

11.14 Why study digital design

i This section has been set as optional by your instructor.

Studying digital design gives professionals, like computer scientists, or electrical and computer engineers, a deeper understanding of how computers work "under the hood." Even if going on to do others tasks, like writing software, assembling systems, etc., such understanding can lead to more professional accomplishment of those tasks—akin to drivers knowing how a car engine works being better professional drivers, or to a skin expert knowing how all the human body works being better dermatologists. And, some computing professionals *will* go on to directly use digital design to build computers.

Figure 11.14.1: Digital design is needed to understand how computing systems work.



Source: Zyante

Studying digital design is also important for professionals who may build embedded systems, like computer scientists, electrical and computer engineers, mechanical engineers, biomedical engineers, physicists, and more. An **embedded system** is a computing system embedded within another device like an automobile, an electronic book reader or music player, a robot, a medical device, a home security system, and much more. Hundreds of times more embedded systems exist than traditional computers. As digital circuit chips continue to shrink, become more powerful, and reduce in cost, previously-unimaginable exciting embedded system inventions continue to be unveiled, like eyeglasses that a user can talk to and get instant information displayed in the lenses, like self-driving cars, or like ingestible computerized pills that deliver time-released medicines or that measure internal body data—all of which exist today. To meet tight constraints on size, performance, power, or cost, embedded systems often use various combinations of microprocessors and custom digital circuits.

Figure 11.14.2: Embedded systems: Smart pill, automobiles, and more!



Source: SmartPILL™ by Given Imaging



Source: Zyante

PARTICIPATION ACTIVITY 11.14.1: Why digital design.

Which of the following are likely to be true, based on the above discussion?

- 1) The VP of Engineering at a billion-dollar hard-drive maker complained that computer science graduates who "don't understand resources" end up writing grossly inefficient software.
☐ True
☐ False
- 2) Knowing what computer parts do, like memory or clock, can help in purchasing computers.
☐ True
☐ False
- 3) A computer software update involved updating the flash memory of a hardware component. The update failed. A phone technician said the component required replacement, but based on knowledge of how flash memory worked, the user suggested manually downloading the software, which worked.
☐ True
☐ False
- 4) The inventor of the most widely-used programming language (as of 2014) says that the trend of hiding under-the-hood details from computing graduates is "a disaster waiting to happen."
☐

- ☒ True
- ☐ False

5) Each function of an embedded system is inherently either a microprocessor program or a custom digital circuit, but can't be both.

- ☐ True
- ☐ False



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