STUDY AT POLYTECH NANTES
INTERNATIONAL MASTER’S DEGREES

DATA SCIENCE - ELECTRICAL ENERGY - MICROALGAE BIOPROCESS ENGINEERING - THERMAL SCIENCE AND ENERGY - VISUAL COMPUTING - WIRELESS EMBEDDED TECHNOLOGIES
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A MAJOR HIGHER EDUCATION & RESEARCH CENTER OF WESTERN FRANCE

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GRADUATE SCHOOL OF ENGINEERING OF THE UNIVERSITY OF NANTES

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Facing a rapidly changing world, The University of Nantes invents a new model of university. This model places the student at its centre and, more than ever, the human being at the heart of its ambitions.

A genuine cultural, sports and society contributor, our university also encourages the revitalization of its region by enriching public debate and stimulating creativity (conferences, high-level sports...).

The University of Nantes is one of the rare French universities to promote cooperations. Within its 20 faculties and schools, 295 specialities are represented and 44 laboratories work in all fields of knowledge.

It contributes to the innovation of the socioeconomic fabric thanks to its researchers, laboratories, equipment and state-of-the-art technological platforms.

**A multi-disciplinary university**

The University of Nantes covers the 4 main fields of knowledge:

- Law, Economy, Management
- Arts, Letters, Languages
- Sciences, Technology, Health
- Social and Human Sciences

20 faculties and schools

3 750 staff (which 50% dedicated to research)

10 500 graduate per year

3 900 international students (140 nationalities represented)

**Information desk**

There are many services and associations present on campus to enhance and facilitate the daily lives of students (The university library, university theatre, pôle étudiant and more than 80 students’ associations).

www.univ-nantes.fr

The international students’ association Autour du Monde • ESN Nantes, promote intercultural exchange, mutual help and facilitates integration within the university.

nantes.ixesn.fr
POLYTECH NANTES
GRADUATE SCHOOL OF ENGINEERING OF THE UNIVERSITY OF NANTES

It is located in an attractive area of strong economic and demographic growth. Polytech Nantes is accredited by the ‘Commission des Titres d’Ingénieur’ (CTI), the French institution awarding engineering degrees.

As the graduate school of engineering of the University of Nantes, Polytech Nantes benefits from the scientific and educational environment of a university.

**Attractive campus**

The Chantrerie campus is located at the heart of ‘Atlanpole’, Nantes technology park. Its modern and well-equipped buildings provide an ideal learning environment for engineering students.

The Gavy campus is situated in Saint-Nazaire, amongst the aeronautics and shipbuilding industries, benefiting from the exceptional Guérande Peninsula atmosphere and a number of seaside resorts.

The Courtaisière campus in La Roche sur Yon, benefits from a recognized research activity thanks to the Chair for Telecommunications and networks.

→ www.polytech.univ-nantes.fr

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**Polytech network**

Polytech Nantes is the founding member of the Polytech group, a national network of 14 graduate engineering schools in France.

These 14 schools award the French ‘diplôme d’ingénieur’ (equivalent to an MSc) which is a national degree recognized by the French Ministry of Higher Education and Research.

70,000 engineers around the world

→ www.polytech-reseau.org

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20% foreign students

40 nationalities represented

+120 partner schools from over 40 countries
REASONS TO COME TO POLYTECH NANTES

Training programs adapted to different profiles

Polytech Nantes proposes a large range of Master’s Degrees in many areas (energy, computing...). More than 150 foreign students, from all over the world, come to study at Polytech Nantes each year.

Advanced research facilities

Polytech Nantes relies on the expertise of 7 laboratories. The school is pro-actively involved in research and development activities. It aspires to conduct research in diverse areas, aiming to cover a large spectrum (materials, energy, data processing, microalgae culture...).

Strong industrials links with companies

During their studies, the students work on real projects proposed by the companies and they have to complete an internship in these companies. Engineers and experts of the companies give lectures to Polytech students.

A very dynamic environment

Polytech Nantes radiates thanks to its 3 campuses situated at Nantes, Saint-Nazaire and La Roche-sur-Yon. Nantes (located at two hours from Paris by train) is a city renowned for its vitality, culture, economic development and its quality of life.
Polytech Nantes houses 7 world-renowned high-level research laboratories with cutting edge equipment. The strength of these research labs lies in their numerous research contracts with businesses, in particular small companies, as well as in their significant involvement in European and international collaborations.

Our laboratories have a number of academic and industrial partners both in France and abroad.

French and foreign students carry out research projects in these laboratories. The professors conduct research activities alongside their teaching missions. Polytech Nantes welcomes PhD students in its laboratories.

Two fields of research

**COMPUTER SCIENCE, ELECTRONICS, ELECTRICAL ENGINEERING**

- Digital Sciences Laboratory of Nantes (LS2N - UMR 6004) - www.ls2n.fr
- Electronics and Telecommunications Institute of Rennes (IETR - UMR 6164 CNRS) - www.ietr.fr

**MATERIALS, THERMAL AND ENERGY SCIENCE**

- Jean Rouxel Materials Institute (IMN- UMR 6502 CNRS) - www.cnrs-imn.fr
- Institute of Research in Civil Engineering and Mechanics (GEM- UMR 6183 CRNS) - www.gem.ec-nantes.fr
- Laboratory of Bioprocess Engineering, Environment and Agrifood (GEPEA- UMR 6144) - www.gepea.fr
- Nantes Thermokinetic Laboratory (LTEN- UMR 6607 CNRS) - www.polytech.univ-nantes.fr/ltn/fr
Polytech Nantes is open to the world. The school has agreements with more than 120 partners universities, in Europe (through Erasmus+ exchange programs) and outside Europe.

It allows Polytech Nantes to receive and send students wishing to gain experience by working abroad. Incoming students receive a warm welcome when they arrive at Polytech Nantes.

Its international partnerships have enabled Polytech Nantes to develop a complete range of programs taught in English, thanks to the quality of its research and teaching staff.

**A comprehensive range of studies**

Polytech Nantes offers 6 courses in research masters, with the University of Nantes, in the fields of bio-processes, information technology, electronics and electrical and thermal energy.

**Partnerships**

The research masters offer courses designed and developed with several partners: The Faculty of Science, Ecole Centrale de Nantes, IMT Atlantique and Polytech Nantes.

They are also supported by recognized research laboratories (IETR, LS2N, IMN, etc.).
The digital transformation of human activities (health, science, commerce, education, ...) is producing large amounts of complex data. Data science is a major scientific and technological area of computer sciences, founded on the fields of data analysis, machine learning and databases. It leads to produce methods and technologies to enable data-driven progress in these social, scientific and economic activities.

The Master’s Degree is a two-year degree. At Polytech Nantes, only the second year is accessible. However, for international students, the current program is a one-year program, where successful applicants enter directly the second year. Applicants should hold a degree which validates at least 4-years in higher education, in the field of computer science.

They are expected to have solid foundations in the following fields:

- mathematics (statistics, probability and optimization)
- relational databases (theory and practice)
- software development (e.g. Python, R, C++, software engineering)
- report writing

Career opportunities

- Data scientist
- R & D engineer
- Education and research

Contact: master-datascience@univ-nantes.fr
ELECTRICAL ENERGY
2nd year option of the Automatic electronics electrical energy Master’s Degree

THROUGH THIS MASTER’S DEGREE, STUDENTS WILL ACQUIRE EXCELLENT SKILLS IN THE MANAGEMENT OF ELECTRICAL ENERGY. BASED ON ELECTRICAL ENGINEERING COURSES, STUDENTS WILL BE ABLE TO DESIGN, DEVELOP AND IMPROVE COMPLEX ELECTRICAL SYSTEMS (INNOVATIVE MACHINE, ADVANCED POWER ELECTRONICS, SMART GRID AND MULTI-SOURCE SYSTEMS), AND TO PREPARE A PhD.

SYLLABUS
By focusing on the management of Electrical Energy the Master’s program covers various topics related to Electrical engineering: Advanced modeling of electromagnetic devices, Control management of electrical energy. The field of applications concerns more particularly energy conversion, transportation (boats, aircrafts, automotive...), sustainable development (wind and marine energy and their integration in the network) and multi-source systems.

FIRST SEMESTER (S9 - 30 ECTS):
- Electrical energy conversion
- Advanced electromagnetics
- Numerical methods
- Signal processing and control
Optional course (2 Teaching Units out of 3 – 10 ECTS)
- Electrical energy system
- Advanced numerical modeling
- Electrical systems control

SECOND SEMESTER (S10 - 30 ECTS):
- 1 Teaching Units + internship
  Internship: 5 months
- Scientific innovation: 25 h

SKILLS
→ To be able to design innovative solutions for the electrical integration of renewable energies
→ To integrate electrical efficiency and eco-conception rules during the design of electrical systems
→ To model a multiphysics system including sensing electrical systems and control process
→ To be able to design optimal electrical energy management systems

ADMISSION
The Master’s Degree is a two-year degree. At Polytech Nantes, only the second year is accessible, so applicants should hold a degree which validates at least 4 years in higher education (i.e. a 3-year Bachelor is not acceptable) and should be in one of the following fields:
- electrical engineering
- applied mathematics and physics
- command and signal processing

Career opportunities
→ Engineer in industry or research
→ Project engineer
→ R & D engineer
→ Higher education and research, particularly through doctoral training

Contact: master-ee@univ-nantes.fr

STUDY AT POLYTECH NANTES - INTERNATIONAL MASTER’S DEGREES
Students enroll for a two-semester program (second year of the Master). A total of 60 ECTS must be validated to graduate. For candidates entering the first year of the Master’s Degree (PM3E, IMT Atlantique), the program will deliver fundamentals in process engineering and project management before entering the second year of the Master’s Degree (Master’s PM3E for details). All courses are taught in English. French courses are organised for foreign students. A French Summer School is also available on request (see language chapter).

FIRST SEMESTER (S9 - 30 ECTS):

- Biology of microalgae
- Industrial valorization of microalgae
- Biochemical and metabolic engineering
- Microalgae culture and photobioreactor engineering
- Harvesting and biorefinery of microalgae
- Process integration and operation of microalgae exploitation facilities
- Project
- Language

SECOND SEMESTER (S10 - 30 ECTS):

- FEM - Master’s Thesis

Career opportunities

- Engineer in industry or research
- Project engineer
- R & D engineer
- Higher education and research, particularly through doctoral training

Skills

- To develop an industrial process for microalgae valorization
- To be able to conduct a research project on microalgae
- To be able to manage an industrial project related to the microalgae field
- To be familiar with the multidisciplinary approach needed in microalgae field (biology, engineering)

Admission

The Master’s Degree is a two-year degree. Candidates with a Bachelor of Science degree will enroll in the first year of the Master’s Degree (Master PM3E, IMT Atlantique).

Candidates with at least a 4-year Bachelor degree or first year of Master’s Degree can ask to enroll directly in the second year of the Master’s Degree. Candidates must have a good knowledge in, not necessarily all, but a majority, of the following fields:

- chemical and bioprocess engineering
- biochemical engineering
- mechanical engineering
- physics, Chemistry and biology

Contact: master-mbe@univ-nantes.fr
THERMAL SCIENCE AND ENERGY
2nd year option of the Mechanics Master’s Degree

This second year Master’s program covers a large scientific field related to energy. It is focused on heat transfer, fluid dynamics, polymers and composites processing and energy systems. This training prepares students to pursue doctoral studies and to occupy engineering positions in industrial companies.

FIRST SEMESTER (S9 - 30 ECTS):
• Fundamentals of heat transfer (Physics and engineering of heat transfer, Convective and radiative heat transfer)
• Experimental and digital methods (Experimental methods, Digital methods)
• Fluid mechanics (Fundamentals, Turbulence and turbulent flow, Hydrodynamic stability and Dynamic systems)
• Heat transfer in solids and heterogeneous media (Heat transfer at interfaces, Heat transfer during composite injection, Heat transfer with phase change, Polymers and composite thermophysical properties)
• Energy systems (Thermal energy storage)

SECOND SEMESTER (S10 - 30 ECTS):
The second semester is dedicated to a full-time scientific and technical internship (minimum 5 months) related to a research & development project conducted in academic labs or private companies.

Validations of both the exam session and of the master internship (defense and report) lead to the French Master’s Degree from the University of Nantes.

Career opportunities
→ R&D engineer
→ Future involvement in international PhD top level programs
→ Thermal design engineer in industrial companies (Energy Production, Transport...)

Skills
→ Perform engineering design of industrial projects
→ Conduct experimental and numerical analysis studies and analyzing results

Admission
The Master’s Degree is a two-year degree. At Polytech Nantes, only the second year is accessible, so applicants should hold a degree which is at least a 4-year degree in higher education (i.e. a 3-year Bachelor is not acceptable) and should be in one of the following fields: Applied Physics, Mechanical Engineering, Chemical Engineering

Applicants should be able to demonstrate (from transcripts of their degrees) good knowledge in, not necessarily all, but in most of the following fields:
• mathematics (tools for engineer)
• thermodynamics
• heat transfer
• fluid mechanics
• digital methods (coding)

Contact: master-te@univ-nantes.fr

THROUGH THIS PROGRAM, STUDENTS WILL ACQUIRE THE SCIENTIFIC AND TECHNOLOGICAL KNOWLEDGE, AS WELL AS THE PRINCIPAL EXPERIENCE, TO UNDERSTAND AND CONTRIBUTE TO INNOVATIVE RESEARCH AND DEVELOPMENT PROCESSES IN THE ENERGY FIELD.

HEAT TRANSFER
FLUID MECHANICS
ENERGY
POLYMERS AND COMPOSITES

© Polytech Nantes
The Master’s Degree is a two-year degree. At Polytech Nantes, only the second year is accessible, so applicants should hold a degree which validates at least 4-years in higher education (i.e. 240 ECTS) and should be able to demonstrate (from transcripts of their degrees) good knowledge in, not necessarily all, but in most of the following fields:

- software design, software development, software engineering
- signal processing, basic image processing
- machine learning
- mathematics (algebra, statistics and probabilities)

**Syllabus**

During the first semester, each course comprises lectures and associated exercises as well as personal work. This personal work includes further exercises, hands-on lab work and projects, and revising lecture notes.

Students will have access to a set of reference scientific books and papers, covering the scope of the Master’s program, to study for the duration of their studies in Nantes. During the second semester, every student starts his/her Master’s internship.

The student works full time on his/her research & development project which may be conducted in our research labs (Polytech Nantes will assure an internship in LS2N labs, students don’t need to look for one), or in the R&D team of a private company, typically near Nantes.

**FIRST SEMESTER (S9 - 30 ECTS):**

- Advanced image and video processing
- Perceptual computing
- Machine learning for computer vision
- 3D computer graphics
- Multimedia communication
- Human computer interaction
- French language and European culture

**SECOND SEMESTER (S 10 - 30 ECTS):**

- Internship

**Career opportunities**

- R&D engineer in visual computing
- Project engineer
- Student in top level international PhD programs

**Skills**

- Modeling and solving image and video processing and analysis problems
- Exploiting high level knowledge about human visual perception in order to contribute state-of-the-art solutions for multimedia applications.
- Using machine learning algorithms in order to build computer vision applications.
- Understanding and implementing a 3D data processing chain (from acquisition to representation)

**Admission**

The Master’s Degree is a two-year degree. At Polytech Nantes, only the second year is accessible, so applicants should hold a degree which validates at least 4-years in higher education (i.e. 240 ECTS) and should be able to demonstrate (from transcripts of their degrees) good knowledge in, not necessarily all, but in most of the following fields:

- software design, software development, software engineering
- signal processing, basic image processing
- machine learning
- mathematics (algebra, statistics and probabilities)
WIRELESS EMBEDDED TECHNOLOGIES

2nd year option of the Automatic electronics electrical energy Master’s Degree

Syllabus

The Wireless Embedded Technologies Master’s Degree proposes a new cross-disciplinary education paradigm, designed to provide high-level training for professional engineers who plan to become technical leaders in this burgeoning field. The purpose of this Master’s program is to provide a broad education in communicating embedded systems with the opportunity to specialize in areas that cover theoretical as well as practical aspects of embedded systems development.

All courses are taught in English, except the module for innovation and entrepreneurship. French courses are organized for foreign students.

FIRST SEMESTER (S9 - 30 ECTS):

- Models and mathematics
- Signal processing
- Communicating objects technologies
- Architecture and methodologies for embedded systems
- Tools and methodology for research
- Innovation and entrepreneurship

SECOND SEMESTER (S10 - 30 ECTS):

Students choose one of the following three streams:

- Antenna and propagation
- Communications systems architecture
- Advanced hardware and software architecture of embedded systems
- Internship (25 ECTS): a position of 5 months in a recognized laboratory.

Career opportunities

- R&D engineer in industry or research
- Electronic system architect
- Higher education and research through doctoral training

Skills

- To integrate knowledge, in an independent way and with a critical eye
- To identify, formulate and handle complex problems within the area
- To create technical solutions that fulfill human and societal needs
- To show an ability independently or within a group, to create relevant connected objects.

Admission

The Master’s Degree is a two-year degree. Students enroll for a two-semester program. A total of 60 ECTS must be validated to graduate. Equivalences can be considered (up to 15 ECTS) taking into account the student’s previous experience (Master’s and Bachelor’s courses). Applicants should earn a degree which validates at least a 4-year degree in higher education (i.e 240 ECTS) and should be in one of the following fields:

- computer science or engineering
- information technology
- telecommunications

Hosting research labs
**Costs**

This cost corresponds to education and training costs, and furthermore, it includes an internship in a laboratory, French courses, cultural outings and student social security*.

*It is included if you are less than 28 years old. If not, you will have to pay your own social security.

More information:
www.univ-nantes.fr/polytech/internationalmasters

**Internship**

During the 2nd semester, students complete a five-month research thesis/internship in a laboratory or company which allows them to be paid around €2500 (€500 per month).

**Language**

The program mainly aims at international students and is taught in English. A good command of the English language is required (B2 score as defined by the Council of Europe). Introductions to French language and European culture are provided locally at Polytech Nantes.

**Academic calendar**

The courses start in early September.

**Admission**

- For students coming from a partner university with Polytech Nantes, please contact the international office coordinator of your home university concerning the enrolment.

- For students coming from a country that is part of the Campus France procedure, please enrol with Campus France first, and then send us the requested documents below.

  > www.campusfrance.org

- For students coming from a country that is not part of the Campus France procedure, please send us directly the requested documents below.

  - a detailed CV in English (including the precise content of your studies, which topics were studied each year, grades/marks obtained, score obtained for an international test of English, reports you may have written during your studies)
  - a cover letter
  - a complete transcript in English of years of study at the University
  - a copy of your passport

  Complete the application form on our website
  > More information : www.univ-nantes.fr/polytech/internationalmasters
WELCOME TO NANTES AND SAINT-NAZAIRE

For the Master’s Degrees in Data Science, Thermal Science and Energy, Visual Computing and Wireless Embedded Technologies, courses are located in Nantes, on the Chantrerie Campus which hosts 5 Graduate Schools, with over 4,000 students, two university restaurants, a technology library, as well as about 30 companies of advanced technology.

Nantes (600,000 inhab.) is located close to the Atlantic Ocean and is regularly rated as one of the most pleasant French cities to live in. Thanks to its beautiful parks, efficient public transport and other policies for sustainable development, Nantes has been awarded the status of European Green Capital.

For the Master’s Degrees in Electrical Energy and Microalgae Bioprocess Engineering, courses are located in Saint-Nazaire, a coastal town of Western France with several advantages for students on biotechnological fields.

The Gavy campus at Saint-Nazaire hosts over 1000 students in various engineering courses (biotechnology, process, structural and electrical), university restaurant and a university library just located a few meters from the sea.

Accommodation

The rent for students’ accommodations may vary between €350 and €450 per month (allow for a deposit: usually 1 month rent). The housing market is saturated in September. It is highly recommended to seek accommodation in June or July. Expect to pay for insurance for any accommodation, as well as the housing tax for accommodation in town.

For students who come from a partner university with Polytech Nantes, please contact international@polytech.univ-nantes.fr before April for possibilities of cheap accommodation in CROUS Residences (approximately 260€ par month).
AIM FOR THE FUTURE