SARDAR PATEL UNIVERSITY

NAAC 'A' Grade (10-01-2023 To 09-01-2028)

Vallabh Vidyanagar

Gujarat

Academic Program Structure

&

Curriculum

(Aligned with NEP-2020)

PG Diploma (Semiconductor Science and Technology)

NHEQF Level: 6

Entry NHEQF Level	:	5.5
Duration	:	One Year (Two Semesters)
Total Courses	:	12
Total Learning Hours	:	1320
Total Credits	:	44
Total Marks	:	1100

Graduate Attributes (GAs)

Upon successful completion of the PG Diploma (Semiconductor Science and Technology) programme, graduates are expected to attain the following Graduate Attributes:

GA1. Comprehensive Knowledge of Semiconductor Science and Technology

Apply fundamental concepts of solid-state physics, electronic circuits and material properties along with understanding of evolution of semiconductor electronics to develop an integrated understanding of semiconductor devices, junction behaviour, thin film processes and basic characterization methods with the help of EDA tools.

GA2. Analytical Problem-Solving in Semiconductor Systems

Evaluate industrial and research problems related to semiconductor components such as diodes, transistors as well as other advanced solid-state devices and utilize experimental and simulation based analytical methods to determine suitable solutions.

GA3. Critical Thinking and Scientific Reasoning

Question existing device models as well as technological approaches, develop scientific intuitiveness and systematically analyze device characteristics, electrical behaviour and simulation outputs followed by determination of logical conclusion.

GA4. Innovation in Semiconductor Device Engineering

Learn to investigate performance limitations in semiconductor devices by examining material interfaces, carrier transport, defects as well as structural parameters and establish necessary improvements for enhanced efficiency.

GA5. Scientific Communication and technical Presentation Skills

Improve the ability to present technical findings related to device analysis, circuit design and simulation studies through structured reports and presentations.

GA6. Experimental, Computational and collaborative Teamwork Skills

Learn to utilize characterization techniques, fabrication concepts and computational platforms such as Technological Computer Aided Design (TCAD) belonging to EDA tools family for device modelling along with effective collaboration in technical teams.

GA7. Design and Advancement of Semiconductor Technologies

Design and refine semiconductor devices, analog/digital circuits and basic VLSI modules using tools such as Verilog to address practical electronic system requirements.

GA8. Leadership and Knowledge Sharing in Emerging Technologies

Learn to explore and share advancements in semiconductor technologies such as nanofabrication, optoelectronics, packaging, testing, metallization and integrated system design through academic as well as technical interactions and contribute effectively in semiconductor ecosystem.

GA9. Professional Skills and ICT Capability

Develop competencies in digital tools, circuit simulation, PCB design and modern EDA environments for efficient execution of semiconductor-related tasks and present it effectively via ICT tools.

GA10. Professional Ethics, Integrity and Accountability

Demonstrate responsible conduct and ethical practices while working on semiconductor device design, fabrication processes and data analysis along with clean room protocols.

GA11. Sustainability, Energy Efficient Semiconductor ecosystem and Technologies

Understand the importance of energy efficient device operation, low-power circuit design, environmentally responsible fabrication techniques along with exploration of materials powered by renewable energy for global net-zero target.

GA12. Industry-Oriented Practical Training and Exposure

Develop hands-on skills in semiconductor processing, thin film deposition and device testing on sophisticated instruments aligned with industry practices.

GA13. Societal and Industrial Relevance of Semiconductor Technologies

Recognize the role of semiconductor devices and sensors and designed for artificial intelligence (AI) hardware development in societal welfare and industrial applications.

GA14. Innovation, Entrepreneurship and Technology-Based Learning

Translate technical knowledge into practical solutions, fostering innovation and entrepreneurial skills in semiconductor and electronics domains to support India Semiconductor Mission (ISM).

GA15. Lifelong Learning and Adaptability in Semiconductor Science and Technology

Possess the ability to continuously upgrade knowledge in semiconductor devices, fabrication methods as well as evolving EDA tools and allied technologies.

Programme Educational Objectives (PEOs):

Within 3–5 years of completing the programme, graduates are expected to:

PEO1. Develop professional careers in semiconductor industries, research centres, academic organizations and tech-driven institutions by utilizing theoretical understanding, computational approaches, EDA tools and practical knowledge of semiconductor materials, devices and fabrication processes.

PEO2. Pursue advanced studies, technical training programs and specialized research in emerging domains such as semiconductor physics, nanofabrication, optoelectronics, crystal growth, thin film technology, advanced electronic materials, power semiconductors, VLSI design and related interdisciplinary areas at national and international levels. Actively working towards continuous skill enhancement required for semiconductor industry.

PEO3. Contribute to semiconductor manufacturing and allied sectors such as VLSI design, assembly, testing, marking and packaging in ATMP/OSAT industries while promoting innovation, entrepreneurship and technology development in areas such as wafer fabrication, semiconductor process simulation, sensors as well as detectors, PCB designing and advanced electronic systems.

PEO4. Support industrial advancement by addressing technical challenges faced by semiconductor industries in devices fabrication technologies via research, simulation, characterization and process optimization simulators using modern instrumentation and semiconductor process simulator platforms.

PEO5. Participate in national initiatives focused on semiconductor and electronics self-reliance such as India Semiconductor Mission (ISM) and PLI schemes along with continuously strengthening expertise in AI hardware, nanoscale devices, sensors, 2D materials and EDA based semiconductor design.

PEO6. Demonstrate professional ethics and responsible research practices by following cleanroom discipline, laboratory safety regulations as well as contamination control standards in semiconductor fabrication and characterization environments. Actively communicate technical findings through seminars, workshops and scientific reports.

PEO7. Apply device modelling and circuit simulation methodologies with the help of EDA tools such as TCAD, Verilog, PCB designing software and related simulation platforms for analysis and performance enhancement of semiconductor devices and systems.

Program Learning Outcomes (PLOs):

Upon successful completion of the PG Diploma (Semiconductor Science and Technology) programme, learner will be able to

PLO1. Apply fundamental concepts of semiconductor science to interpret the behaviour of materials, devices and basic electronic systems using logical, experimental and computational approaches via quantitative and qualitative measurements.

PLO2. Employ computational techniques and modern device design software e.g., EDA platforms to simulate and study semiconductor devices and circuit responses for understanding of basic operation, scalability and performance optimization of advanced semiconductor devices.

PLO3. Analyze electrical characteristics as well as system responses by examining experimental observations along with simulation outputs to extract meaningful insights of device physics.

PLO4. Design advanced semiconductor devices in addition to electronic circuits by utilizing appropriate methodologies as well as EDA tools for precise and speedy output in practical applications.

PLO5. Evaluate the performance of semiconductor components using data analysis methods, graphical interpretation and comparison with expected behaviour.

PLO6. Employ fabrication-related methods such as material preparation, crystal growth and thin film deposition accompanied by materials characterization techniques to understand the formation and processing of semiconductor devices.

PLO7. Apply knowledge of semiconductor components ranging from diodes as well as transistors to digital building blocks and implement simple circuit designs using hardware description languages such as Verilog.

PLO8. Utilize vacuum generation and measurement techniques and understand how fabrication conditions influence crystal as well as thin film quality and device performance.

PLO9. Demonstrate operating knowledge of semiconductor optoelectronic devices and their use in modern electronic systems used in AI hardware.

PLO10. Design metal-semiconductor interfaces by differentiation between Ohmic and Schottky contacts and verifying their impact on charge transport and device behaviour along with basic packaging and interconnection techniques used in electronic systems.

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NEP-2020 aligned Curriculum with effect from Academic Year 2026-27

PG Diploma (Semiconductor Science and Technology)

Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme		Credits	Assessment Scheme & Marks				
			L-P-T	Total Notional Hours		Internal Assessment			External Assessment	Total Marks
						FA	SA	Total		
DSC	PGD01CSST01	Semiconductor Ecosystem, Devices and Technology	4-0-0	120	4	25	25	50	50	100
DSC	PGD01CSST02	Fundamentals of Analog and Digital Circuits	4-0-0	120	4	25	25	50	50	100
DSC	PGD01CSST03	Verilog HDL for Digital Design and Synthesis	4-0-0	120	4	25	25	50	50	100
DSC	PGD01CSST04	Practical-1	0-8-0	120	4	25	25	50	50	100
DSC	PGD01CSST05	Practical-2	0-8-0	120	4	25	25	50	50	100
DSC	PGD01CSST06	Research Project	0-2-0	60	2	15	10	25	25	50
				660	**22**	**140**	**135**	**275**	**275**	**550**

DSC: Discipline Specific Core **DSE**: Discipline Specific Elective **L**: Lecture **P**: Practical **T**: Tutorial
FA: Formative Assessment **SA**: Summative Assessment

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PG Diploma (Semiconductor Science and Technology)

Semester-II

Course Type	Course Code	Course Title	Teaching-Learning Scheme		Credits	Assessment Scheme & Marks				
			L-P-T	Total Notional Hours		Internal Assessment			External Assessment	Total Marks
						FA	SA	Total		
DSC	PGD02CSST01	Advanced Semiconductor Devices, Packaging and PCB Design	4-0-0	120	4	25	25	50	50	100
DSC	PGD02CSST02	Semiconductor Fabrication and Characterization Techniques	4-0-0	120	4	25	25	50	50	100
DSC	PGD02CSST03	Nanofabrication and Device Simulation	4-0-0	120	4	25	25	50	50	100
DSC	PGD02CSST04	Practical-1	0-8-0	120	4	25	25	50	50	100
DSC	PGD02CSST05	Practical-2	0-8-0	120	4	25	25	50	50	100
DSC	PGD02CSST06	Research Project	0-2-0	60	2	10	15	25	25	50
				660	**22**	**135**	**140**	**275**	**275**	**550**

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