

## UNIVERSITE DE BRETAGNE OCCIDENTALE (UBO) ÉCOLE NATIONALE D'INGÉNIEURS DE BREST (ENIB)

### Master in Electronics Electrical Energy and Automatic Systems

# Radio-Frequency Electronics and Telecommunications

## Aims

The Master in Radio-Frequency Electronics and Telecommunications provides students with the necessary theoretical knowledge and practical skills to step into careers in telecommunications and the electronics of wireless communication systems.

This course covers topics ranging from the **materials** and **technologies** used to design components to the study of the architecture of **radio-frequency and microwave systems**. The design theory for the various components that make up transmit/receive chains (antenna, filter, coupler, amplifier, circulator, etc.) is studied, then validated using advanced simulation tools and mock-ups. Graduates are thus capable of working with current and future technologies of all analogue parts of a wireless communication system. The programme is **half theory** and **half practical** (practical work, mini-projects and long projects).

The **Master's degree in Radio-Frequency Electronics and Telecommunications** builds on a **strong partnership with industry** at both local and national level. During the course, many industrial firms (Thales LAS, Ipremer, GTID, Thales DMS, etc.) contribute to the course through lectures, seminars or mini-projects.

This specialization offers **job opportunities** immediately after the Master's degree as well as **further study** through doctoral programmes. The final 4- to 6-month internship can thus be completed either in a research laboratory or with a company.

For graduates who choose to directly enter the job market, the career opportunities are quite varied. Most are specialized engineering positions in the field of telecommunications. To cite a few examples: high-frequency electronics engineer, design engineer for radio-frequency or microwave communication systems, radio-frequency engineer, electronic engineer, test & measurement engineer, radio broadcasting engineer, etc.

The ET Master's is a **joint degree awarded by UBO and ENIB**.

## Skills acquired

Graduates from the Master's degree in Radio-Frequency Electronics and Telecommunications are professionals ready to be tasked with designing and finalizing new products and technologies or upgrading existing products and technologies. They are capable of studying the feasibility of projects and of developing technical and technological proposals, designing solutions or technological upgrades by studying the project's characteristics and constraints, conducting tests and trials, analysing their results and determining the strategies to adopt. They may be assigned to supervise or coordinate a project or even team.

Their field of expertise focuses on telecommunications with specificities directly linked to their chosen specialization. More specifically, ET Master's graduates are capable of:

- Designing and integrating front end subsystems for microwave telecommunications systems;
- Characterizing radio-frequency and microwave telecommunications technologies and systems;
- Characterizing communication technologies and systems;
- Dimensioning wireless links and networks for terrestrial, spatial and maritime applications;
- Conceptualizing and conducting the overall management of a project...

## Admission requirements

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Access to the second year of this Master's course is open to students with 4 years of post-secondary education in the field of electronics and more generally in the field of "Science, Technologies and Health". Classes are taught in French; the recommended level of proficiency in French is B2.

It is also possible to take this course as a continuing education student by obtaining recognition of prior experience or qualifications (VAE, VAPP 85 or VES).

In order to guarantee the high quality of this course and the recognition it enjoys within the professional world, the number of students admitted to the Master's degree in Radio-Frequency Electronics and Telecommunications is limited to 20. Candidates are selected **based on their application according to their qualities, diligence and work capacities**.

## Applications

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With a maximum of 20 places on this course each year, the admissions process to the 2nd year of the Master's course is application-based. Application documents:

Application form, CV, cover letter, copy of qualifications and academic transcripts (post-secondary) + interview (possibly).

## Internship

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### Mandatory long-term internship (4 to 6 months)

- > Type of internship: Assignment
- > Start of internship: February/March
- > Duration: 16 weeks minimum
- > Note on duration:

The internship lasts for a minimum of 4 months and a maximum of 6 months (16 weeks minimum).

## Further study

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This Master's degree is a combined professional and research course and has been designed so as to ensure that the Telecommunications Master's graduates are job-ready or, for those seeking to pursue a research career, are on track to continue on to doctoral studies.

For instance, some of the projects focus on businesses' issues in this sector, while others are geared towards research. Throughout the course, students therefore have the opportunity to tackle both aspects.

Every year, various research teams from the Lab-STICC laboratory (UMR CNRS 6285) propose research topics for funded PhDs accessible to our Master's graduates.

Possibility of access to certain courses as a dual competency.

## Career opportunities

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Graduates from the ET Master's degree mainly pursue careers as expert engineers in the fields of telecommunications and communication systems electronics: engineer in the high-frequency electronics sector, design engineer for radio-frequency or microwave communication systems, radio-frequency engineer, electronic engineer, test & measurement engineer, radio broadcasting engineer, etc.

The Master's degree in Radio-Frequency Electronics and Telecommunications is a first-rate programme for engineering excellence. The key figures (recorded in 2018) for graduate employment (1st job after graduating) are:

- Employment: **100% of graduates** are in employment or further studies (PhD) **6 months after graduation**.
- Monthly net income: The **median monthly net income is €2,222**.
- Geographical distribution: **67% of graduates find a job in Brittany** (due to the major industrial basin in this sector of activity).

## Learning environment

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Several very well equipped practical classrooms are available. Emphasis is placed on students' projects and individual autonomy. The course is supported by a leading laboratory in the field of telecommunications (Lab-STICC UMR CNRS 6285), providing assurance that students will benefit from classes taught by lecturers familiar with the latest technologies, as well as internship and PhD opportunities. Private-sector engineers as well as academic staff from jointly accredited or partner engineering schools also teach classes to offer additional insight.

## Promoting success

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Class sizes are small (no more than 20 students) to facilitate discussions with teachers and ensure that students benefit from close supervision.

## Practical information

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- > **Ecole Nationale d'Ingénieurs de Brest (ENIB)**
- > Course available as co-op programme
- > **Teaching location:** Brest
- > **Contacts:**  
 Course Director:  
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 Service Scolarité – Master ET  
 +33 (0)2 98 05 66 16 (or 00)  
[scolarite@enib.fr](mailto:scolarite@enib.fr)

## Course content

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The second year of this Master's course is divided into two semester-long course units, S9 and S10, the details of which are provided in the table below.

### Semester 9

Antennae and sensors	48h
Modelling and optimization methods for passive microwave systems	48h
Active microwave systems	48h
Optoelectronic systems	48h
Microwaving filtering	48h
Preparing for the working world	60.5h
- English	22h
- Communication	22h
- Business	16.5h

### Semester 10

Materials for microwave frequencies	48h
Industrial and intellectual property	10h
Annual integrator project	48h
Internship with a business or laboratory (4 to 6 months)	

Double degree engineering students are exempt from certain modules where equivalent modules are taken as part of their general engineering programme. For further information, please contact the Course Director at ENIB.

Last update: 6th July 2023