Electrical Engineering
Wireless Communication and Sensing

MSc Programme

Wireless Communication & Sensing systems are a strongly expanding and integral part of our modern society. Wireless communication systems, e.g. cellular networks (4G, LTE, 5G) and WiFi (2,4 GHz, 5 GHz, 60 GHz), are continuously evolving towards further improved services at lower cost. New developments in wireless communication systems include ad hoc networking, dynamic spectrum access, positioning, Massive MIMO and (low power) sensor networks.

Degree	Master of Science
Starts	September
Type	full-time
Credits	120 ECTS, 24 months
Language	English
Application deadline	1 April 2019
Tuition fee	€ 18.750 (non-EU) € 2.083 (EU)
Scholarships	scholarships.tudelft.nl

In parallel to the telecommunications services, yet based on similar techniques, novel wireless sensing and observation technologies are being developed and widely deployed in a broad spectrum of applications from health care to space. Microwave and Tera-Hertz (remote) sensing are used to collect up-to-date information required to enable autonomous driving, to support reliable weather forecast, to diagnose and treat medical conditions, to manage crop health and to provide real-time observations for security applications. The needs for this kind of information is vastly increasing to efficiently manage and safeguard our complex society.

Communication networks as well as other complex networks (like power grids) rely to a large extent on decentralisation and self-organisation. Both require the management of a higher complexity and sophisticated design to guarantee stability and optimise performance. An important new and challenging development is the Internet of Things (IoT), which impacts both wireless and fixed networks.

Current research focuses a.o. on 5G communications, IoT, autonomous driving, space based communication & sensing and security & safety. Because of the developments in Wireless

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For more information on all courses, please visit: **www.studyguide.tudelft.nl**

Communication and Sensing, we can live more safely, securely, healthy, comfortably and more sustainably. They shape society in profound ways and their impact will become only bigger. Aimed at providing your education and making you successful in those fields, the WiCoS track is a multidisciplinary master level educational programme in Electrical Engineering (EE).

Programme

The programme offers challenging high-level education and research to talented students holding a BSc degree in technology or science.

The programme covers a broad spectrum of topics related to wireless applications including radio communication, radar and THz sensing, positioning and electromagnetic imaging as well as complex networks with extended opportunities for specialisation.

You can learn fundamental concepts and techniques related to:

- Electromagnetics, radio wave propagation and RF system design and antenna design.
- Observation technologies: radar, quasi-optical systems, short range imaging and remote sensing.
- Signal processing techniques for telecommunications & sensing, including modulation, coding, estimation and detection principles.
- Network design and management: fundamental concepts of network science; design and architecture, management, protocols and algorithms for wireless and fixed networks, robustness and resilience assessment.

Specialisations

In the first quarter of your first year, you will get an overview of the different specialisations within the Wireless Communication & Sensing track. The track subsequently offers a number of education profiles as listed below.

THz Sensing focuses on the theory and physical phenomena behind generation, guided propagation, transmission, and reception of electromagnetic waves, as well as the principles of radiation from antennas, typical antenna structures, and antenna design skills.

Microwave Sensing and Radar focuses on theoretical foundations of advanced multi-sensor systems and application of multi-sensor technologies to gather information of natural and man-made phenomena at short distances (e.g. in medical imagers and security scanners) and at long distances (radar).

Network Design and Management focuses on complex networks, ranging from data communications and internetworking, infrastructures such as energy networks, to biological, brain, social and financial sector networks.

Physical Layer Signal Processing for Communication focuses on physical layer aspects of (wireless) communication systems, i.e. how to efficiently transport information through a physical radio channel, and the fundamental signal processing issues of estimation and detection.

Master's Thesis

The thesis project is the last study unit of the programme and serves to prove that you acquired the academic competencies of a Master of Science in Wireless Communication & Sensing. The project may be executed within a research programme at TU Delft, or in a suitable research institute or company.
Some examples of graduation projects are:

- Increasing robustness of Software-Defined Networks.
- Software-defined radio receiver design and development for China Digital Radio (CDR).
- Analysis of Antenna and RF Front-End Topologies for Multi-Beam 5G Systems.
- Opportunistic Routing for Indoor Energy Harvesting Wireless Sensor Networks.
- Interference in 79 GHz Phase-Coded Automotive Radar.
- Analysis and design of a dual-band THz imager based on incoherent detectors.

Career perspective

Companies

NXP, Ampleon, Thales, Signify, Shell, ASML, TNO, Philips

Positions

Engineering, Defense & Space, Automotive, Telecommunications, IT, research, Academic Career