Letter to the Editor

Prospects of Electrical Engineers in Pharmaceutical and Biomedical Engineering

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Pharmaceutical and Biomedical Engineering are the two behind-the-screen key playing sectors that constitute the backbone of health care industries. While one (pharmaceutical) regulates the existence of medicines, the other (biomedical) controls the fields of diagnostics and treatments. Though not being the sole part of these two fields, electrical engineering remains in vital coordination and cooperation with other engineering (e.g., electronics, mechanical, automation) services. However, a lack of such attention has been observed in the electrical engineering study curriculum.

Simply, starting from infrastructure service, electrification, process and building electricity and circuit design, instrumentation, maintenance and repairment of devices that reach to process and machine operation, clean rooms, water systems, and environmental monitoring systems, the scope of electrical engineering lies with the existence of pharmaceutical industries [1]. Moreover, now more than ever, pharmaceutical industries are moving forward with technological advancement and innovation while keeping the user's demand and FDA's requirements [2]. One such example is creating human organ system simulators to test drugs (e.g., simulated gastrointestinal system) which are opening up more windows for electrical engineering engagements [3].

Biomedical engineering comes up with a broader scope for electrical engineering by itself emerging as one of the fastest-growing industries to support the advancement of the health care system [4]. In association with electronics engineering, the involvement of electrical engineering is regularly spotted on focusing and developing diagnostic tools such as measurement of biological signals and indicators (electrocardiogram (ECG), electroencephalogram (EEG), electromyogram (EMG), lung volumes, and non-invasive blood pressure), reverse engineering of automated blood pressure monitor (pressure sensor and transducer, liquid crystal display, microprocessor, inflating pump motor, and the solenoid valve), biopotential amplifiers (isolation preamplifiers, differential amplifiers, AC/DC coupling for noise suppression, and basic filter design), cardiac monitor for arrhythmia detection (signal conditioning, cardiac tachometer design for determining the heart rate), signal denoising and compression, biotelemetry, physiological modeling of lung mechanics, etc. [4-6].

Electrical, pharmaceutical, and biomedical engineering together have so far revolutionized healthcare facilities with the invention of devices and machines such as simulated gastrointestinal systems, ultrasounds, and pacemakers. Rationally, some world's leading educational institutions are offering bioengineering with an emphasis on electrical engineering [7-10] however, hardly any institution offers pharmaceutical engineering options. Therefore, it should be considered to expand the electrical engineering curriculum for integration of pharmaceutical and biomedical engineering courses. In addition, it is necessary to launch new study programs with specialization in these two disciplines for electrical engineering students.

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