# AcSIR-IMP-2014 Programme Brochure

*(Admission Session : August, 2014)*

## Integrated MTech-PhD Programme in Advanced Semiconductor Electronics at CSIR-CEERI, Pilani

The integrated MTech-PhD programme has two segments:

1. MTech programme of 2 years duration spread over 4 semesters.
2. PhD programme of 3 years duration after the successful completion of the MTech programme. Continuation into the PhD programme will be decided on case-by-case basis.

This full-time programme aims to provide in-depth exposure to the engineering concepts, scientific principles, research methodology and hands-on experience on advanced real-life R&D projects in different specializations of semiconductor electronics. Students completing this integrated programme will be fully research-enabled and industry-ready.

The first semester of the MTech programme focuses on core subjects and associated laboratories related to semiconductor electronics.

The second semester of the programme offer elective courses for specialization in the areas of :

- MEMS and Microsensors.
- Nanoelectronics.
- VLSI Design.
- Optoelectronics and Photonics.

The third and fourth semesters of the MTech programme then give the opportunity to the candidates to effectively utilize the knowledge acquired through the courses towards advanced R&D project work and dissertation in their specialization areas.

The medium of instruction and evaluation is English.

**Number of Seats in the Programme**

The total number of seats available is 7.

The allotment of specializations will be done based on the candidate's performance and preference at the end of the first semester.

**Admission Process and Eligibility for Admission**

Please see the AcSIR website at **http://acsir.res.in/** for on-line submission of the admission form and details of eligibility.

**Fellowship**

Fellowship amount will depend on selection as TS (Trainee Scientist) or as a JRF (NET-Engg-JRF or GATE-JRF).

**Programme Fee Structure**

1. One-time Admission Fee (non-refundable) : Rs. 4,000.
2. One-time Security Deposit (refundable) : Rs. 6,000.
3. Semester Fees (non-refundable) : Rs. 24,000.

Students wanting to withdraw from the programme after deposit of fees and security amount will need to apply in writing for refund. If such an application is made before 7 days to the start of first semester session at CSIR-CEERI, refund of fees / other charges will be made after deducting the admission fee amount of Rs. 4,000.

No refund of fees / other charges will be made if the student leaves after joining the programme except for the security deposit / caution money amount of Rs. 6,000.

Total amount of Rs. 34,000 needs to deposited at the time of admission. Subsequently, only the semester fees of Rs. 24,000 needs to be deposited before the start of every semester for the duration of the MTech programme. The tuition fees during PhD programme is Rs. 1,000 per month.

For NEFT bank transfer, please transfer the amount to the bank account number **61033385318** of "Director, CSIR-CEERI" at SBBJ, Pilani **(IFSC code SBBJ0010398)** with appropriate narration statement. *This is the preferred mode of transaction for the depositing the amount.*

In case of Demand Draft, please get it issued in favour of "Director, CSIR-CEERI" payable at Pilani and post it by speed post or registered letter to "Director, CSIR-CEERI, Pilani – 333 031" with your name written in pencil on the reverse side of the demand draft.

**Important Dates**

All important dates will be announced on AcSIR website at **http://acsir.res.in/**.

The detailed academic programme calendar will be made available before the start of each semester.

**Please visit the AcSIR website at http://acsir.res.in/ for more information. You should also periodically visit CSIR-CEERI's website link for AcSIR-IMP-2014 at http://www.ceeri.res.in/ for updates and news about this programme.**

## MTech Programme : Semester-wise Scheme : Advanced Semiconductor Electronics

**Semester-I**

| Subject Code | Subject | L-T-P-C |
|---|---|---|
| ENG(CEERI) : 2-221 | Physics of Semiconductor Materials and Devices | 4-0-0-4 |
| ENG(CEERI) : 2-222 | Unit Processes in Semiconductor Technologies | 3-0-0-3 |
| ENG(CEERI) : 2-223 | CMOS Digital VLSI Design | 3-0-0-3 |
| ENG(CEERI) : 2-225 | Lab: Semiconductor Processing Technologies | 0-0-4-2 |
| ENG(CEERI) : 2-226 | Lab: CMOS-based Physical Design | 0-0-4-2 |
| ENG(CEERI) : 1-206 | Technical Communications | 2-0-0-2 |

**Semester-II**

| Subject Code | Subject | L-T-P-C |
|---|---|---|
| ENG(CEERI) : 2-224 | Characterization Techniques for Semiconductor Materials, Technologies and Devices | 3-0-0-3 |
| ENG(CEERI) : 2-227 | Lab: Semiconductors Related Characterization and Measurement Techniques | 0-0-4-2 |
| ENG(CEERI) : 3-211 / 3-215 / 3-217 | Elective-I | 3-0-0-3 |
| ENG(CEERI) : 3-213 / 3-214 / 3-216 / 3-218 | Elective-II | 3-0-0-3 |
| ENG(CEERI) : 3-221 / 3-225 / 3-227 | Lab/Seminar: Elective-I Related | 0-0-4-2 |
| ENG(CEERI) : 3-223 / 3-224 / 2-228 / 3-228 | Lab/Seminar: Elective-II Related | 0-0-4-2 |
| ENG(CEERI) : 2-206 | Project Management | 2-0-0-2 |

**MEMS and Microsensors (Elective-I and Elective-II)**

| Subject Code | Subject | L-T-P-C |
|---|---|---|
| ENG(CEERI) : 3-211 | MEMS and Nano-structures Technologies | 3-0-0-3 |
| ENG(CEERI) : 3-212 | Physics and Design of MEMS and Microsensors | 3-0-0-3 |
| ENG(CEERI) : 3-221 | Lab: MEMS and Nano-structures Technologies | 0-0-4-2 |
| ENG(CEERI) : 3-222 | Lab: Design of MEMS and Microsensors | 0-0-4-2 |

**Nanoelectronics (Elective-I and Elective-II)**

| Subject Code | Subject | L-T-P-C |
|---|---|---|
| ENG(CEERI) : 3-211 | MEMS and Nano-structures Technologies | 3-0-0-3 |
| ENG(CEERI) : 3-213 | Nanoelectronic Devices and Technologies | 3-0-0-3 |
| ENG(CEERI) : 3-221 | Lab: MEMS and Nano-structures Technologies | 0-0-4-2 |
| ENG(CEERI) : 3-223 | Lab: Nanoelectronic Technologies | 0-0-4-2 |

**VLSI Design (Elective-I and Elective-II)**

| Subject Code | Subject | L-T-P-C |
|---|---|---|
| ENG(CEERI) : 3-215 | CMOS Analog Design | 3-0-0-3 |
| ENG(CEERI) : 3-216 | Advanced VLSI System Architectures | 3-0-0-3 |
| ENG(CEERI) : 3-225 | Lab: CMOS Analog Design | 0-0-4-2 |
| ENG(CEERI) : 2-228 | Lab: HDL-based Digital Design | 0-0-4-2 |

**Optoelectronics and Photonics (Elective-I and Elective-II)**

| Subject Code | Subject | L-T-P-C |
|---|---|---|
| ENG(CEERI) : 3-217 | Optoelectronic Materials, Devices and Technologies | 3-0-0-3 |
| ENG(CEERI) : 3-218 | Photonic Materials, Devices and Technologies | 3-0-0-3 |
| ENG(CEERI) : 3-226 | Lab: Optoelectronic Devices and Technologies | 0-0-4-2 |
| ENG(CEERI) : 3-227 | Lab: Photonic Devices and Technologies | 0-0-4-2 |

**Semester-III**

| Subject Code | Subject | L-T-P-C |
|---|---|---|
| ENG(CEERI) : 2-210 | Intelligent Instrumentation | 2-0-0-2 |
| ENG(CEERI) : 2-217 | Lab: Intelligent Instrumentation | 0-0-2-1 |
| ENG(CEERI) : 2-098 | MTech Dissertation-I | 0-7-14-14 |

**Semester-IV**

| Subject Code | Subject | L-T-P-C |
|---|---|---|
| ENG(CEERI) : 2-099 | MTech Dissertation-II | 0-9-18-18 |

## MTech Programme : Brief Course Descriptions : Advanced Semiconductor Electronics

**ENG(CEERI) : 1-206 : Technical Communication : 2-0-0-2**

Role and importance of technical communication; Effective written and oral communication; Ethical issues; Technical report writing; Technical / R&D proposals; Research paper writing; Letter writing and official correspondence; Emails; Oral communication in meetings and group discussions; Oral presentations; Use of modern aids.

**ENG(CEERI) : 2-206 : Project Management : 2-0-0-2**

Introduction; Project formulation, evaluation and initiation; Project planning and scheduling; Risk management; Project execution and implementation; Project monitoring and control; Project closure; Project documentation; Leadership and teamwork issues; Complex projects; Advances and trends.

**ENG(CEERI) : 2-210 : Intelligent Instrumentation : 2-0-0-2**

Sensor characteristics and terminology; Sensing techniques for temperature and humidity; Data conversion; Intelligent sensor systems structure and characteristics; Modeling of sensors and strain gauges; Temperature compensation, linearization and calibration; Mutli-sensor systems; Introduction to soft-computing techniques; Foundations of fuzzy approaches, fuzzy relations, fuzzy modeling, fuzzy-rules based systems; Introduction to statistical pattern recognition, dimensionality reduction and classification; Future trends in intelligent sensor systems.

**ENG(CEERI) : 2-217 : Intelligent Instrumentation Laboratory : 0-0-2-1**

Laboratory practices and safety considerations; Data acquisition (DAQ) techniques; LabView-based virtual instrument and GUI design; Analog and digital I/O; File I/O; Integration of sensor, DAQ and GUI modules; Experiments with modeling and use of sensors and strain gauges; Implementation of fuzzy systems and algorithms; Time series forecasting.

**ENG(CEERI) : 2-221 : Physics of Semiconductor Materials and Devices : 4-0-0-4**

Semiconductors; Inorganic and organic, single crystalline, polycrystalline, porous, amorphous crystal structures, and material properties; Si, GaAs, GaN, SiC; Energy band diagrams; Dielectric constant, permeability, permittivity, sheet resistance, resistivity, mobility, thermal conductivity and heat dissipation; Piezo-resistive and piezo-electric effects; Defects, dislocations and micro-plasma, phonon dynamics, ion-solid interactions; Electron transport in semiconductors, minority carrier life time, avalanche breakdown phenomena, Hall effect; Theory of p-n junction, Schottky barrier, MOSFETs and MESFETs, IMPATTs and BARRITTs; Hetro-structures, strained semiconductors; Photovoltaics and solar cell; Solid state sensors and transducers; MOS analysis.

**ENG(CEERI) : 2-222 : Unit Processes in Semiconductor Technologies : 3-0-0-3**

Crystal growth techniques, wafer preparation and shaping, chemical cleaning, thermal oxidation, photo-lithography, chemical etching (wet and dry), metalization, chemical vapor deposition (CVD) techniques, thermal diffusion, ion implantation, chemical mechanical polishing, rapid thermal processing.

**ENG(CEERI) : 2-223 : CMOS Digital VLSI Design : 3-0-0-3**

MOS Capacitor: energy-band diagram, C-V curve, accumulation, depletion and inversion regions; MOS transistor: threshold voltage computation, body effect, channel length modulation, current equation; NMOS/ pseudo-NMOS/CMOS inverters and their analysis, static and switching characteristics; CMOS processing technology, layout design rules and technology interfaces, layer properties, parasitic and delay estimation; Layout of CMOS inverter and basic gates; CMOS latch-up; Combinational MOS logic circuits; Pass transistor and transmission gate based logic circuits; Dynamic logic circuits; Sequential logic circuits; Latches, D F/F; Clocking issues; Programmable Logic, PLA/PLD, memories; VLSI subsystem design strategies: structure, hierarchy, regularity, modularity; Various adder architectures: ripple carry adder, carry look-ahead adder, carry select adder, carry save adder; Booth multiplier, array multiplier; Shift register; Parity generator; Barrel shifter; State machines and controller design; Trends in VLSI design.

**ENG(CEERI) : 2-224 : Characterization Techniques for Semiconductor Materials, Technology and Devices : 3-0-0-3**

Resistivity, contact resistance, mobility, carrier life-time and IV-CV measurement techniques; Test structures for technology characterization; Analysis of surfaces, interfaces, thin films; Electrons, ions and photons based techniques (SEM, EDS, WDS, AES, MS, ISS, SIMS, XRD, PL, XPS); Scanning probe (SPM), optical polarization and interferometry based techniques.

**ENG(CEERI) : 2-225 : Semiconductor Processing Technologies Laboratory : 0-0-4-2**

Laboratory practices and safety considerations; Wafer preparation and chemical cleaning; Thermal oxidation, photo-lithography; Wet chemical etching; Dry etching; Chemical vapor deposition (CVD); Thermal diffusion; Ion implantation; Metalization.

**ENG(CEERI) : 2-226 : CMOS-based Physical Design Laboratory : 0-0-4-2**

Laboratory practices and safety considerations; Overview of the laboratory CAD tools-set environment; Schematic editor; SPICE/Spectre simulation; Layout editor; Extraction, DRC and LVS tools; Transfer and output characteristics of NMOS transistor, parameter variations; CMOS inverter design and layout; Layout versus schematic (LVS), circuit simulation and layout of basic gates, D latch, D flip-flop, and adders; VLSI subsystem design mini-project.

**ENG(CEERI) : 2-227 : Semiconductors Related Characterization and Measurement Techniques Laboratory : 0-0-4-2**

Laboratory practices and safety considerations; IV and CV Measurements; Resistivity, thickness, thin-film surface and bulk defects; SEM/AFM/STM surface topographical analysis; Grain size measurements; Elemental analysis (EDS, AES); Stress and deformation measurements; Measurement of sheet resistance, carrier mobility, doping profile estimation, minority carrier life-time measurement.

**ENG(CEERI) : 2-228 : HDL-based Digital Design Laboratory : 0-0-4-2**

Laboratory practices and safety considerations; Introduction to HDLs; Simulation of behavioral, Architecture/RTL, data-flow and structural HDL code; Sub-system design using HDL : various adder architectures, BCD arithmetic, various counters, traffic-light controller, *etc.*; Mini-project. *(SystemC, VHDL and/or SystemVerilog will be used as the HDL for the laboratory.)*

**ENG(CEERI) : 3-211 : MEMS and Nano-structures Technologies : 3-0-0-3**

Review of semiconductor unit processes; Use of silicon dioxide, polymers, and glass; Advanced processes (thermal, ICP-PECVD, PVD, RTO); Thick-film process steps (for MEMS) and ultra-thin-film process steps (for Nano-structures); Special lithography techniques, front and backside alignment, sub-micron/nano-lithography, stencil masking, lift-off lithography, EBL; Surface and bulk micro-machining techniques; DRIE and LIGA process; Process integration for structures like comb, cantilever, diaphragm, channel, nano-wire, nano-gaps; Sacrificial materials; Characterization of MEMS and nano-dimensional structures; Wafer-level bonding and packaging techniques; Flip-chip bonding, vacuum and hermetic packaging, micro-fluidic device packaging; LTCC technology, materials, LTCC process steps, bonding and packaging; Reliability and residual stress issues. Trends in MEMS and nano-devices technologies.

**ENG(CEERI) : 3-212 : Physics and Design of MEMS and Microsensors : 3-0-0-3**

Overview of Microsensors; Mechanical properties of materials and essentials of structural mechanics; Electro-mechanical, magneto-mechanical and piezo-based sensing; Structural elements for MEMS and microsensors (Beams, plates, cantilevers, bridges and diaphragms); Electrostatic sensing and actuation (parallel plate and torsional structures, time domain analysis); Micro-fluidics; Scaling laws and miniaturization; Micro-system design principles; MEMS simulation and design Tools; RF MEMS; Reliability issues in microsensors; Examples and applications of MEMS microsensors.

**ENG(CEERI) : 3-213 : Nanoelectronic Devices and Technologies : 3-0-0-3**

Low-dimensional semiconductor structures (quantum well, quantum wire, quantum dot), quantum confinement; Density of states, discrete energy levels, band-gap enhancement, optical properties, absorption-emission spectra, blue shift, photo-luminescence; Nanoelectronic devices: Coulomb blockade, single electron box, single electron transistor (SET), pump, turnstile, trap, nanocrystal based memory; Simulation of single electron transistor; Nanostructures for next generation solar cells; Carbon nanotubes (CNTs): properties, synthesis and applications; Nanowires: properties, synthesis and applications; Advanced nanofabrication technologies : CVD, ALD, PLD, sputtering, EB evaporation, next generation lithography techniques, deep-UV, e-beam, dip-pen, nano-imprint, extreme-UV, X-ray; Characterization techniques : TEM, ellipsometry, XRD, Raman, IR spectroscopy, STM, AFM, electrical measurements. Future trends.

**ENG(CEERI) : 3-215 : CMOS Analog Design : 3-0-0-3**

Basic concepts of transistors and diodes, their modeling, large-signal and small signal analysis, CMOS technology, clock feed-through; Reference sources : bias circuits, band-gap reference circuit, cascode current mirror; Single-stage amplifier, common source amplifier, drain and gate amplifier, differential amplifier; Operational amplifier; Comparators; Switched-capacitor circuits; Introduction to data converters; Issues of analog layout and device noise.

**ENG(CEERI) : 3-216 : Advanced VLSI System Architectures : 3-0-0-3**

Introduction and review of basic computer architectures, CISC and RISC processors; Pipelining, hazards, exception handling, optimization techniques, synchronous and asynchronous pipelining; Memory organization, caches, virtual memory, memory management; Arithmetic circuits, algorithms and architectures for high-radix adders, multipliers, sine-cosine and exponential computation; Instruction-level parallelism, super-scalar, super-pipelined and VLIW architectures, array and vector processors; Multiprocessor architectures and parallel architectures, synchronization, memory consistency; DSP architectures; Performance improvement techniques; ASIP; Low-power architectures; Fault-tolerant architectures; Case-study on Algorithm-to-Architecture; Future trends.

**ENG(CEERI) : 3-217: Optoelectronic Materials, Devices and Technologies : 3-0-0-3**

Optoelectronic basics and materials: GaAs, InP, GaN, SiC, ZnO-based compound semiconductors materials; Double hetero-structures, semiconductor quantum well structures, simulation and modeling issues; Growth of Epitaxial materials: MOCVD, MBE; Characterization of Epitaxial Materials: XRD, photoluminescence, Hall effect measurements, SIMS, ECV profiling; Optoelectronic Devices: Light emitting diodes (LEDs), semiconductor lasers, UV, visible and IR photodetectors and receivers, solar cells; Compound semiconductors and advanced electronic devices: MESFET, HEMT, HBT, sensors; Compound semiconductor technologies; Packaging of compound semiconductor components; Applications and trends.

**ENG(CEERI) : 3-218 : Photonic Materials, Devices and Technologies : 3-0-0-3**

Introduction to Photonics; Basic photonic components and their technologies; Propagation of Electromagnetic waves; Optical waveguides and optical fibers; Principle of optical fiber communications, Transmission capacity, Dispersion and losses in optical fiber; Coupled mode theory in guided wave systems; Materials and fabrication technologies; Types of waveguides; Basic photonics devices and components; Optical sensors and sensing techniques; Optical MEMS; Fiber gratings and waveguide gratings; Photonic crystal based waveguides and devices; Packaging of photonic devices; Applications of photonic devices; Recent trends.

**ENG(CEERI) : 3-221 : MEMS and Nano-structures Technologies Laboratory : 0-0-4-2**

Laboratory practices and safety considerations;; Wafer cleaning; Lithography : front and backside alignment; Bulk micro-machining; Surface planarization; DRIE process; LPCVD process; Metalization; Characterization of MEMS and nano-dimensional structures; Wafer bonding; Wafer dicing; LTCC process; Packaging.

**ENG(CEERI) : 3-222 : Design of MEMS and Microsensors Laboratory : 0-0-4-2**

Laboratory practices and safety considerations; MEMS design tools; Design of pressure sensors of various types; Design of gas sensors of various types; Acoustic, Ultrasonic, micro-resonator, ISFET; RF MEMS design and simulation.

**ENG(CEERI) : 3-223 : Nanoelectronic Technologies Laboratory : 0-0-4-2**

Laboratory practices and safety considerations; Simulation of fabrication process steps using simulation software; Ultra-thin films of silicon oxide and nitride and thickness measurements; Synthesis of silicon nanoparticles by LPCVD; fabrication of MOS capacitor with embedded silicon nanoparticles and electrical measurements; Dip-pen nanowriting experiments; Silicon nanowires fabrication; exposure to experiments with CNT.

**ENG(CEERI) : 3-225 : CMOS Analog Design Laboratory : 0-0-4-2**

Laboratory practices and safety considerations; I-V characteristics of MOSFET, estimation of early voltage; Clock feed-through and its minimization; Bias generation architecture simulation; Band-gap reference circuit simulation; Design and simulation of various amplifiers; Design and simulation of 2-stage CMOS operational amplifier; Layout of analog circuits.

**ENG(CEERI) : 3-227 : Optoelectronic Devices and Technologies Laboratory : 0-0-4-2**

Laboratory practices and safety considerations; MOCVD system demonstration; PL/Prism-coupler characterization of GaN material; Metallization; Lift-off process for Ohmic contact on GaN material; Ashing; TLM measurements for specific contact resistance; Hall effect Measurement; RIE process for GaN etching; Thinning and polishing; Dicing; Wire bonding; LED characteristics.

**ENG(CEERI) : 3-228 : Photonic Devices and Technologies Laboratory : 0-0-4-2**

Laboratory practices and safety considerations; Measurement of refractive index and thickness of planar waveguides; Propagation loss measurement of planar waveguides; Design of 1x2 and 1x4 optical power splitter; Measurement of insertion loss, uniformity and polarization-dependent loss of a packaged 1x8 optical splitter at C+L band region; Design and simulation of Bragg gratings; Waveguide patterning by photo-lithography; Testing of MUX/DEMUX by DWDM test set-up; Chip-level testing: alignment of DUT (in a diced chip) to the source and the detector with x-y-z alignment stages.

## MTech Programme : List of Faculty Members : Advanced Semiconductor Electronics

| S. No. | Name | Designation | Discipline |
|---|---|---|---|
| 1. | Dr. Chandra Shekhar | Director | Microelectronics/VLSI Design |
| 2. | Sh. Raj Singh | Chief Scientist | Microelectronics/VLSI Design |
| 3. | Dr. A. S. Mandal | Chief Scientist | Microelectronics/VLSI Design |
| 4. | Dr. S. C. Bose | Sr. Princ. Sc. | Microelectronics/VLSI Design |
| 5. | Dr. A. Karmakar | Princ. Sc. | Microelectronics/VLSI Design |
| 6. | Dr. Ravi Saini | Scientist | Microelectronics/Digital Design |
| 7. | Sh. Anil Kumar Saini | Scientist | Microelectronics/Digital Design |
| 8. | Sh. Jai Gopal Pandey | Scientist | Microelectronics/Digital Design |
| 9. | Sh. G. Rajahari | Scientist | Microelectronics/Analog Design |
| 10. | Sh. M. Santosh Kumar | Scientist | Microelectronics/Analog Design |
| 11. | Sh. Sanjay Singh | Scientist | Microelectronics/Digital Design |
| 12. | Sh. Amit Kumar Mishra | Scientist | Microelectronics/Analog Design |
| 13. | Dr. V. K. Khanna | Chief Scientist | MEMS/IC Technology |
| 14. | Dr. B. D. Pant | Chief Scientist | MEMS/IC Technology |
| 15. | Dr. Ram Gopal | Chief Scientist | MEMS Technology/Devices |
| 16. | Dr. K. J. Rangra | Chief Scientist | MEMS Design/IC Technology |
| 17. | Dr. Ajay Agarwal | Princ. Sc. | MEMS Technology/Devices |
| 18. | Dr. Rishi Sharma | Scientist | MEMS Technology/Devices |
| 19. | Dr. R. Mukhiya | Scientist | MEMS Technology/Devices |
| 20. | Sh. Ankush Jain | Scientist | MEMS Technology/Design |
| 21. | Sh. S. Santosh Kumar | Scientist | MEMS Technology/Design |
| 22. | Ms. Aditi | Scientist | MEMS Technology/Design |
| 23. | Sh. Deepak Bansal | Scientist | MEMS Design/Devices |
| 24. | Sh. Rahul Prajesh | Scientist | MEMS Technology/Devices |
| 25. | Dr. P. K. Khanna | Chief Scientist | LTCC Technology/Packaging |
| 26. | Dr. Nikhil Suri | Scientist | LTCC Technology |
| 27. | Dr. J. Akhtar | Chief Scientist | Devices/IC Technology |
| 28. | Sh. Jitendra Singh | Scientist | Devices/IC Technology |
| 29. | Sh. Anil Kumar | Chief Scientist | Nanoelectronics Technology |
| 30. | Sh. William Taube | Scientist | Nanoelectronics/Nanodevices |
| 31. | Dr. C. Dhanvantri | Chief Scientist | Optoelectronics/Photonics |
| 32. | Dr. Suchandan Pal | Princ. Sc. | Optoelectronics/Photonics |
| 33. | Dr. Nidhi Chaturvedi | Senior Scientist | Optoelectronics/Photonics |
| 34. | Sh. Kuldip Singh | Senior Scientist | Optoelectronics/Photonics |
| 35. | Sh. Ashok Chauhan | Senior Scientist | Optoelectronics/Photonics |
| 36. | Sh. Sonachand Adhikari | Scientist | Optoelectronics/Photonics |
| 37. | Dr. Sumitra Singh | Scientist | Optoelectronics/Photonics |