Microwaves and mm-waves for the Design of Advanced Wireless Links:

Communication, Sensing and Power Transfer

June 15-20, 2026 – Pisa (Italy)

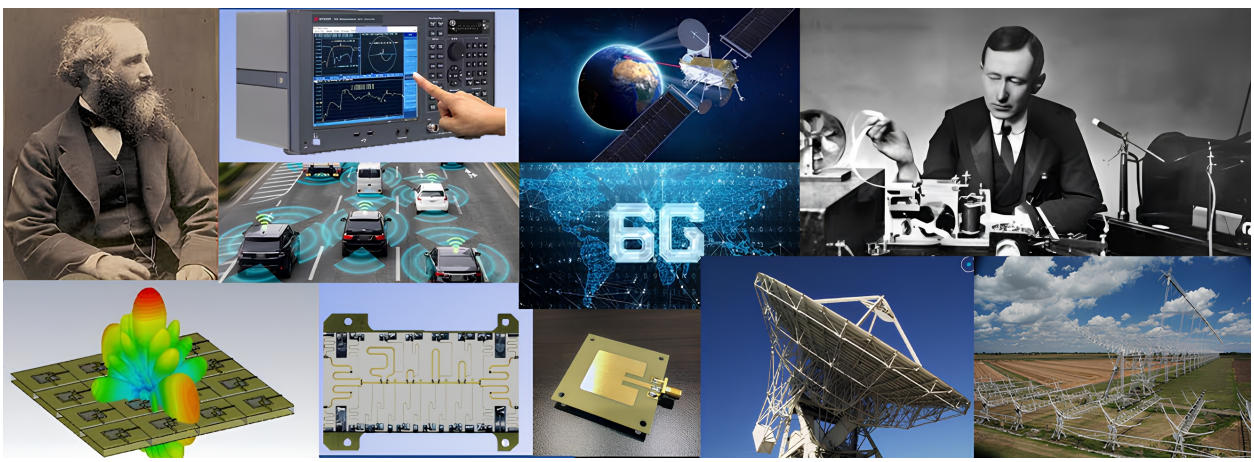
IEEE STUDENT BRANCH – UNIVERSITY OF PISA

The third edition of the Summer School “Microwaves and mm-waves for the design of advanced wireless links: communication, sensing and power transfer” aims to introduce the attendees to the building blocks required for understanding the basic principles, the implementation strategies and the design criteria of the most common wireless systems operating in the microwaves and mm-waves frequency bands.

An overview of the fundamental electromagnetic (EM) phenomena will be provided and exploited to describe the most important high-frequency devices of the wireless system physical layer. The Summer School will support the gain of skills useful to control the wave propagation and shape the EM fields, thus helping the attendees to face the challenging and ever-evolving requirements of advanced wireless systems.

The Summer School offers 6 ECTS credits through the delivering of 48-hour lectures. Attendees will get an introduction to EM fundamentals and then will learn how some basic EM concepts are applied to the design and implementation of advanced communication systems, radars, wireless sensing systems, wireless networks and high-frequency circuits.

To fully pursue the Summer School objectives and provide the most effective outcome, the lectures are subdivided into two parts. The first part is dedicated to a concise and basic description of the most important EM phenomena: wave propagation in free space and guiding structures; properties and characteristic parameters of passive devices, transceivers and antennas. Experimental measurements and an introduction to a



commercial EM solver are also planned. The second part of the lecturers is devoted to highlight how the EM phenomena and devices previously reviewed are applied in some of the most advanced wireless systems.

Lecturers from academia (University of Pisa and University of Bologna), ICT industries and research centers, will focus on the design criteria, technical features, architectures and innovative aspects that are induced by the EM fundamentals into 5G mobile communications, wireless power transfer systems, V2X communications, satellite communication networks, non-terrestrial networks, microwave systems for aerospace, defense and radioastronomy.

Lessons will be held at the Department of Information Engineering, Via G. Caruso n. 16, Pisa. The program will be also activated in distance learning mode (TEAMS platform).

On June 17th, the lectures will be given during the educational visit at the Radio Astronomical Station in Medicina (close to Bologna), which is managed by the Italian National Institute for Astrophysics (INAF). The attendees will have a guided tour of the exposition center and antenna site (the Northern Cross and the 32m-dish antennas). The bus transfer for the round trip to Medicina, as well as a class-building lunch, will be provided by the Summer School organizers.

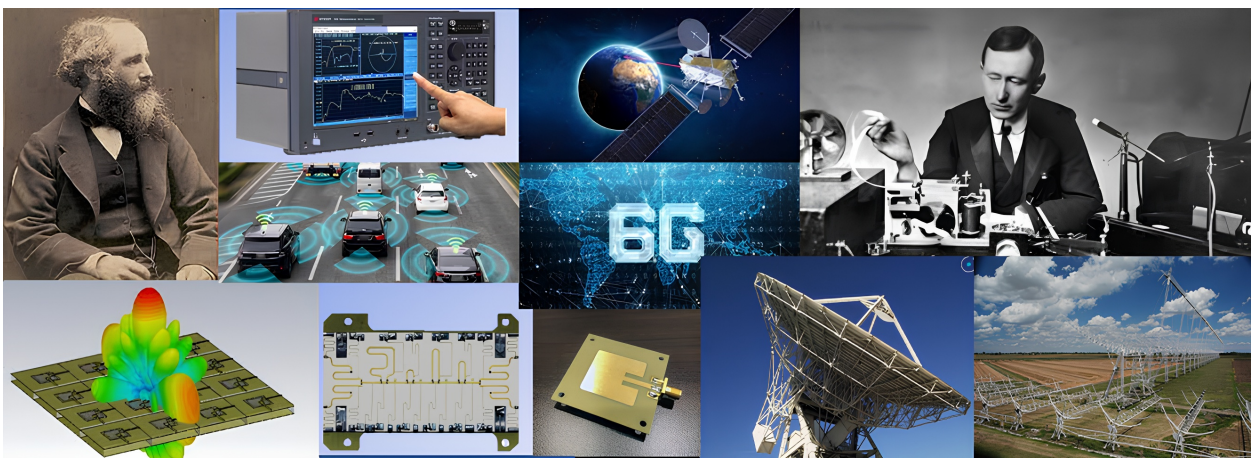
School Syllabus

Part I: Basic remarks on EM phenomena and devices

- Free-space propagation, ray-based propagation models
- Wave propagation through dielectric media, multipath models
- Wave propagation in guiding structures, printed lines
- Passive devices for advanced wireless systems: characterization and design criteria.
- Antennas for high-frequency wireless links
- Transceivers: modeling and design examples
- EM solvers for the analysis and design of devices and antennas
- Instrumentation for the characterization of wireless network devices

Part II: Microwaves and mm-waves for advanced wireless links

- Non-terrestrial communication networks
- The evolution of terrestrial communication networks toward the fifth generation (5G)
- Wireless sensing and communications in automotive V2X scenarios

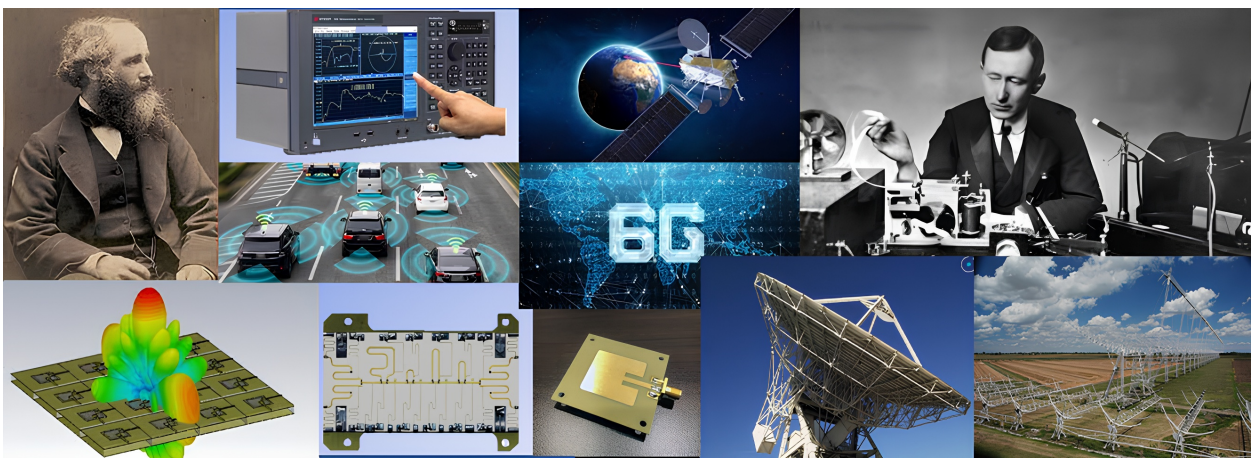


- Devices and architectures of systems for wireless power transfer and energy harvesting
- Radio telescopes to capture radio waves from astronomical radio sources in the sky
- Microwaves systems for satellite broadband networks, aerospace and defense

Educational visit at Medicina (Bologna)

The Medicina Radio Astronomical Station is an observatory managed by the National Institute for Astrophysics (INAF). Located 30 km from Bologna, it hosts the first Italian radio telescope, the Northern Cross and a 32-m parabolic dish.
Several laboratories are present, dedicated to topics such as radio frequency, electronics, time and frequency processing techniques, and Radio Frequency Interference. A team of engineers, technicians and researchers is in charge of the design, development and test of all the aspects related to the radio telescopes. In particular, they are involved in any aspects of the radio astronomy facility, as mechanics, radio frequency devices, digital systems and control software.
During the visit, the participants will have the opportunity to attend seminars on different topics related to the application of radio frequency techniques to radio astronomy, as well as more interactive sessions as the interaction with equipment available at the exposition center and a tour on the large antennas and advanced laboratories (photo gallery).

Who can apply
The Summer School can be of interest for students (PhD students, postgraduate students, and undergraduate students who are close to getting their degree), practitioners and industry employees, who are involved in any Information and Communication Technology (ICT) fields (and more generally in STEM disciplines) and aim to exploit the EM phenomena to shape future communication systems, radars, wireless sensing systems, wireless networks and high-frequency circuits.
Lecture contents do not require a solid background in electromagnetics, yet experimental measurements and commercial simulation tools will be used to validate EM basic



concepts, as an effective alternative to conventional approaches based only on strict analytical derivations.
The maximum number of participants is 50.

Language: English

ECTS credits: 6
All participants will receive a certificate of attendance. Attendees interested to earn the 6 ECTS credits are expected to agree with the Summer School coordinators on a Project Work topic and then submit a final report no later than 30 August 2026 (pdf submission by email to paolo.nepa@unipi.it). The approved project works will receive a grade, and after a few days the attendees could download a transcript-of-records from their student account at the University of Pisa.
Master students and PhD students could spend the earned 6 ECTS credits at their home institution (based on credit recognition rules applied at their local Bachelor/Master Degree course or PhD program).

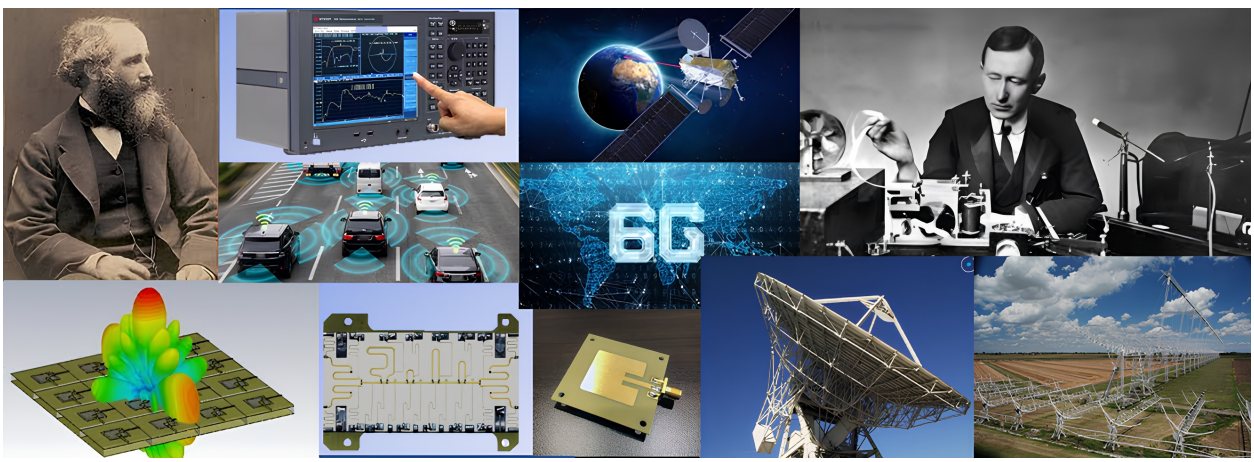
Fees: 250 euro

Tuition-fee waivers
Up to **4 tuition-fee waivers are available for international students**, which are made available by the Department of Information Engineering thanks to a liberal donation from the company Sensor ID srl, Campobasso, Italy.
All the applicants applying by April 1, 2026, will be considered for the tuition-fee waiver selection procedure. Selections results will be notified by April 14, 2026.
Priority will be given to women for gender balance, and to students with special needs coming from developing countries.

Application procedure
Application has to be submitted via **Alice portal** following the instructions of the **"How to apply" page**.

Required Documents
- Identity Document (*PASSPORT in case you are a foreign student*)
- Enrolment Form
- Curriculum Vitae

All documents must be in pdf format, in order to upload them on the portal when required.



IMPORTANT DEADLINES

- **April 1, 2026**: application deadline for students interested to participate to the selection procedure for the assignment of four tuition-fee waivers
- April 14, 2026: the selection procedure for the assignment of the tuition-fee waivers will be concluded and the results will be notified to the awardees
- April 15, 2026: opening of the portal for tuition-fee payment
- **April 30, 2026**: general application deadline for all candidates
- May 15, 2026: tuition-fee payment deadline

Information about the payment method will be published soon at this webpage

Refund Policy: There will be no refund of paid tuition fees

Summer School Coordinators:
Paolo Nepa, Department of Information Engineering, University of Pisa, Pisa, Italy
paolo.nepa@unipi.it
Pietro Bolli, Technology Director, INAF Arcetri Astrophysical Observatory, Florence, Italy
pietro.bolli@inaf.it

Contacts:
Paolo Nepa, Department of Information Engineering, University of Pisa, Pisa, Italy
paolo.nepa@unipi.it

Maria Marinelli, Administrative Staff, Department of Information Engineering, University of Pisa, Pisa, Italy
maria.marinelli@unipi.it

Summer/Winter School Office support.summerschool@unipi.it