Advanced Networking Lab

2025 - 2026

Is part of the next programmes:

- M0012004 Master of Computer Science: Software Engineering

- M0012005 Master of Computer Science: Data Science and Artificial Intelligence

- M0012006 Master of Computer Science: Computer Networks

- M0048004 Master of Computer Science: Software Engineering

- M0048005 Master of Computer Science: Data Science and Artificial Intelligence

- M0048006 Master of Computer Science: Computer Networks

- M0090004 Master of Teaching in Science and Technology: Computer Science

- U0001008 Courses open to exchange students in Sciences

Course Code:	2001WETLMW
Study Domain:	Computer Science
Semester:	2E SEM
Sequentiality:	ECTS-credit obtained OR enrolled for Mobile and wireless networks.

Contact Hours:	60
Credits:	6
Study Load (hours):	168
Contract Restrictions:	No contract restriction
Language of Instructions:	ENG
Lecturer(s):	(T) Jeroen Famaey (M) Johan Bergs
Examperiod:	exam in the 2nd semester

1. Prerequisites *

speaking and writing of:

- English

reading and comprehending of:

- English

general notion of the basic concepts of

- The Linux command line
- Networking tools, such as ping, iperf, wireshark, ...
- Docker

specific prerequisites for this course

The students should have a solid understanding of various concepts in Wi-Fi and 5G networks, such as those covered in the course *"Advanced Wireless and 5G networks" (2001WETMWN)*.

2. Learning outcomes *

- After following this course, the student has broadened their insight in wireless and mobile networks based on practical applications.

- The student can design, implement and analyze the traffic and operational performance of today's WiFi systems, based on hands-on labs with actual hardware and software tools.

- The student can design, implement and analyze the traffic and operational performance of today's 5G systems, based on hands-on labs with actual hardware and software tools.

3. Course contents *

The course is split in two parts:
- Part 1 focuses on Wi-Fi networks
- Part 2 focuses on 5G networks

Wi-Fi
- In the Wi-Fi labs, the students start by configuring Wi-Fi networks using different modes and frequencies.
- After these concepts are covered, the students take a look at different performance metrics and security techniques in Wi-Fi networks.
- Finally, the students will use dedicated hardware that runs Openwifi (https://github.com/open-sdr/openwifi) in order to play with more advanced settings that are usually inaccessible in commercial Wi-Fi chips.

5G
- The students start by designing a 5G network that is specifically tailored to a given use case.
- In a second step, the students get familiar with OpenAirInterface (https://gitlab.eurecom.fr/oai/openairinterface5g), configuring and setting up their previously designed 5G network in a virtual environment.
- Finally, the students will deploy their virtual 5G network on real hardware and perform some real-life tests.

4. International dimension *

- This course stimulates international and intercultural competences.

- Students use course materials in a foreign language.

5. Teaching method and planned learning activities

5.1 Used teaching methods *

Class contact teaching

- Laboratory sessions

Personal work

Assignments

- In group

5.2 Planned learning activities and teaching methods

There will be weekly planned lab sessions on campus (not recorded).
The labs can be divided into three different types:
- **Remote labs:** you interact with real hardware from a remote location (in class or from home).
- **Virtual labs:** you work on a virtual environment that mimicks real hardware (in class or from home).
- **In-person labs:** you physically interact with real hardware in class.

During the weekly sessions, new assignments are introduced. They also serve as interactive Q&A sessions. These sessions will also be used for the students to interact with the dedicated hardware provided for the in-person labs.

5.3 Facilities for working students *

Classroom activities

- Practica: free to choose the group division

Individual work

- In group: individual alternative assignment possible

Others

The lab sessions can be logged in to remotely, and a large part of the work can be done without needing to attend the in-person sessions. Next to this, we will make available a remote web conference link for working students to dial in and interact and ask their questions. That being said, the labs do take some effort depending on the background of the students.

6. Assessment method and criteria *

6.1 Used assessment methods *

Continuous assessment

- Assignments

6.2 Assessment criteria *

All assignments have a specific deadline during the course of the semester.
Students can ask for feedback on the submitted assignments.
The final grade is calculated as follows:
- 6/20 points on the Wi-Fi assignments
- 14/20 points on the 5G assignments
There is no minimum requirement for either part, as long as the combined grade is 10/20 or more.

7. Study material

7.1 Required reading *

Jupyter notebooks and a set of slides will be provided at the start of each assignment.

7.2 Optional reading

The following study material can be studied voluntarily :

The slides of the *"Advanced Wireless and 5G Networks"* course will be made available. Next to this, the same material as for that course is relevant here too:
- 5G NR, The Next Generation Wireless Access Technology - Erik Dahlman
- 802.11 Wireless Networks - Matthew Gast
- 802.11ac, a survival guide - Matthew Gast
- Wireless Connectivity, an intuitive and fundamental guide - Peter Popovski
- Mobile Communication - Joachim Schiller
- Fundamentals of Wireless Communication - David Tse

8. Contact information *

Lecturer: Prof. Dr. Ir. Michael Peeters
Assistants: Arno Troch and Johan Bergs

9. Tutoring

These are designed as hands-on labs that give you skills that are directly applicable to the actual operation of wireless networks in the industry. As such, making sure that you can reproduce each and every result yourself (even though these are group projects) is a good test strategy.