

Course Relevance:

The evolution of cellular networks from the first generation (1G) through the fifth generation (5G) has witnessed a dramatic change in the types of connected devices and the offered services. 5G has paved the way for connecting the networks not only with the smartphones but also with the entities like Internet-of-Things (IoT), vehicular networks, etc. It is envisioned that the sixth generation (6G) networks will serve a wider range of smart terminals connecting everything, be it on ground, in air, and/or over the sea. The 6G is anticipated to have peak data rates at least 10 to 100 times larger and the latency 10 times lesser than the 5G. The other targets include ubiquitous coverage, larger connectivity, extreme ultra reliability, energy efficiency, etc. There are several key enablers for 6G including the Terahertz and visible light spectra, unmanned aerial vehicle (UAV), energy harvesting, and intelligent reflecting surface (IRS). It is important for students, researchers, and communication engineers to understand the fundamentals of these emerging wireless technologies to be employed in 6G and beyond 6G networks. Aim of the course is to provide an overview of 6G enabling technologies. This course would cover fundamentals of wireless communications, channel modeling, IRS, Integrated space-aerial-terrestrial networks, underwater communication, advanced computational tools for performance analysis, machine learning for wireless communications, and energy harvesting.

Course Objectives:

- To provide a comprehensive overview of evolution of wireless communications towards 6G.
- To demonstrate the state-of-the-art enabling technologies for 6G like Massive MIMO, TeraHertz, visible light communications, underwater communications, IoT, space and UAV networks, energy harvesting communications, machine learning, etc.
- To introduce advanced computational tools for performance analysis of 6G wireless networks.

Topics to be Covered:

- Fundamentals of wireless communications: Propagation mechanisms and channel models.
- Evolution from 1G through 6G.
- Advanced computational tools for performance analysis of communication systems.
- Machine learning for wireless networks.
- Intelligent Reflecting Surfaces.
- mmWave, TeraHertz, and visible light
- Underwater communications.
- Massive MIMO wireless communications.
- Energy harvesting communications.
- Integrated Space-Aerial-Terrestrial Networks.

Speakers:

- Dr. Poonam Singh, NIT Rourkela
- Fundamentals of wireless communications
- Dr. Pankaj K. Sharma, NIT Rourkela
- Introduction to 6G
- Integrated space-aerial-terrestrial networks
- Dr. Debiprasad Acharya, NIT Rourkela
- 6G-IoT
- Dr. Pawan Kumar, NIT Rourkela
- Wireless Channel Modeling, Massive MIMO
- Wireless Powered Communications
- Mellin Transform and Special Functions
- Dr. Upendra Kumar Sahoo, NIT Rourkela
- Machine learning
- Dr. Siddharth Deshmukh, NIT Raipur
- Reinforcement learning for wireless communications
- Dr. Situ Rani Patre, NIT Rourkela
- Broadband MIMO antennas
- Dr. Shrishail M. Hiremath, NIT Rourkela
- SDR/GNU radio
- Dr. Santos Kumar Das, NIT Rourkela
- Free Space Optical Communication
- Li-Fi
- Dr. Anirban Bhowal, NIT Rourkela
- Underwater Communication
- Dr. Kalpana Dhaka, IIT Guwahati
- Device-to-device communications



Five-day Short-Term Course on Emerging Technologies for 6G Communications

Hybrid Mode
(Online and Offline)
17th – 21st July 2023



Coordinators:

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Dr. Pankaj Kumar Sharma

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Technically Co-sponsored by:





About National Institute of Technology (NIT) Rourkela

National Institute of Technology (NIT), Rourkela was founded as Regional Engineering College, Rourkela in 1961. It is a prestigious institute with a reputation for excellence at both undergraduate and postgraduate levels, fostering the spirit of national integration among the students, a close interaction with industry and a strong emphasis on research, both basic and applied. The city of Rourkela is a bustling industrial city, cosmopolitan by nature and is well connected to all parts of the country by road and rail. The nearest airports are Ranchi, Kolkata and Bhubaneswar, which are well connected by trains. Please visit <https://www.nitrkl.ac.in/About.aspx> to know more about NIT Rourkela.

About Department of Electronics and Communication Engineering

The department was established with the vision to become a nationally acclaimed department of higher learning that will serve as a source of knowledge and expertise for the society. The department offers various UG and PG programmes with the mission to advance and spread knowledge in the areas of electronics, communication, instrumentation, signal processing and VLSI leading to creation of wealth and welfare of humanity. The department also offers M. Tech in Microwave and Radar Engineering and Ph. D. for regular as well as sponsored candidates.

The faculties of EC department are handling several externally funded research projects. Please visit <https://www.nitrkl.ac.in/EC/> to know more about the Department of ECE.

Important Dates:

Registration Deadline	13 th July 2023
Confirmation to Participants by email	14 th July 2023
Commencement of Course	17 th July 2023 (Online/Offline)

Target Participants:

The short-term course is of immense interest for UG/PG students, research scholars/professionals, staff/faculty members and industry professionals working in the area of Wireless Communications and Networking. The participants having Electronics and Communication Engineering, Electrical Engineering and Computer Science and Engineering background will be benefitted with this course.

Coordinators:

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Registration Details:

The registration fee (non-refundable) for various participants for attending the short-term course is given below:

Registration Type	Fees
Student	INR 300
Faculty Members	INR 600
Scientist from R&D Organization/Industry Person	INR 1000

- The students of NIT Rourkela are exempted from the payment of registration fee.

Bank Account Details for Paying Registration Fee:

The registration fee is to be deposited in the following bank account:

Account Name	CONTINUING EDUCATION NIT ROURKELA
Account No.	10138951784
Bank	State Bank of India
Branch	NIT Campus Rourkela (02109)
IFS Code	SBIN0002109

Registration Form:

To complete online registration, the participants need to fill the following google form:

<https://forms.gle/YFGG98uuA7B2zxcn9>

E-certificates will be provided to the registered participants upon successfully completing the course.

Contact and Queries: Please send your queries directly to the course coordinators.