(080-E&E-02-02) ELECTRONICS ENGINEERING (SEMI-CONDUCTORS)

Significance of the Program:

Moore's Law has been the driving force behind semiconductor technological improvements for decades. This program continues to propose Moore's Law for semiconductor technology at the IC and system levels, even though it is no longer applicable to ICs due to limits in terms of physical, material, electrical, and budgetary aspects. Electronic gadgets are fundamentally constructed from semiconductors. For everyone working in the electronics industry, it is essential to comprehend their characteristics and behaviour. The fundamental knowledge required to comprehend the concepts underlying electronic devices can be acquired through a semiconductor course. Semiconductors play a crucial role in the production of microchips and integrated circuits (ICs), which are necessary for a variety of electronic devices, such as computers, cell phones, and other digital systems. Semiconductor technology is essential to several industries, including consumer electronics, automotive, aerospace, and telecommunications. Completing a semiconductor course improves one's chances of finding employment in these fields because it gives one specialized knowledge and abilities in a highly sought-after field. Electronic systems that are more potent and efficient are produced as a result of the development of new semiconductor materials, equipment, and production processes. Engineers and physicists studying semiconductors make advances that propel the electronics sector forward.

Career Options:

A foundation in semiconductors can open up a wide range of fulfilling employment options across multiple industries. The following are a few typical job pathways in the semiconductor industry:

- Semiconductor Design Engineer: Design engineers develop and enhance integrated circuits and semiconductor devices. They create circuits that adhere to strict specifications for size, power, and performance using simulation techniques and software tools.
- Process Engineer: The development and optimization of semiconductor device production processes is the primary focus of process engineers. In the process of manufacturing semiconductors, they strive to ensure quality control, optimize fabrication processes, and integrate new technology.

- Device Physicist: This type of scientist examines the behaviour and physical characteristics of semiconductor materials and devices. They carry out studies to comprehend and enhance the functionality of semiconductor components, advancing technological progress.
- Test Engineer: To guarantee the dependability and functionality of semiconductor devices, test engineers create and carry out testing protocols. They seek to find and fix manufacturing-related problems that could compromise the end product's quality.
- Applications Engineer: These professionals collaborate directly with clients to comprehend their requirements and support the incorporation of semiconductor products into particular applications. They offer technical assistance and assist in resolving problems that could occur when using semiconductor equipment.
- Analog or Digital Circuit Design Engineer: Engineers that specialize in either analog or digital circuit design work on creating circuits that process discrete digital signals or continuous analog signals, respectively. They are essential to the development of electronic systems' fundamental functionality.
- Manufacturing Engineer: The manufacturing engineers are in charge of the semiconductor device production operations. Their main objectives are to enhance productivity, cut expenses, and introduce enhancements to the production process.
- Entrepreneur/Startup Founder: People with a background in semiconductors may decide to launch their own businesses, creating and distributing cutting-edge semiconductor products.

Program Objectives:

1. Develop a thorough understanding of the fundamental concepts of materials science and semiconductor physics.
2. Gain expertise in the design and analysis of analog and digital semiconductor circuits.
3. Understand more about the steps involved in making semiconductors, including as photolithography, etching, deposition, packaging, and cleanroom procedures.
4. Become proficient in the use of testing and measuring techniques to characterize semiconductor devices and components.
5. Stay updated on the most recent developments in semiconductor technologies, including new materials, MEMS (Micro-Electro-Mechanical Systems), and nanotechnology.

6. Gain expertise in predicting and optimizing the behaviour of semiconductor devices and circuits via the use of modeling techniques and simulation tools.

Outcomes of the Program:

On successful completion of the program, Graduates will be

- Graduates will be able to apply the knowledge of thorough comprehension of the fundamentals of semiconductor physics, such as band theory, carrier transport, and the behaviour of electrons and holes.
- Graduates will be able to apply the knowledge of Create and examine semiconductor circuits with analog and digital components, showcasing your ability to apply theory to real-world design problems
- Graduates will be able to apply the knowledge of the processes involved in the production of semiconductors, including as photolithography, etching, deposition, cleanroom procedures, and packaging.
- Graduates will be able to apply the knowledge of Analyze semiconductor devices using testing and measurement methods to show that they can assess performance and spot possible problems.
- Graduates will be able to apply the knowledge of design and build sophisticated circuits by integrating semiconductor devices into larger electronic systems.
- Graduates will be able to apply the knowledge of developments in semiconductor technologies, such as MEMS, nanotechnology, and new materials, and use this knowledge for real-world applications.

Major Course Outlines:

1. Physics & Modeling of Semiconductor Devices
2. Analog and Digital Electronic Circuits
3. Semiconductor Fabrication Processes
4. Introduction to MEMS
5. Testability of VLSI
6. VLSI Architecture