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Perspective

Electronic Engineering and its Specialist Areas

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ABOUT THE STUDY

Electrical engineering is a subfield of electronics engineering, which differs from electrical engineering by using additional active components, like semiconductor devices, to enhance and regulate electric current flow. Until recently, passive components like mechanical switches, resistors, inductors, and capacitors were the only ones utilized in electrical engineering.

It includes topics like power electronics, embedded systems, consumer electronics, digital electronics, and analogue electronics. It also has a significant presence in a number of allied subjects, including solid-state physics, radio engineering, telecommunications, control systems, signal processing, systems engineering, computer engineering, instrumentation engineering, electric power control, and robotics.

Specialist areas

There are numerous subfields in electronic engineering. The most well-known are described in this section.

Electronic signal processing: It deals with the evaluation and tinkering with signals. Signals can be either analogue or digital, with the former varying continuously in accordance with the information while the latter fluctuates in accordance with a series of discrete values that correspond to the information [1].

Signal processing for analogue signals can include radio frequency signal modulation and demodulation for telecommunications as well as audio signal amplification and filtering for audio equipment. Signal processing for digital transmissions may include compression, error checking, error detection, and error correction.

Telecommunications engineering: It is concerned with the transfer of data *via* a channel like a coaxial cable, an optical fibre, or open space. Information must be encoded in a carrier wave for transmission across empty space, this process is referred to as modulation [2]. Amplitude modulation and frequency modulation are two common types of analogue modulation.

Telecommunication engineers design the transmitters and receivers required for such systems after the transmission characteristics of a system are established. A transceiver, a two-way communication device, is occasionally created by combining these two. The power consumption of transmitters is an important factor to take into account throughout the design process because it is closely related to the signal intensity. A transmitter's insufficient signal strength will cause noise to tamper with the signal's information.

Aviation-Electronic Engineering: Aerospace applications are covered by aviation-electronic engineering and aviation-telecom engineering [3,4]. Engineers in aviation and telecommunications may also be experts in ground-based or airborne avionics. Computer, networking, IT, and sensor knowledge are the most important skills for specialists in this industry. Such colleges as Civil Aviation Technology Colleges provide these courses.

Control engineering: It is used in a broad variety of electrical devices, including the propulsion and flight systems of commercial aircraft and the cruise control used in many contemporary vehicles. It is crucial to industrial automation as well [5]. Feedback is a common tool used by control engineers while creating control systems.

Instrumentation engineering: It concerns with the creation of instruments that measure things like pressure, flow, and temperature. Such instruments need to be designed with a solid understanding of electronic engineering and physics; radar guns, for instance, employ the Doppler Effect to gauge the speed of approaching vehicles [6,7]. The Peltier-Seebeck effect is also used by thermocouples to gauge temperature differences between two sites.

Instrumentation is frequently utilized as the sensors of bigger electrical systems rather than by itself. For instance, a thermocouple could be used to help maintain a furnace's constant temperature. Because of this, control engineering and instrumentation engineering are frequently seen as complementary disciplines [8].

Computer engineering: It is concerned with computer and computer system design. This could involve developing new computer gear, creating PDAs, or using computers to manage an industrial facility. This topic also includes the creation of embedded

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systems and systems created for a particular purpose. The microcontroller and its applications fall under this category [9]. The software of a system may also be developed by computer engineers. However, software engineering, which is often seen as a different subject, is frequently responsible for the design of complicated software systems.

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