR

Chairman

Prof. Bibhudatta Sahoo

Coordinators

Dr. Shyamapada Mukherjee

Co-Coordinator

Dr. Sumanta Pyne

Organized By

Dept. of Computer Science and Engineering
National Institute of TechnologyRourkela,
Odisha - 769008

Introduction:

In our ever-evolving technological landscape, quantum computing emerges as an indispensable tool with profound implications, not only for the present but also for the future. Our online short-term course, "Fundaments of Quantum Computing," is designed to illuminate the paramount importance of quantum computing in modern society. Quantum computing, with its unique ability to exploit the principles of superposition and entanglement, has the potential to revolutionize computation and accelerate scientific breakthroughs. It transcends classical computing limitations, making previously insurmountable challenges in cryptography, drug discovery, optimization, and artificial intelligence attainable. Beyond immediate applications, quantum computing fuels innovation and scientific progress, offering new horizons for exploration in fields like artificial intelligence, machine learning, and materials science. Proficiency in quantum technologies is no longer optional—it is the key to competitiveness in a rapidly evolving landscape. However, with great power comes great responsibility, and ethical considerations surrounding quantum technologies are paramount. As we look to the future, quantum computing stands as a catalyst for addressing humanity's most pressing challenges. By enrolling in our course, you embark on a transformative journey that empowers you to navigate the quantum frontier, shaping the future of computing, technology, and the world itself.

Online Account Details:

Account No: 10138951784
Account Name: CONTINUING EDUCATION NIT ROURKELA
IFSC No: SBIN0002109
Branch: State Bank of India, NIT Campus Rourkela

About the Institute:

National Institute of Technology (NIT) Rourkela is an institute of importance funded by the ministry of Education. NIT Rourkela was established as Regional Engineering College (REC) on August 15, 1961. NIT Rourkela was ranked 601-800 in the world by the times Higher Education World University Ranking of 2018 and 126th in Asia. In India, it was ranked 16 among engineering colleges by the National Institutional Ranking Framework (NIRF) 2023. For details about the institute ***Please visit*** *https://www.nitrkl.ac.in/*

39 NIRF Overall	15 NIRF Engg.	24 NIRF Research	281-290 QS Asia

About the Departments:

The department of Computer Science and Engineering is established with the vision to prepare its students for professional employment and graduate education through study and implementation of the fundamental principles of theory, abstraction, and software design. The department offers various UG and PG programmes with the mission to provide high-quality education that prepares the graduates for success in their professional practice and advanced studies. The department also offers M. Tech in Computer Science, Information Security, and Software Engineering; and Ph. D for regular as well as sponsored candidates. Please visit *https://website.nitrkl.ac.in/CS/* to know more about the department of CSE.

Online Registration Form:

https://forms.gle/xx7CX48qkH4H1m1t9

Registration Details:

Category	Online Registration Fee in INR(including 18% GST)
Research Scholars/ PG / UG Student	590/-
Faculty fromEngineering Institutes	1180/-
Engineers from Industry and R&D Organizations	2360/-
No registration fee for students / staffs of NIT Rourkela	

Important Dates:

Registration Deadline: 5th January 2024
Short-term Course Date: 15th -19th January 2024

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