



## What is a Telecommunications Engineer?

by Russell V. Carstensen, PE, NCE

Over the years I have been drawn into numerous debates over wired and wireless systems. The debates seem to consistently follow two themes: that wired telecommunications are dead and that wireless technology is different. Both technologies employ telecommunications engineers but claim that there is the “true faith.” Even though the same degree titles are awarded, technology has changed substantially in the 40 years I have been practicing as an engineer. This leads me to raise the point that if the degrees are the same, what is different? The following paragraphs reflect what I know to be correct about telecommunications engineering. The question is whether this reflects your reality. Please read my thoughts and let me know if I am on track.

### Telecommunications Defined

In my research for this article, I looked first at what telecommunications is. The definitions currently in use seem to follow my old logic. For example, telecommunications engineering focuses on the transmission of information across a channel such as a coax cable optical fiber or free space. Transmissions across free space require information to be encoded in a carrier wave in order to shift the information to a carrier frequency suitable for transmission. Popular analog modulation techniques include amplitude modulation and frequency modulation. The choice of modulation affects the cost and performance of a system and these two factors must be balanced carefully by the engineer.

Once the transmission characteristics of a system are determined, telecommunications engineers design the transmitters and receivers needed for such systems. These two are sometimes combined in a single transceiver. A key consideration in the design of transmitters is their power consumption as this is closely related to their signal strength. If the signal strength of a transmitter is insufficient, the signal's information will be corrupted by noise.

Internet will allow us to maintain and develop contacts and ensure that all our commitments are met.

“While we are here, I believe there are a number of interesting opportunities for NARTE to introduce certification programs to Europe, and I will be starting right away with some leads that have developed in the U.K. Once programs are running in the U.K., it will be easier to expand into other Western European countries.

“With the globalization of industries, it is more and more important that engineers appreciate what is going on in the different global markets. By introducing NARTE to Europe, we can act as a conduit for the exchange of ideas and information between the communities.”

Brian ends by saying, “We have active certification programs running in Japan and there has been an initial interest in Singapore that needs to be fostered. The longer term goal in Asia will be to get NARTE programs up and running in China, Korea and Taiwan, then we will have a truly global presence”.

## Educating A Telecommunications Engineer

## Work Requirements

Society relies on telecommunications engineering for breakthroughs in applications such as satellites, next-generation mobile phones, air-traffic control, the Internet and much more.

A telecommunications engineer is involved in the planning, design, commissioning and monitoring of complex telecommunications networks and associated broadcasting equipment. Many telecommunications engineers work for major carriers, both wireless as well as telecommunications and IT service providers.

A portion of their education is targeted to core units for electrical engineering: mathematics, physics, electrical and computer systems engineering, digital logic systems, computer organization and programming.

Another portion is targeted to include telecommunications, information transmission, electromagnetic theory, signals and systems, electronics and control systems, advanced programming techniques, mathematics and management. Level three and four students concentrate on engineering management, telecommunications electives and group and individual projects.

Throughout the course, students choose from a range of electives, including antennas and propagation, advanced electronic and phonic devices, microwave/RF devices, circuits and communications, optical communication systems, Internet architecture and protocols, ATM and ISDN networks, mobile systems and networks.

They learn about the planning and design, commissioning, performance monitoring, optimization and management of both small scale and complex telecommunications systems.

Electrical engineers, on the other hand, design, develop and supervise the manufacture, installation, operation and maintenance of electrical systems. They work on systems for the generation, distribution, utilization and control of electric power. They also work on electronic systems used for computing, communications and other industrial applications. The point being that there is a lot of similarity between educational development for both.

What then do telecommunications engineers do? Typically, a telecommunications engineer will:

Manage engineering teams

Design telecommunications equipment, including modems, switches, routers and radio links

Develop real-time computer systems, including imbedded computer systems and their software

Build and test prototypes of new equipment, including integrated circuit components

Predict telecommunications system performance

Optimize the performance of telecommunications systems

Provide technical support to marketing or customer service staff and telecommunications technicians

Train technical and engineering staff once new systems have been installed

Supervise special research projects on next generation telecommunications systems.

## Career In Telecommunications Engineering

Employment opportunities for telecommunications engineers are growing rapidly. The list of employers is long and includes manufacturers of radio, television, and other audio/visual, broadcasting and receiving equipment, and developers of hardware and

associated software, including computer systems, interfaces, security devices, data concentration, data transmission, signaling, satellite and radio communications and telephone equipment. Graduates also work in service organizations that provide broadcasting, consulting, data communications, entertainment, custom manufacturing, research and development, and telecommunications system support.

Multimedia services are establishing communications and employment opportunities not dreamed of even a few years ago, for example video conferencing, interactive video on demand, Internet broadcasting of conferences and training programs and the real-time transfer of vast amounts of information.

So, what I have tried to show is that the field of telecommunications engineering still exists as a separate discipline and that telecommunications engineers do real engineering work for which there is a constant and (believed by some) a growing demand. The question is – am I correct? I await your confirmation. I can be reached through [narte@narte.org](mailto:narte@narte.org) or directly by email at [writeme@tss.net](mailto:writeme@tss.net).