



IIT Kanpur, IIT Roorkee, IIT Guwahati,  
NIT Patna, NIT Warangal, IIITDM Jabalpur

## Online Faculty Programme on QT-10: Solid State Physics for Quantum Technologies

**Dec 08 – Dec 30, 2025**  
**Twenty Days (Mon to Sat)**  
**Time: 2 – 4 PM (Daily 2 Hours)**



इलेक्ट्रॉनिकी एवं  
सूचना प्रौद्योगिकी मंत्रालय  
MINISTRY OF  
ELECTRONICS AND  
INFORMATION TECHNOLOGY



Innovation Centre for Education

### Chairman, EICT Academy & Director MNIT Jaipur

Prof. Narayana Prasad Padhy

### Chief Investigator, EICT Academy

Prof. Vineet Sahula, ECE

### Coordinator, EICT Academy

Dr. Satyasai Jagannath Nanda, ECE

### Co- Chief Investigators, EICT Academy

Prof. Lava Bhargava, ECE

Prof. Pilli Emmanuel Shubhakar, CSE

Dr. Ravi Kumar Maddila, ECE

### Objective (Electronics & ICT Academy-Phase II)

- 1) To conduct specialized FDPs for faculty/mentor training in line with the vision of MeitY by promoting emerging areas of technology and other high-priority areas that are pillars of both the "Make in India" and the "Digital India" programs.
- 2) To promote synergy and collaboration with industry, academia, universities and other institutions of learning, especially in emerging technology areas.
- 3) To support the National Policy on Electronics 2019 (NPE 2019) which envisions positioning India as a global hub for ESDM sector, including MeitY Schemes/policies such as Programme for Semiconductors and Display Fab Ecosystem; India AI; National Programme on AI, Production Linked Incentive Scheme for IT Hardware & Large-Scale Electronics Manufacturing; EMC; SPECS; Chips to System (C2S); etc.
- 4) To promote standardization of FDPs through Joint Faculty Development Programmes.
- 5) To support the vision of the National Education Policy (NEP 2020), which mandates that Indian educators go through at least 50 hours in professional development programmes per year.
- 6) To design, develop & deliver specialised FDPs on emerging technologies/ niche areas/ specialised modules for specific research areas for Faculty in Higher Education Institutions (HEI), besides FDPs on multi-disciplinary areas connected with ICT tools and technologies and other digital hybrid domains, covering a wide spectrum of engineering and non-engineering colleges, polytechnics, ITIs, and PGT educators.

An intensive **20 Day - 40 Hours** Training Programme in Online Mode is being organized for faculty and doctoral students of engineering, science and technological institutions. It is also open to working professionals from industry / organizations. The programme will be run for **only two hours** in the afternoon from **14:00 to 16:00 hours Daily (Mon to Sat)**.

**QT-10: Solid State Physics for Quantum Technologies** is the **fifth** in a series of Faculty Development programmes aligning to the courses in the recently approved **Minor Course Curriculum on Quantum Computing** by AICTE, DST and IBM.

<https://facilities.aicte-india.org/Minor Quantum Technologies.pdf>

### Experts/Speakers-

- 1) Prof. Rajendra Kumar, CSE, IIT Delhi
- 2) Prof. Venkata Vivek Kumar Koppula, CSE IIT Delhi
- 3) Prof. Aravinda S, Physics department, IIT tirupati
- 4) Prof. Alakesh Kalita, Mathematics and Computing department, IIT ISM Dhanbad
- 5) Prof. Aditi Sen De, QIC group, HRI Allahabad
- 6) Dr. Rahul Singhal, MNIT Jaipur

### Programme Modules:

- Structure and bonding in solids, properties, characterization:** Unit cells, crystal lattices and structures, Bravais lattices, miller indices and d-spacing, Laue equations and Bragg's law, atomic scattering factor, bonds, Drude theory of metals, electrical conductivity, Hall effect, density of energy states, MB, BE and FD statistics, characterization tools-XRD, FTIR, Raman, XPS
- Lattice vibrations, free electron theory, formation of energy bands:** Lattice vibrations, 1D mono-atomic and di-atomic chains, normal modes, concept of phonons, classical theory of solids, free electron theory, electron in periodic potential, Bloch theorem, K-P Model, formation of energy bands, band gap, effective mass, concept of negative mass
- Magnetism and Superconductivity:** Origin of magnetism, diamagnetism, quantum theory of diamagnetism, paramagnetism, ferromagnetism, mean field theory, Curie Weiss law, domain theory of ferromagnetism, superconductivity, BCS theory, Type-I and II superconductors, high T<sub>c</sub> superconductors, Josephson's effect and SQUID
- Basics of Quantum Technologies:** Review of Quantum Mechanics, Qbit, matrix and Bloch sphere representation, computational basis, unitary evolution, multi qubit states, multiqubit devices, qubit-qubit interaction and entangling gates, spin qubits, electron spin manipulation, two spin qubit gates, scaling up spin qubits, quantum error correction, no-cloning theorem, superdense coding, pure states to bell states, bell inequalities, density operator, pure and mixed ensemble, interfacing qubit and photons, circuit quantum electrodynamics

### Principal Coordinator

**Dr. Rahul Singhal**

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### Joint-Principal Coordinator

**Prof. Vikas Gupta**

(LNMIIT Jaipur)

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### Registration:

Registration is open to faculty, working professionals, industry persons, doctoral, postgraduate and graduate students. Participants will be admitted on first-come first-served basis. Register online at- (<http://online.mnit.ac.in/eict/>)



### Certification Fee:

- Academic (Faculty/PhD Scholars) [(India/SAARC/African countries)]: **₹500/-**
  - Professionals / Industry / Others [India / SAARC / African countries]: **₹1000/-**
  - Participants from the **Rest of the World USD: US\$ 60**
- (A) The fee covers online participation, material and certification charges.  
(B) Webinar Classes will be on Cisco **WebEx**, Notes / Slides will be shared and Quizzes / Assignments will be conducted on **Canvas** e - Learning Platform,  
→ For any other query, email us at [fdp.academy@mnit.ac.in](mailto:fdp.academy@mnit.ac.in)

**Malaviya National Institute of Technology (MNIT) Jaipur** one of the oldest NITs, the institute has a rich heritage of sixty years producing world class engineers, managers, architects and scientists. Ranked 43rd nationally in the NIRF ranking-2024 (Engineering), the institute offers learning opportunities for undergraduate, postgraduate students, and researchers in various domains. Having a lush green campus of over 317 acres, the Institute offers a world class teaching infrastructure, state-of-art laboratories and a safe & lively environment.