

# Connected world elective package

Connected world	
Offered by	Department of Electrical Engineering
Language	English
Primarily interesting for	All students, but most relevant for students with background in EE and AU, Inf, Wsk, TN (with additional requirements)
Prerequisites	Required courses: - Recommended courses: -
Contact person	Prof.dr.ir. S. Heemstra de Groot (sheemstradegroot@tue.nl)

## Content and composition

The “Connected World” is one of the three core activities in the domain of electrical engineering. It involves well-known applications such as an IPAD and smartphone, but also the wireless infrastructure which is needed for high-speed communications. Telecommunications form the arteries and the veins for economic activities ranging from research to manufacturing, for transport, health care, banking, logistics, leisure activities, intelligent energy supply, etc. Communication technologies have to provide ample telecommunication capacity transparently, both wireless and wired (e.g. optical networks), at affordable costs for the end users, yielding a traffic-jam free communication world. Other systems are more localized and are only carrying traffic over short distances, but may be equally important to our society. Some popular communication functions are so localized that they may not be recognized as communication devices; e.g. the TV remote control, wireless mouse and keyboard of a PC, etc.

Course code	Course name	Level classification
5XTA0	Telecommunication systems	3.
5XTB0	Photonics	3.
5XTC0	Components in wireless technologies	3.

## Course description

### Telecommunication systems (5XTA0)

This course will give a general overview of telecommunication systems and includes the following topics:

- OSI model
- wireless versus optical communication systems
- the Shannon limit
- modulation methods
- noise in communication systems
- receivers, matched filters and Bit Error rate (BER)
- multiple access (TDMA, CDMA, FDMA)
- computer networks and protocols

# Connected world elective package

## Photonics (5XTB0)

Photonics is multidisciplinary with strong roots in physics and with a rapidly increasing range of engineering applications in information technology, energy, lighting, manufacturing and materials processing, metrology and sensing, medicine and biotechnology etc. The course Photonics is set up as a course for the last year of a bachelor program. Its ambition is to introduce most of the basic concepts used in photonics as well as to teach some basic design approaches. Furthermore it will confront the student with a (limited) amount of factual knowledge about "real-life" photonic materials, components and systems. The subjects that are taught are: geometrical optics, scalar waves, gaussian beams, waveguide optics, semiconductor light sources, lighting, displays and solar cells.

## Components in wireless technologies (5XTC0)

This course focuses on key components in the physical layer of wireless systems. It includes the following aspects:

- Transmission lines and waveguides
- Microwave networks: scattering matrix, Smith Chart, matching circuits
- Introduction into antennas
- Active RF and microwave circuits o Amplifiers (incl. definitions of different gains, loss, NF, etc.) o (De)modulators and mixers o VCO, frequency dividers, PLL

The course includes on hands-on lab in which students will design a wireless front-end using advanced design tools. In addition, measurements will be done with a network analyser.