



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



May 08 – May 30, 2026

Twenty Days (Mon to Sat)

Time: 3– 5 PM (Daily 2 Hours)



Facilitated by AICTE, NQM, APSCHE,
MeitY, IITM, IBM, TCS & Others

Jointly Organized by MNITJ, IITG, IITK, IITR,
NITP, NITW & IITDM

Chairman, EICT Academy & Director MNIT Jaipur

Prof. Narayana Prasad Padhy

Chief Investigator, EICT Academy
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Coordinator, EICT Academy
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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 the industry/organizations. The programme will be run for **only two hours** in the afternoon from **15:00 to 17:00 hours Daily (Mon to Sat)**.

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

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

Experts/Speakers

1. Prof. Rupak Banerjee, IIT Gandhinagar	8. Dr. Aswath Babu, IIIT Dharwad
2. Prof J. P. Singh, IIT Delhi	9. Dr. Mostafizur Rahaman, IBM
3. Prof. Manjuladevi V., BITS Pilani	Quantum
4. Dr. Sanjeev Kumar Srivastava, IIT Kharagpur	10. Dr Rajendra Singh, IIT Delhi
5. Prof. Manish K. Kashyap, JNU New Delhi	11. Dr. Abhinav P Singh, NIT Jalandhar
6. Prof Santanu Ghosh, IIT Delhi	12. Prof. R K Gupta, BITS Pilani
7. Dr. K. V. Kamma, MNIT Jaipur	13. Dr. Rahul Singhal, MNIT Jaipur

Programme Modules:

Structure of Solids: Unit cells, crystal lattices and structures, Symmetries, Bravais lattices, miller indices and d-spacing, Laue equations and Bragg's law, **Characterization of crystal structures- XRD etc:** Brillouin Zones, Atomic scattering and structure factor, **Bonding in solids:** van der Waals and Repulsive interactions, Lennard Jones potential, Madelung constant, **Drude theory of metals:** DC & AC electrical conductivity of a metal, Hall effect & Magnetoresistance, Density of energy states, Fermi-Dirac distribution, Specific heat of degenerate electron gases, Free electron theory

Phonons in solids: Lattice vibrations and, 1D mono- atomic and di-atomic chains, Normal modes and Phonons, Phonon Spectrum, Long wavelength acoustic phonons and elastic constants, Vibrational Properties- normal modes, acoustic and optical phonons, **Beyond the Free electron model:** Electron in periodic potential, Kronig-Penney Model and Bloch Theorem, Band Theory, Formation of energy bands, band gap, Tight Binding Model, Effective mass, concept of negative mass

Magnetism: Origin of magnetism, diamagnetism, Quantum theory of diamagnetism, paramagnetism, ferromagnetism, Langevin's theory of paramagnetism, Weiss Molecular theory, **Superconductivity:** Phenomenological description – Zero resistance, Meissner effect, London Theory, BCS theory, Ginzburg-Landau Theory, Flux quantization, Josephson's effect

Review of Quantum Mechanics: Operators Description, Qubit, gate and their representations, Computational basis, unitary evolution, Composite systems, Circuit with Interference and Entanglement, **Qubit topology:** mapping with superconducting processor, Cross Talk and Readout Errors, Spin qubits, electron spin manipulation, two spin qubit gates, Scaling up spin qubits, quantum error correction, Interfacing qubit and photons, Circuit quantum electrodynamics, Density Operator, Pure and Mixed State, Schrödinger vs Heisenberg picture, No Cloning Theorem, Quantum teleportation

Principal Coordinator

Dr. Rahul Singhal
9549654378 (M)

Joint Principal Coordinator

Dr. K. Venkataratnam Kamma
9549654377 (M)

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.eict@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.

Andhra Pradesh State Council of Higher Education (APSICHE), the first of its kind in the country, set up as per the recommendations of the NEP, is primarily a coordinating body between the **University Grants Commission (UGC)** and the **State Government Universities**