

## ADMISSION CRITERIA

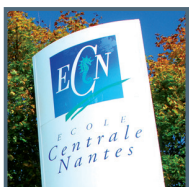


Students must hold a first university degree with 180 credits in the European system, after at least three years of studies (Bachelor of Science level or equivalent).

The applicants must be fluent in English, both in writing and speaking. An applicant whose native language is not English is required to pass a recognized international English test such as the TOEFL or other equivalent tests.

## LANGUAGE

100% of the language of instruction and examination is in English. Beside, 160 hours of French language courses are given during the first year.



## TUITION FEES

Registration fees are indicated on the website.

[www.ec-nantes.fr/version-anglaise/education/masters/](http://www.ec-nantes.fr/version-anglaise/education/masters/)

## APPLICATION PROCESS AND DEADLINE

The application can be done on-line on the website

<http://www.ec-nantes/masters>

## CONTACT

Master Department  
Ecole Centrale de Nantes  
1 rue de la Noë. BP 92101  
44321 Nantes cedex 3 - FRANCE  
[anne-laure.fremondier@ec-nantes.fr](mailto:anne-laure.fremondier@ec-nantes.fr)  
<http://www.ec-nantes.fr>

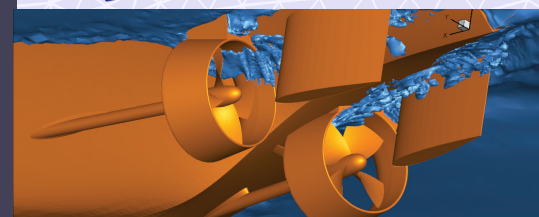
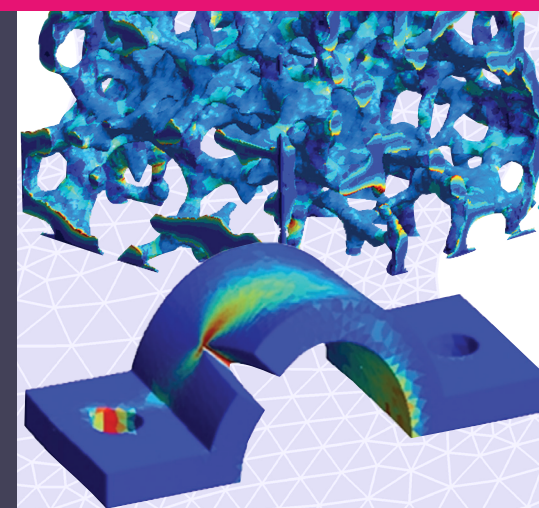


Création : direction de la communication. Ecole Centrale de Nantes. Juillet 2014. Imprimé sur papier recyclé. Crédits photos : Ecole Centrale de Nantes - Ville de Nantes - Tous droits réservés.

## MASTER OF SCIENCES IN APPLIED MECHANICS

### Computational mechanics

## COMPUTATIONAL MECHANICS



ACCÉLÉRATEUR DE VOTRE ÉNERGIE

The Master programme is fully recognized and accredited by the French Ministry of Higher Education. The network established by the researchers engaged in the programme guarantees international exposure to the students. The programme of study lasts two years and gives a total of 120 credits.



[www.ec-nantes.fr/masters](http://www.ec-nantes.fr/masters)

[f MastersProgrammeInEcoleCentraleNantes](#)



## CENTRALE NANTES

Close to the Atlantic Ocean, in a highly advanced scientific and industrial environment (Airbus, shipyards, etc.), Centrale Nantes, created in 1919, offers graduate engineering programs, Masters and PhDs, to French and international students.

With over 1900 graduate and post graduate students, 200 teaching and research staff, 38 partner countries, Centrale Nantes is one of the top Engineering Schools providing human resource to the industry worldwide.

Widespread recognition of the institute by firms and R&D organizations has enabled graduates to assume positions of responsibility in every sector.

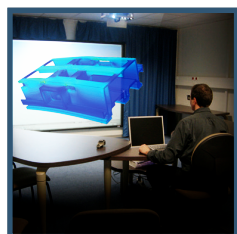
### MASTERS

Centrale Nantes offers the possibility to French and international students to achieve Master's Degree specialised in various fields of engineering such as Robotics, Computational Mechanics, Hydrodynamics and Ocean Engineering, Control Engineering, Applied Informatics, Civil engineering, Energetics and Propulsion, Design and Systems and Products, Metallic Assemblies and Complex Assemblies, Urban Environment.

Being hotbeds of innovation and open-mindedness, the research laboratories of Centrale Nantes provide strong links with France's industrial companies and enjoy a reputation of excellence in Europe and all around the world.

Depending on the specialisation, graduates may join the industry or may pursue PhD programmes in various laboratories of Centrale Nantes, or join other universities all over the world.

## COMPUTATIONAL MECHANICS



This master is aimed at students who wish to deepen their skills in modelling and numerical simulation of mechanical models, both fluid and solid. The course covers the modelling of complex mechanical systems involving a possible coupling of different physics at different scales.

In more general terms, the course provides solid training in advanced techniques in scientific computing at the interface between scientific disciplines for the modelling of engineering problems.

The individual classes adopt a global approach towards the issues associated with numerical modelling, from the construction of models and their discretization to the numerical resolution of discrete models, and to the mathematical analysis of models and approximation methods. The classes are closely related to current scientific issues and harness the expertise of a teaching team in direct contact with industry.



## PROGRAMME

### The First Year

#### COMMON TRACKS

45 credits★

##### Mathematics and Computer Science

Probability and statistics	4
Programming languages	3
Algorithms	3
Numerical analysis	3

##### Mechanical Modelling and Simulation

Numerical methods	4
Continuum mechanics	6
Vibrations	3
Fluid mechanics I	5
Mechanical design technology	3

#### Transverse skills

French language	9
Industrial knowledge	2

#### SPECIALTY TRACKS

15 credits★

student can choose between 2 specialty tracks

##### Solid mechanics Track

Engineering materials	5
Structural mechanics	3
Constitutive laws	3
Computer-aided mechanical design	
OR Introduction to Civil Engineering	4

##### Fluid mechanics Track

Fluid mechanics	5
Energetics	5
Basics of hydrodynamics and propulsion	5

### The Second Year

#### MASTER COURSES

30 credits★

##### Compulsory Modules

Extended Finite Element methods  
Computational methods for incompressible flows  
Model reduction  
Numerical methods for uncertainty quantification

##### Specialty Modules (4 among 9)

Fluid-Structure interaction and advanced CFD  
Physical modeling of fluids  
Meshless numerical methods  
Computational nonlinear dynamics of solids and structures  
Materials modelling for numerical simulation  
Multiscale numerical methods  
Iterative solvers and domain decomposition methods  
Numerical methods for coupled problems  
Computational configurational Mechanics

#### MASTER THESIS

30 Credits★

Credits : ECTS European Credits Transfer System





## ADMISSION CRITERIA



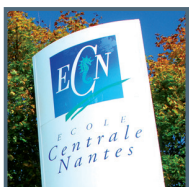
Students must hold a first university degree with 180 credits in the European system, after at least three years of studies (Bachelor of Science level or equivalent).

The applicants must be fluent in English, both in writing and speaking. An applicant whose native language is not English is required to pass a recognized international English test such as the TOEFL or other equivalent tests.

## LANGUAGE

100% of the language of instruction and examination is in English during the 1<sup>st</sup> year. Beside, 160 hours of French language courses are given to prepare the students for the second year.

During the 2<sup>nd</sup> year, courses and Master thesis are either in French or English language.



## TUITION FEES

Registration fees are indicated on the website.

[www.ec-nantes.fr/version-anglaise/education/masters/](http://www.ec-nantes.fr/version-anglaise/education/masters/)

## APPLICATION PROCESS AND DEADLINE

The application can be done on-line on the website

<http://www.ec-nantes/masters>

## CONTACT

Master Department  
Ecole Centrale de Nantes  
1 rue de la Noë. BP 92101  
44321 Nantes cedex 3 - FRANCE  
[anne-laure.fremondiere@ec-nantes.fr](mailto:anne-laure.fremondiere@ec-nantes.fr)  
<http://www.ec-nantes.fr>

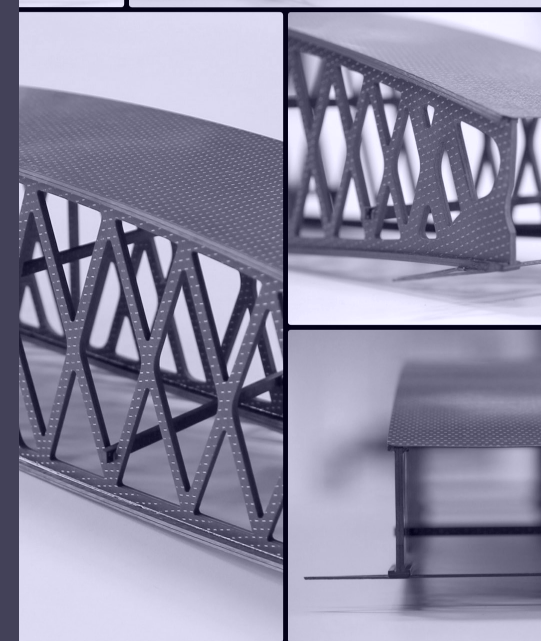


Création : direction de la communication. Ecole Centrale de Nantes. Juillet 2014. Imprimé sur papier recyclé. Crédits photos : Ecole Centrale de Nantes - Ville de Nantes - AIRBUS. 2009. Tous droits réservés.

## MASTER OF SCIENCES IN APPLIED MECHANICS

### Mechanical Engineering

## MATERIALS PROCESSES AND TECHNOLOGY OF COMPOSITES



ACCÉLÉRATEUR DE VOTRE ÉNERGIE



The Master programme is fully recognized and accredited by the French Ministry of Higher Education. The network established by the researchers engaged in the programme guarantees international exposure to the students. The programme of study lasts two years and gives a total of 120 credits.



[www.ec-nantes.fr/masters](http://www.ec-nantes.fr/masters)

[f MastersProgrammeInEcoleCentraleNantes](https://www.facebook.com/MastersProgrammeInEcoleCentraleNantes)



## CENTRALE NANTES

Close to the Atlantic Ocean, in a highly advanced scientific and industrial environment (Airbus, shipyards, etc.), Centrale Nantes, created in 1919, offers graduate engineering programs, Masters and PhDs, to French and international students.

With over 1900 graduate and post graduate students, 200 teaching and research staff, 38 partner countries, Centrale Nantes is one of the top Engineering Schools providing human resource to the industry worldwide.

Widespread recognition of the institute by firms and R&D organizations has enabled graduates to assume positions of responsibility in every sector.

### MASTERS

Centrale Nantes offers the possibility to French and international students to achieve Master's Degree specialised in various fields of engineering such as Robotics, Computational Mechanics, Hydrodynamics and Ocean Engineering, Control Engineering, Applied Informatics, Civil engineering, Energetics and Propulsion, Design and Systems and Products, Metallic Assemblies and Complex Assemblies, Urban Environment.

Being hotbeds of innovation and open-mindedness, the research laboratories of Centrale Nantes provide strong links with France's industrial companies and enjoy a reputation of excellence in Europe and all around the world.

Depending on the specialisation, graduates may join the industry or may pursue PhD programmes in various laboratories of Centrale Nantes, or join other universities all over the world.

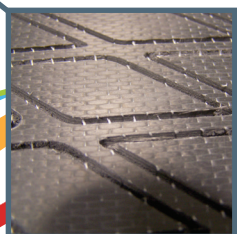
## METALLIC ASSEMBLIES AND COMPLEX COMPOSITES

[www.pole-emc2.fr](http://www.pole-emc2.fr)

This Master is designed to provide trouble-shooting and solution-oriented approach of problems encountered in composite applications, successively during the constituents selection, processing and mechanical design phases. Mostly fiber-reinforced organic-matrix composites will be of concern in this curriculum. Such composite materials and structures are strongly influenced by the constituting materials and the processing stage. Therefore composite mechanical design can be efficiently and optimally performed when one has a good understanding of the manufacturing's influences and constraints. Therefore the curriculum offered within this master program will provide a theoretical emphasis on the relationships between constituents, processing, process modeling and structural design. Through lab sessions dedicated towards characterization, manufacturing, process modeling and design, their links and interactions will be underlined.

The courses rely on theoretical and applied cases given by the course leaders. Fields of applications are numerous: from energy (wind, marine), transportation (automotive, aeronautics, rail, marine), and also niche markets such as sports and leisure or bio-medical.

The Master «Composite Materials» relies on the faculty and staff members, and on the scientific and research facilities of the GeM Institute "Institut de Recherche en Génie Civil et Mécanique" ([www.ec-nantes.fr/gem](http://www.ec-nantes.fr/gem)).



Laminated carbon/epoxy composite

## PROGRAMME

### The First Year

#### COMPULSORY MODULES 45 credits\*

##### Mathematics and Computer Science

1. Probability and statistics	4
2. Programming languages	3
3. Algorithms	3
4. Numerical analysis	3

##### Mechanical and Numerical Method

1. Numerical methods	4
2. Continuum mechanics	6
4. Vibrations	3
3. Fluid mechanics I	5
4. Mechanical design technology	3

French language	9
Industrial knowledge	2

#### SPECIALTY MODULES 15 credits

Engineering materials	5
Structural mechanics	3
Constitutive laws	3
Computer-aided mechanical design	4

### The second Year

#### SPECIALTY MODULES 30 Credits

Composites and constituants	3
Composites Processing Technologies	4
Composites Processing Modeling	6
Composite structures	6
Composites characterization of composite materials and structures	4

#### Conferences 2 Credits

#### 2 free courses (CSP speciality)

Optimization in mechanics
Numerical design of products
Design methodology
Virtual reality in design and production
Voice of the customer and customer satisfaction
Decision support for the design process

#### MASTER THESIS 30 Credits

\* Credits : ECTS European Credits Transfer System





## ADMISSION CRITERIA



Students must hold a first university degree with 180 credits in the European system, after at least three years of studies (Bachelor of Science level or equivalent).

The applicants must be fluent in English, both in writing and speaking. An applicant whose native language is not English is required to pass a recognized international English test such as the TOEFL or other equivalent tests.

## LANGUAGE

100% of the language of instruction and examination is in English during the 1<sup>st</sup> year. Beside, 160 hours of French language courses are given to prepare the students for the second year.

During the 2<sup>nd</sup> year, courses and Master thesis are either in French or English language.



## TUITION FEES

Registration fees are indicated on the website.

[www.ec-nantes.fr/version-anglaise/education/masters/](http://www.ec-nantes.fr/version-anglaise/education/masters/)

## APPLICATION PROCESS AND DEADLINE

The application can be done on-line on the website

<http://www.ec-nantes/masters>

## CONTACT

Master Department  
Ecole Centrale de Nantes  
1 rue de la Noë. BP 92101  
44321 Nantes cedex 3 - FRANCE  
[anne-laure.fremondriere@ec-nantes.fr](mailto:anne-laure.fremondriere@ec-nantes.fr)  
<http://www.ec-nantes.fr>



Création : direction de la communication. École Centrale de Nantes. Juillet 2014. Imprimé sur papier recyclé. Crédits photos : École Centrale de Nantes - Ville de Nantes - Tous droits réservés.

MASTER OF SCIENCES IN APPLIED MECHANICS

Mechanical Engineering

DESIGN OF SYSTEMS AND PRODUCTS



ACCÉLÉRATEUR DE VOTRE ÉNERGIE



The Master programme is fully recognized and accredited by the French Ministry of Higher Education. The network established by the researchers engaged in the programme guarantees international exposure to the students. The programme of study lasts two years and gives a total of 120 credits.



[www.ec-nantes.fr/masters](http://www.ec-nantes.fr/masters)

[MastersProgrammeInEcoleCentraleNantes](#)



## CENTRALE NANTES

Close to the Atlantic Ocean, in a highly advanced scientific and industrial environment (Airbus, shipyards, etc.), Centrale Nantes, created in 1919, offers graduate engineering programs, Masters and PhDs, to French and international students.

With over 1900 graduate and post graduate students, 200 teaching and research staff, 38 partner countries, Centrale Nantes is one of the top Engineering Schools providing human resource to the industry worldwide.

Widespread recognition of the institute by firms and R&D organizations has enabled graduates to assume positions of responsibility in every sector.

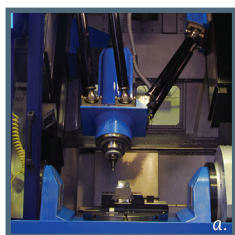
### MASTERS

Centrale Nantes offers the possibility to French and international students to achieve Master's Degree specialised in various fields of engineering such as Robotics, Computational Mechanics, Hydrodynamics and Ocean Engineering, Control Engineering, Applied Informatics, Civil engineering, Energetics and Propulsion, Design and Systems and Products, Metallic Assemblies and Complex Assemblies, Urban Environment.

Being hotbeds of innovation and open-mindedness, the research laboratories of Centrale Nantes provide strong links with France's industrial companies and enjoy a reputation of excellence in Europe and all around the world.

Depending on the specialisation, graduates may join the industry or may pursue PhD programmes in various laboratories of Centrale Nantes, or join other universities all over the world.

## DESIGN OF SYSTEMS AND PRODUCTS



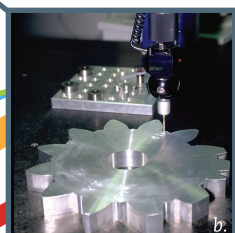
This master provides tools, models and methodologies for the design of mechanical products and for the design and management of industrial systems. Technical, human and economical factors are taken into account. The courses rely on both theoretical and practical aspects and cover the following areas:

- > Mechanical design of innovative mechanisms and products.
- > Customer-oriented design of products.
- > Industrial engineering.

The Master thesis work is closely linked with industrial companies such as car manufacturers (PSA, Renault), robot and machine-tool manufacturers (Staubli, ABB, Fatronik), airplane manufacturers (Airbus), ship manufacturers (DCNS, STX), or CAD-CAM suppliers (CATIA, UGS). This research project can be carried on in university labs (in France or abroad) or in immersion in a company.

Graduate students may prepare a PhD, in particular with teams of the IRCCyN, "Institut de Recherche en Communications et Cybernétique de Nantes" (<http://www.irccyn.ec-nantes.fr>).

- a. five-axis parallel kinematics milling machine
- b. example of machined part



## PROGRAMME

### The First Year

#### COMPULSORY MODULES 45 credits\*

##### Mathematics and Computer Science

1. Probability and statistics	4
2. Programming languages	3
3. Algorithms	3
4. Numerical analysis	3

##### Mechanical and Numerical Method

1. Numerical methods	4
2. Continuum mechanics	6
4. Vibrations	3
3. Fluid mechanics I	5
4. Mechanical design technology	3

French language	9
Industrial knowledge	2

#### SPECIALTY MODULES 15 credits

Engineering materials	5
Structural mechanics	3
Constitutive laws	3
Computer-aided mechanical design	4

### The second Year

#### SPECIALTY MODULES 30 Credits

Optimization in mechanics	5
Numerical design of products	4
Design methodology	3
Virtual reality in product development	3
Voice of the customer and customer satisfaction	3
Decision support for the design process	4

#### Conferences 2 Credits

#### 2 free courses (MPTC speciality)

Composites and constitutants
Composites Processing Technologies
Composites Processing Modeling
Composite structures
Composites characterization of composite materials and structures

#### MASTER THESIS 30 Credits

\* Credits : ECTS European Credits Transfer System





## ADMISSION CRITERIA



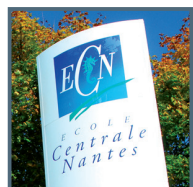
Students must hold a first university degree with 180 credits in the European system, after at least three years of studies (Bachelor of Science level or equivalent).

The applicants must be fluent in English, both in writing and speaking. An applicant whose native language is not English is required to pass a recognized international English test such as the TOEFL or other equivalent tests.

## LANGUAGE

100% of the language of instruction and examination is in English during the 1<sup>st</sup> year. Beside, 160 hours of French language courses are given to prepare the students for the second year.

During the 2<sup>nd</sup> year, courses and Master thesis are either in French or English language.



## TUITION FEES

Registration fees are indicated on the website.

[www.ec-nantes.fr/version-anglaise/education/masters/](http://www.ec-nantes.fr/version-anglaise/education/masters/)

## APPLICATION PROCESS AND DEADLINE

The application can be done on-line on the website

<http://www.ec-nantes/masters>

## CONTACT

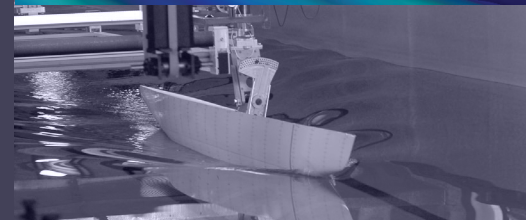
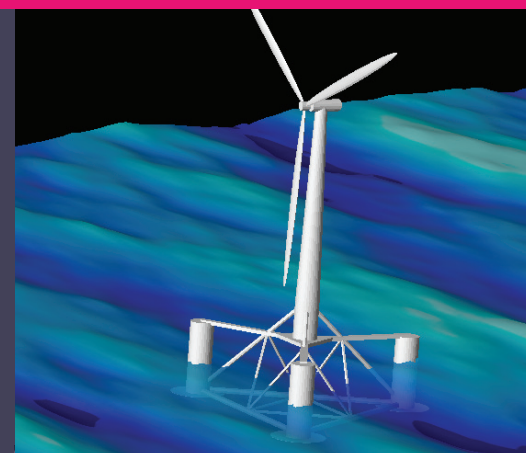
Master Department  
Ecole Centrale de Nantes  
1 rue de la Noë. BP 92101  
44321 Nantes cedex 3 - FRANCE  
[anne-laure.fremondier@ec-nantes.fr](mailto:anne-laure.fremondier@ec-nantes.fr)  
<http://www.ec-nantes.fr>



MASTER OF SCIENCES IN APPLIED MECHANICS

Hydrodynamics - Energetics and Propulsion

HYDRODYNAMICS AND OCEAN ENGINEERING



ACCÉLÉRATEUR DE VOTRE ÉNERGIE

The Master programme is fully recognized and accredited by the French Ministry of Higher Education. The network established by the researchers engaged in the programme guarantees international exposure to the students. The programme of study lasts two years and gives a total of 120 credits.



[www.ec-nantes.fr/masters](http://www.ec-nantes.fr/masters)

[MastersProgrammeInEcoleCentraleNantes](#)



## CENTRALE NANTES

Close to the Atlantic Ocean, in a highly advanced scientific and industrial environment (Airbus, shipyards, etc.), Centrale Nantes, created in 1919, offers graduate engineering programs, Masters and PhDs, to French and international students.

With over 1900 graduate and post graduate students, 200 teaching and research staff, 38 partner countries, Centrale Nantes is one of the top Engineering Schools providing human resource to the industry worldwide.

Widespread recognition of the institute by firms and R&D organizations has enabled graduates to assume positions of responsibility in every sector.

### MASTERS

Centrale Nantes offers the possibility to French and international students to achieve Master's Degree specialised in various fields of engineering such as Robotics, Computational Mechanics, Hydrodynamics and Ocean Engineering, Control Engineering, Applied Informatics, Civil engineering, Energetics and Propulsion, Design and Systems and Products, Metallic Assemblies and Complex Assemblies, Urban Environment.

Being hotbeds of innovation and open-mindedness, the research laboratories of Centrale Nantes provide strong links with France's industrial companies and enjoy a reputation of excellence in Europe and all around the world.

Depending on the specialisation, graduates may join the industry or may pursue PhD programmes in various laboratories of Centrale Nantes, or join other universities all over the world.

## HYDRODYNAMICS AND OCEAN ENGINEERING

The aim of this program is to give students an advanced training on typical problems of hydrodynamics applied to ocean and offshore engineering: ship resistance, seakeeping, water waves and marine environment... physical, modeling and numerical aspects are studied.

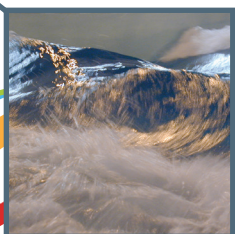
A large part of the training is also dedicated to practical use of softwares to solve problems defined above through a large variety of numerical methods: boundary elements or spectral methods under potential flow theory, finite-difference or finite-volume techniques in solvers for viscous flows, Smooth Particles Hydrodynamics (SPH)...

Students are also involved in lab sessions in the experimental facilities of the Laboratory in Hydrodynamics, Energetics and Environment in Atmosphere (LHEEA) of Centrale Nantes (towing tank, wave tank equipped with a multilap wave generator...)

After their Master thesis (at Centrale Nantes or in other labs in France or abroad), graduate students can prepare a PhD thesis, especially within the teams of LHEEA involved in research for free surface hydrodynamics, through experimental and numerical approaches: wave-structure interactions, 3D numerical simulation of real sea states and extreme waves, ship bow impact in steep waves, flooding and survivability of damaged ships, performances of marine energy devices (wave energy converters, offshore wind turbines, marine current turbines...) ships and marine structures...

The research programs of these PhD thesis are often defined in collaboration with industrial partners.

Alternatively, students can carry out (notably research and development work) in various fields of industry: shipbuilding, sailing and leisure boats, offshore industry, coastal engineering, marine renewable energy...



Water waves in experimental facilities of Ecole Centrale de Nantes

## PROGRAMME

### The First Year

#### COMPULSORY MODULES 45 credits\*

##### Mathematics and Computer Science

1. Probability and statistics	4
2. Programming languages	3
3. Algorithms	3
4. Numerical analysis	3

##### Mechanical and Numerical Method

1. Numerical methods	4
2. Continuum mechanics	6
3. Vibrations	3
4. Fluid mechanics I	5
5. Mechanical design technology	3

French language	9
Industrial knowledge	2

#### SPECIALTY MODULES 15 credits

##### Hydrodynamics, Energetics and Propulsion

1. Fluid mechanics II	5
2. Energetics	5
3. Basics of hydrodynamics	2,5
4. Basics of propulsion	2,5

### The second Year

#### THEORETICAL COURSES

Introduction to hydrodynamics	4
Marine environment and hydrodynamic loads	4
Seakeeping	3
Numerical methods for hydrodynamics – part 1	3
Experimental hydrodynamics	4
Numerical methods for hydrodynamics – part 2	4
Specific methods for free surface problems	4
Innovative methods for hydrodynamics	4

#### MASTER THESIS

30 Credits

\* Credits : ECTS European Credits Transfer System





## ADMISSION CRITERIA



Students must hold a first university degree with 180 credits in the European system, after at least three years of studies (Bachelor of Science level or equivalent).

The applicants must be fluent in English, both in writing and speaking. An applicant whose native language is not English is required to pass a recognized international English test such as the TOEFL or other equivalent tests.

## LANGUAGE

100% of the language of instruction and examination is in English during the 1<sup>st</sup> year. Beside, 160 hours of French language courses are given to prepare the students for the second year.

During the 2<sup>nd</sup> year, courses and Master thesis are either in French or English language.

## TUITION FEES

Registration fees are indicated on the website.

[www.ec-nantes.fr/version-anglaise/education/masters/](http://www.ec-nantes.fr/version-anglaise/education/masters/)

## APPLICATION PROCESS AND DEADLINE

The application can be done on-line on the website

<http://www.ec-nantes/masters>

## CONTACT

Master Department  
Ecole Centrale de Nantes  
1 rue de la Noë. BP 92101  
44321 Nantes cedex 3 - FRANCE  
[anne-laure.fremondriere@ec-nantes.fr](mailto:anne-laure.fremondriere@ec-nantes.fr)  
<http://www.ec-nantes.fr>



Création : direction de la communication. École Centrale de Nantes, juillet 2014. Imprimé sur papier recyclé. Crédits photos : École Centrale de Nantes - Ville de Nantes - Tous droits réservés.

MASTER OF SCIENCES IN APPLIED MECHANICS

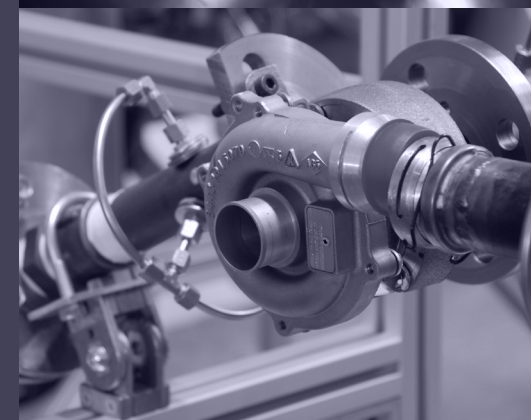
Hydrodynamics - Energetics and Propulsion

ENERGETICS AND PROPULSION



Centrale  
Nantes

ACCÉLÉRATEUR DE VOTRE ÉNERGIE



The Master programme is fully recognized and accredited by the French Ministry of Higher Education. The network established by the researchers engaged in the programme guarantees international exposure to the students. The programme of study lasts two years and gives a total of 120 credits.



[www.ec-nantes.fr/masters](http://www.ec-nantes.fr/masters)



MastersProgrammeInEcoleCentraleNantes



## CENTRALE NANTES

Close to the Atlantic Ocean, in a highly advanced scientific and industrial environment (Airbus, shipyards, etc.), Centrale Nantes, created in 1919, offers graduate engineering programs, Masters and PhDs, to French and international students.

With over 1900 graduate and post graduate students, 200 teaching and research staff, 38 partner countries, Centrale Nantes is one of the top Engineering Schools providing human resource to the industry worldwide.

Widespread recognition of the institute by firms and R&D organizations has enabled graduates to assume positions of responsibility in every sector.

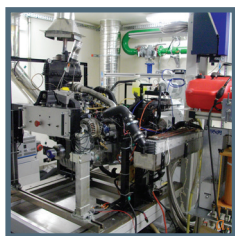
### MASTERS

Centrale Nantes offers the possibility to French and international students to achieve Master's Degree specialised in various fields of engineering such as Robotics, Computational Mechanics, Hydrodynamics and Ocean Engineering, Control Engineering, Applied Informatics, Civil engineering, Energetics and Propulsion, Design and Systems and Products, Metallic Assemblies and Complex Assemblies, Urban Environment.

Being hotbeds of innovation and open-mindedness, the research laboratories of Centrale Nantes provide strong links with France's industrial companies and enjoy a reputation of excellence in Europe and all around the world.

Depending on the specialisation, graduates may join the industry or may pursue PhD programmes in various laboratories of Centrale Nantes, or join other universities all over the world.

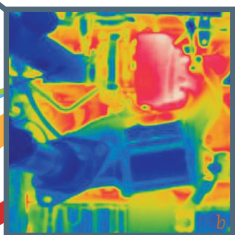
## ENERGETICS AND PROPULSION



Courses of energetic and propulsion program are taught by various speakers from prestigious universities or leading companies (Snecma, Bosch, MAN Diesel, PSA...). They mix theoretical courses with applied case studies.

Different Master thesis are offered in university labs (Centrale Nantes, Cranckfield, Eindhoven, Birmingham, Valencia...) or in companies (Renault, PSA, Delphi, Valéo, Snecma, EADS, GE, Mann+Hummel, Magneti Marelli) in the field of propulsion.

Graduate students may prepare a PhD, in particular with the Internal Combustion Engines Research Team of Centrale Nantes, which proposes experimental and/or numerical studies, often in cooperation with automotive manufacturers, or work for automotive or aerospace R&D.



a. internal combustion engine on test bench  
b. temperature field of the turbocharger

## PROGRAMME

### The First Year

#### COMPULSORY MODULES 45 credits\*

##### Mathematics and Computer Science

1. Probability and statistics	4
2. Programming languages	3
3. Algorithms	3
4. Numerical analysis	3

##### Mechanical and Numerical Method

1. Numerical methods	4
2. Continuum mechanics	6
3. Vibrations	3
4. Fluid mechanics I	5
5. Mechanical design technology	3

French language	9
Industrial knowledge	2

#### SPECIALTY MODULES 15 credits

##### Hydrodynamics, Energetics and Propulsion

1. Fluid mechanics II	5
2. Energetics	5
3. Basics of hydrodynamics	2,5
4. Basics of propulsion	2,5

### The second Year

#### THEORETICAL TRACKS

Combustion	6
Turbomachinery	4
Gas dynamics	4
Internal combustion engines	6
Aeronautic propulsion	4
Experimental methods for energetics	2

#### Elective course (1 to be chosen among 3)

- Automotive propulsion
- Automotive energy management
- Spatial propulsion

4

#### MASTER THESIS

30 Credits

\* Credits : ECTS European Credits Transfer System





## ADMISSION CRITERIA



Students must hold a first university degree with 180 credits in the European system, after at least three years of studies (Bachelor of Science level or equivalent).

The applicant must be fluent in English, both in writing and speaking. An applicant whose native language is not English is required to pass a recognized international English test such as the TOEFL or other equivalent tests.

## LANGUAGE

100% of the language of instruction and examination is in English during the two years. Beside, French language courses are given to help the students integration for the life in France.



## TUITION FEES

Registration fees are indicated on the website.

<http://masteraria.irccyn.ec-nantes.fr>

## APPLICATION PROCESS AND DEADLINE

The application can be done on-line on the website of the master

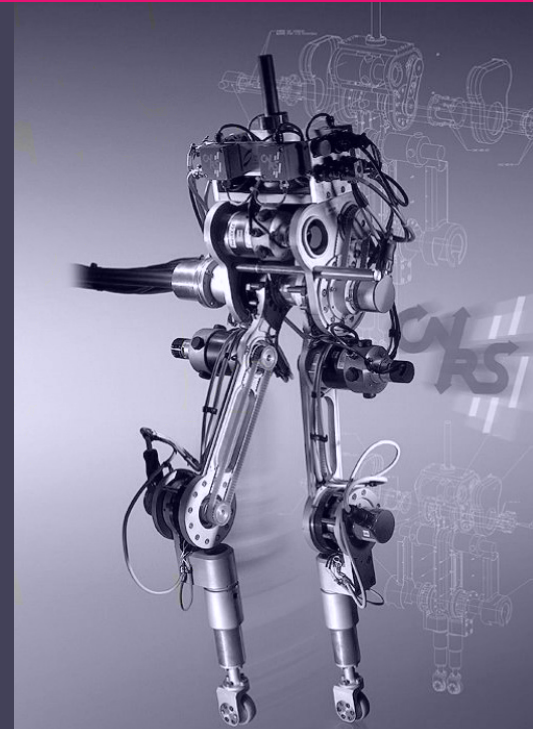
## CONTACT

Master Department  
Ecole Centrale de Nantes  
1 rue de la Noë. BP 92101  
44321 Nantes cedex 3 - FRANCE  
[anne-laure.fremondier@ec-nantes.fr](mailto:anne-laure.fremondier@ec-nantes.fr)  
<http://www.ec-nantes.fr>



MASTER OF SCIENCES IN CONTROL ENGINEERING,  
ROBOTICS AND APPLIED INFORMATICS

## ADVANCED ROBOTICS



ACCÉLÉRATEUR DE VOTRE ÉNERGIE

ECN  
Centrale  
Nantes

The Master programme is fully recognized and accredited by the French Ministry of Higher Education. The network established by the researchers engaged in the programme guarantees international exposure to the students. The programme of study lasts two years with a total of 120 credits. After validation the student will obtain master degree in Advanced Robotics.



ROBA  
Advanced Robotics

[www.ec-nantes.fr/masters](http://www.ec-nantes.fr/masters)

[f MastersProgrammeInEcoleCentraleNantes](#)



## CENTRALE NANTES

Close to the Atlantic Ocean, in a highly advanced scientific and industrial environment (Airbus, shipyards, etc.), Centrale Nantes, created in 1919, offers graduate engineering programs, Masters and PhDs, to French and international students.

With over 1900 graduate and post graduate students, 200 teaching and research staff, 38 partner countries, Centrale Nantes is one of the top Engineering Schools providing human resource to the industry worldwide.

Widespread recognition of the institute by firms and R&D organizations has enabled graduates to assume positions of responsibility in every sector.

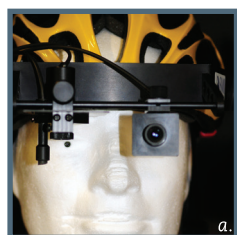
### MASTERS

Centrale Nantes offers the possibility to French and international students to achieve Master's Degree specialised in various fields of engineering such as **Robotics, Computational Mechanics, Hydrodynamics and Ocean Engineering, Control Engineering, Applied Informatics, Civil engineering, Energetics and Propulsion, Design and Systems and Products, Metallic Assemblies and Complex Assemblies, Urban Environment.**

**Being hotbeds of innovation and open-mindedness, the research laboratories of Centrale Nantes provide strong links with France's industrial companies and enjoy a reputation of excellence in Europe and all around the world.**

**Depending on the specialisation, graduates may join the industry or may pursue PhD programmes in various laboratories of Centrale Nantes, or join other universities all over the world.**

## ADVANCED ROBOTICS

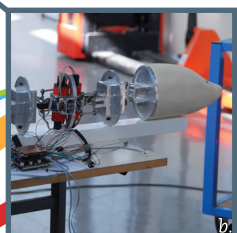


This Master courses focus on advanced robotics. More generally, it deals with modern techniques in systems engineering for the modelling, simulation, optimisation, analysis, and control of a variety of robotics systems.

The quality of this Master has been recognized by the European Union by supporting the European Master on Advanced Robotics (EMARO) in the framework of the Erasmus Mundus programme.

The Master "Advanced Robotics" relies on the staff members and on the scientific and research facilities of the IRCCyN, "Institut de Recherche en Communication et CYbernétique de Nantes" ([www.irccyn.ec-nantes.fr](http://www.irccyn.ec-nantes.fr)).

It is a common master of three institutions in Nantes: Ecole Centrale, Ecole des mines and University of Nantes.



a. eye tracking  
b. eel-like robot

## PROGRAMME

### The First Year

#### 1<sup>st</sup> semester

COMPULSORY MODULES	10 credits★
French language	4
Modeling and control of manipulations	6

#### ELECTIVE MODULES

students can choose 4 modules among the 5 proposed	
Control of linear multivariable systems	5
Real-time systems	5
Signal processing	5
Neural networks	5
Computer vision	5

#### 2<sup>d</sup> semester

COMPULSORY MODULES	6 credits
Group Project	6

#### ELECTIVE MODULES

students can choose 6 modules among the 8 proposed	
Mechanical design methods in robotics	4
Robot programming methods	4
Mobile robots	4
Artificial intelligence	4
Optimisation techniques	4
Non linear control techniques	4
Human computer interaction	4
Embedded systems	4

### The second Year

The second year is composed of two semesters with 30 ECTS for each. The 1st semester (September/January) contains the theoretical courses. The 2nd semester (February/July) is devoted to the Master thesis.

#### COMMON AND MANDATORY COURSES

French language	4
Advanced modeling of robots	4
Research methodology	6

#### ELECTIVE TRACKS (in English language)

Identification and control of robots	4
Humanoid and walking robots	4
Optimum Kinematics design of robots	4
Biologically inspired robots	4
Vision based control	4
Capture and simulation of human motion	4

#### MASTER THESIS

30 credits

★ Credits : ECTS European Credits Transfer System





## ADMISSION CRITERIA



Students must hold a first university degree with 180 credits in the European system, after at least three years of studies (Bachelor of Science level or equivalent).

The applicants must be fluent in English, both in writing and speaking. An applicant whose native language is not English is required to pass a recognized international English test such as the TOEFL or other equivalent tests.

## LANGUAGE

100% of the language of instruction and examination is in English during the 1<sup>st</sup> year. Beside, 160 hours of French language courses are given to prepare the students for the second year.

During the 2<sup>nd</sup> year, courses and Master thesis are either in French or English language.

## TUITION FEES

Registration fees are indicated on the website.

[www.ec-nantes.fr/version-anglaise/education/masters/](http://www.ec-nantes.fr/version-anglaise/education/masters/)

## APPLICATION PROCESS AND DEADLINE

The application can be done on-line on the website

[www.ec-nantes.fr/masters](http://www.ec-nantes.fr/masters)

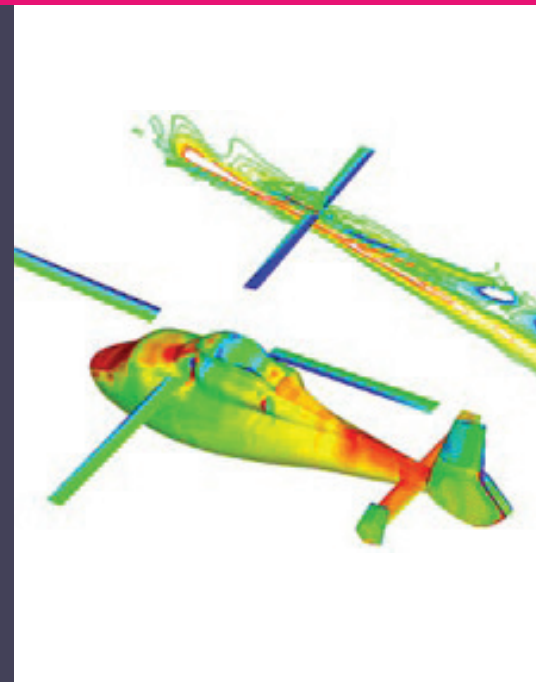
## CONTACT

Master Department  
Ecole Centrale de Nantes  
1 rue de la Noë. BP 92101  
44321 Nantes cedex 3 - FRANCE  
[anne-laure.fremondier@ec-nantes.fr](mailto:anne-laure.fremondier@ec-nantes.fr)  
<http://www.ec-nantes.fr>



MASTER OF SCIENCES IN CONTROL ENGINEERING,  
ROBOTICS AND APPLIED INFORMATICS

## AUTOMATIC CONTROL, SIGNAL AND IMAGE




ACCÉLÉRATEUR DE VOTRE ÉNERGIE



The Master programme is fully recognized and accredited by the French Ministry of Higher Education. The network established by the researchers engaged in the programme guarantees international exposure to the students. The programme of study lasts two years and gives a total of 120 credits.



[www.ec-nantes.fr/masters](http://www.ec-nantes.fr/masters)

 [MastersProgrammeInEcoleCentraleNantes](https://www.facebook.com/MastersProgrammeInEcoleCentraleNantes)



## CENTRALE NANTES

Close to the Atlantic Ocean, in a highly advanced scientific and industrial environment (Airbus, shipyards, etc.), Centrale Nantes, created in 1919, offers graduate engineering programs, Masters and PhDs, to French and international students.

With over 1900 graduate and post graduate students, 200 teaching and research staff, 38 partner countries, Centrale Nantes is one of the top Engineering Schools providing human resource to the industry worldwide.

Widespread recognition of the institute by firms and R&D organizations has enabled graduates to assume positions of responsibility in every sector.

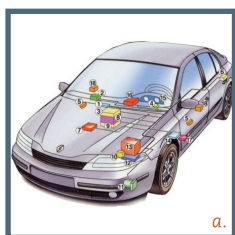
### MASTERS

Centrale Nantes offers the possibility to French and international students to achieve Master's Degree specialised in various fields of engineering such as Robotics, Computational Mechanics, Hydrodynamics and Ocean Engineering, Control Engineering, Applied Informatics, Civil engineering, Energetics and Propulsion, Design and Systems and Products, Metallic Assemblies and Complex Assemblies, Urban Environment.

Being hotbeds of innovation and open-mindedness, the research laboratories of Centrale Nantes provide strong links with France's industrial companies and enjoy a reputation of excellence in Europe and all around the world.

Depending on the specialisation, graduates may join the industry or may pursue PhD programmes in various laboratories of Centrale Nantes, or join other universities all over the world.

## AUTOMATIC CONTROL, SIGNAL AND IMAGE



a.

### TRACK: CONTROL OF SYSTEMS

The aim of this track is to present the most recent results in modern control theory including application of optimization methods in control system design. Analysis and design of nonlinear control systems and structural approach to control will be given. An important topic of the track are advanced industrial control techniques, mainly structures and algorithms of linear and nonlinear model-based predictive control. These are presented within a general framework of a multilayer control structure, consisting of basic control, advanced control and set-point optimization layers.



b.

a. embedded system  
b. 3d stereoscopic vision

### TRACK: SIGNAL & IMAGE PROCESSING

This track has the purpose of introducing the most modern tools of signal and image processing (non-stationary analysis, stochastic simulation algorithms, supervised statistical learning, source separation, etc) and their applications to the biomedical domain, but also to satellite imaging, industrial non-destructive testing and speech processing. The focused problems are classification, inverse problems (signal restoration, tomography) as well as image processing and pattern recognition.

## PROGRAMME

### The First Year

#### 1<sup>st</sup> semester

COMPULSORY MODULES	10 credits*
French language	4
Modeling and control of manipulators	6

#### ELECTIVE MODULES

20 credits

students can choose 4 modules among the 6 proposed

Control of linear multivariable systems	5
Real-time systems	5
Signal processing	5
Neural networks for classification and identification	5
Computer vision	5

#### 2<sup>d</sup> semester

COMPULSORY MODULES	6 credits
Group Project	6

#### ELECTIVE MODULES

24 credits

students can choose 6 modules among the 8 proposed

Mechanical design methods in robotics	4
Robot programming methods	4
Mobile robots	4
Artificial intelligence	4
Technical optimization	4
Non linear control theory	4
Human computer interaction	4
Embedded systems	4

### The second Year

#### COMMON CORE MODULES

14 credits

Models and systems	4
Optimisation	4
Research planning	6

#### TRACK: CONTROL OF SYSTEMS

Control Methodology	4
Structural Approach for Control	4
Advanced control of non linear dynamical systems	4
Time-delay systems	4
Optimisation convexe and Control	4
Theory of the control of linear systems	4

#### TRACK: SIGNAL & IMAGE PROCESSING

Statistical signal processing and Bayesian estimation	4
Analysis and representation of signals and images	4
Identification of linear systems	4
Machine learning and data analysis	4
Inverse Problems and Applications	4

#### MASTER THESIS

30 Credits

\* Credits : ECTS European Credits Transfer System





## ADMISSION CRITERIA



Students must hold a first university degree with 180 credits in the European system, after at least three years of studies (Bachelor of Science level or equivalent).

The applicants must be fluent in English, both in writing and speaking. An applicant whose native language is not English is required to pass a recognized international English test such as the TOEFL or other equivalent tests.

## LANGUAGE

100% of the language of instruction and examination is in English during the 1<sup>st</sup> year. Beside, 160 hours of French language courses are given to prepare the students for the second year.

During the 2<sup>nd</sup> year, courses and Master thesis are either in French or English language.



## TUITION FEES

Registration fees are indicated on the website.

[www.ec-nantes.fr/version-anglaise/education/masters/](http://www.ec-nantes.fr/version-anglaise/education/masters/)

## APPLICATION PROCESS AND DEADLINE

The application can be done on-line on the website

[www.ec-nantes.fr/masters](http://www.ec-nantes.fr/masters)

## CONTACT

Master Department  
Ecole Centrale de Nantes  
1 rue de la Noë. BP 92101  
44321 Nantes cedex 3 - FRANCE  
[anne-laure.fremondriere@ec-nantes.fr](mailto:anne-laure.fremondriere@ec-nantes.fr)  
<http://www.ec-nantes.fr>



MASTER OF SCIENCES IN CONTROL ENGINEERING,  
ROBOTICS AND APPLIED INFORMATICS

## REAL TIME, STEERING AND SUPERVISION



ACCÉLÉRATEUR DE VOTRE ÉNERGIE



The Master programme is fully recognized and accredited by the French Ministry of Higher Education. The network established by the researchers engaged in the programme guarantees international exposure to the students. The programme of study lasts two years and gives a total of 120 credits.



[www.ec-nantes.fr/masters](http://www.ec-nantes.fr/masters)

[MastersProgrammeInEcoleCentraleNantes](#)



## CENTRALE NANTES

Close to the Atlantic Ocean, in a highly advanced scientific and industrial environment (Airbus, shipyards, etc.), Centrale Nantes, created in 1919, offers graduate engineering programs, Masters and PhDs, to French and international students.

With over 1900 graduate and post graduate students, 200 teaching and research staff, 38 partner countries, Centrale Nantes is one of the top Engineering Schools providing human resource to the industry worldwide.

Widespread recognition of the institute by firms and R&D organizations has enabled graduates to assume positions of responsibility in every sector.

### MASTERS

Centrale Nantes offers the possibility to French and international students to achieve Master's Degree specialised in various fields of engineering such as Robotics, Computational Mechanics, Hydrodynamics and Ocean Engineering, Control Engineering, Applied Informatics, Civil engineering, Energetics and Propulsion, Design and Systems and Products, Metallic Assemblies and Complex Assemblies, Urban Environment.

Being hotbeds of innovation and open-mindedness, the research laboratories of Centrale Nantes provide strong links with France's industrial companies and enjoy a reputation of excellence in Europe and all around the world.

Depending on the specialisation, graduates may join the industry or may pursue PhD programmes in various laboratories of Centrale Nantes, or join other universities all over the world.

## REAL TIME, STEERING AND SUPERVISION

### TRACK: Real Time Embedded Systems - Embedded Computer Science

The objective of this track is to present the techniques currently used for the design and the verification of embedded systems, and more especially real-time embedded systems. The track relies on several courses covering various topics: the design of real-time systems and the architecture of a real-time operating system (OSEK/VDX standard is used); the real-time scheduling policies and the associated implementation; tools for the modelling and verification of real-time systems: Petri networks, finite state automata and time automata.

### TRACK: Simulation and Supervision

This track aims at introducing the modern tools and methods for the performance analysis, simulation, control and supervision of discrete event systems, in particular in production systems and on-line management. The lectures include the modeling and supervisory control of discrete-event systems, resource management, sizing and synthesis, just in time control, hybrid systems and their optimal control, discrete-event off-line and on-line simulation and applications to flexible manufacturing, dynamic scheduling and rescheduling, on-line observation and computer-aided decision making.

### TRACK: Management of complex systems

This track is dedicated to complex systems consisting of many subsystems interacting at multiple levels of organization and collective structure. This set of modules cover the modeling of complex systems and especially business models, information systems, supply chain management and constraint programming.

## PROGRAMME

### The First Year

#### 1<sup>st</sup> semester

COMPULSORY MODULES	10 credits*
French language	4
Modeling and control of manipulators	6

#### ELECTIVE MODULES

students can choose 4 modules among the 6 proposed	
Control of linear multivariable systems	5
Real-time systems	5
Signal processing	5
Neural networks for classification and identification	5
Computer vision	5

#### 2<sup>d</sup> semester

COMPULSORY MODULES	6 credits
Group Project	6

#### ELECTIVE MODULES

students can choose 6 modules among the 8 proposed	
Mechanical design methods in robotics	4
Robot programming methods	4
Mobile robots	4
Artificial intelligence	4
Optimisation techniques	4
Non linear control theory	4
Human computer interaction	4
Embedded systems	4

### The second Year

COMMON CORE MODULES	14 credits
Models and systems	4
Optimisation	4
Research planning	6

### TRACK: Management of complex systems (choose 4 modules among 5)

Knowledge and Diversity Management	4
Enterprise Modelling	4
Information Systems	4
Supply Chain management	4
Constraint Programming	4

### TRACK: Real Time Embedded Systems - Embedded Computer Science (choose 4 modules among 5)

Real time systems	4
Modelling and verification	4
Scheduling for real-time systems	4
Petri nets	4
Embedded Systems Design	4

### Track: Simulation and Supervision (choose 4 modules among 5)

Modelling and supervision of DES	4
Data-processing simulation of DES	4
Hybrid systems	4
Logistics, planification and scheduling	4
Statistical methods for process monitoring	4
Reliability and maintenance of production systems	4

### MASTER THESIS 30 Credits

\* Credits : ECTS European Credits Transfer System





## ADMISSION CRITERIA



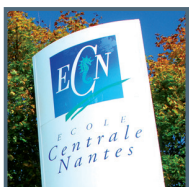
Students must hold a first university degree with 180 credits in the European system, after at least three years of studies (Bachelor of Science level or equivalent).

The applicants must be fluent in English, both in writing and speaking. An applicant whose native language is not English is required to pass a recognized international English test such as the TOEFL or other equivalent tests.

## LANGUAGE

100% of the language of instruction and examination is in English during the 1<sup>st</sup> year. Beside, 160 hours of French language courses are given to prepare the students for the second year.

During the 2<sup>nd</sup> year, courses are in French language and Master thesis can be either in French or English.



## TUITION FEES

Registration fees are indicated on the website.

[www.ec-nantes.fr/version-anglaise/education/masters/](http://www.ec-nantes.fr/version-anglaise/education/masters/)

## APPLICATION PROCESS AND DEADLINE

The application can be done on-line on the website

<http://www.ec-nantes/masters>

## CONTACT

Master Department  
Ecole Centrale de Nantes  
1 rue de la Noë. BP 92101  
44321 Nantes cedex 3 - FRANCE  
[anne-laure.fremondier@ec-nantes.fr](mailto:anne-laure.fremondier@ec-nantes.fr)  
<http://www.ec-nantes.fr>



## MASTER OF SCIENCES AND TECHNIQUES IN URBAN ENVIRONMENT

## ATMOSPHERE, WATER AND URBAN ENVIRONMENT



ACCÉLÉRATEUR DE VOTRE ÉNERGIE

The Master programme is fully recognized and accredited by the French Ministry of Higher Education. The network established by the researchers engaged in the programme guarantees international exposure to the students. The programme of study lasts two years and gives a total of 120 credits.



[www.ec-nantes.fr/masters](http://www.ec-nantes.fr/masters)

[MastersProgrammeInEcoleCentraleNantes](https://www.facebook.com/MastersProgrammeInEcoleCentraleNantes)



## CENTRALE NANTES

Close to the Atlantic Ocean, in a highly advanced scientific and industrial environment (Airbus, shipyards, etc.), Centrale Nantes, created in 1919, offers graduate engineering programs, Masters and PhDs, to French and international students.

With over 1900 graduate and post graduate students, 200 teaching and research staff, 38 partner countries, Centrale Nantes is one of the top Engineering Schools providing human resource to the industry worldwide.

Widespread recognition of the institute by firms and R&D organizations has enabled graduates to assume positions of responsibility in every sector.

### MASTERS

Centrale Nantes offers the possibility to French and international students to achieve Master's Degree specialised in various fields of engineering such as Robotics, Computational Mechanics, Hydrodynamics and Ocean Engineering, Control Engineering, Applied Informatics, Civil engineering, Energetics and Propulsion, Design and Systems and Products, Metallic Assemblies and Complex Assemblies, Urban Environment.

Being hotbeds of innovation and open-mindedness, the research laboratories of Centrale Nantes provide strong links with France's industrial companies and enjoy a reputation of excellence in Europe and all around the world.

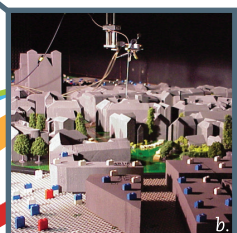
Depending on the specialisation, graduates may join the industry or may pursue PhD programmes in various laboratories of Centrale Nantes, or join other universities all over the world.

## ATMOSPHERE, WATER AND URBAN ENVIRONMENT



This Master offers a well-balanced education to future engineers and town planners by providing the skills necessary to solve environmental and energy issues through an integrated approach, combining technological development together with the consideration of human, social and urban constraints. The programme is designed to provide scientific knowledge and tools through advanced lectures and research work in recognized and renowned research laboratories.

The Master "Atmosphere, Water and Urban Environment" relies on the staff members and on the scientific and research facilities of the IRSTV "Research Institute on Urban Sciences and Technology" ([www.irstv.fr](http://www.irstv.fr)).



a. large experimental wind tunnel «Boussinesq».

b. small scale physical model of dense urban canopy in atmospheric wind tunnel.

## PROGRAMME

### The First Year

1 <sup>st</sup> semester	30 credits*	2 <sup>nd</sup> semester	30 credits
French intensive (one week full time)	0	French language II	6
French language I	6	Fluid mechanics II	4
Programming languages and algorithms	4	Scientific publication & review project	3
Numerical methods	6	Experimental methods for envir. fluids	4
Fluid mechanics I	3	Geographic information systems	3
Urban management and services	4	Urban photochemistry	3
Energetics	4	Heat transfers in buildings	3
Probability and statistics	3	Common research project	4

### The second Year

#### COMPULSORY MODULES

30 Credits

##### COMMON COURSES

Urban and environmental management	2
Metropolitan organization & planning	2
Tools for urban data management	2
Interdisciplinary methodology for research	3
Urban project	3
Urban indicators and envir. assessment	2

##### SPECIALTY COURSES

General and urban meteorology	2
Turbulence & atmospheric boundary layer	3

Hydrology and drainage basin	2
Urban atmosphere	2
Water management in cities	2
Urban pollution and remediation	3
Simulation tools	2

#### OPTIONAL MODULES

Fluid mechanics (upgrading)	0
Energetics (upgrading)	0
English language (TOEIC preparation)	0
French language	0

#### MASTER THESIS

30 Credits

\* Credits : ECTS European Credits Transfer System





## ADMISSION CRITERIA



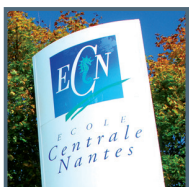
Students must hold a first university degree with 180 credits in the European system, after at least three years of studies (Bachelor of Science level or equivalent).

The applicants must be fluent in English, both in writing and speaking. An applicant whose native language is not English is required to pass a recognized international English test such as the TOEFL or other equivalent tests.

## LANGUAGE

100% of the language of instruction and examination is in English during the 1<sup>st</sup> year. Beside, 160 hours of French language courses are given to prepare the students for the second year.

During the 2<sup>nd</sup> year, courses and Master thesis are either in French or English language.



## TUITION FEES

Registration fees are indicated on the website.

[www.ec-nantes.fr/version-anglaise/education/masters/](http://www.ec-nantes.fr/version-anglaise/education/masters/)

## APPLICATION PROCESS AND DEADLINE

The application can be done on-line on the website

<http://www.ec-nantes/masters>

## CONTACT

Master Department  
Ecole Centrale de Nantes  
1 rue de la Noë. BP 92101  
44321 Nantes cedex 3 - FRANCE  
[anne-laure.fremondier@ec-nantes.fr](mailto:anne-laure.fremondier@ec-nantes.fr)  
<http://www.ec-nantes.fr>

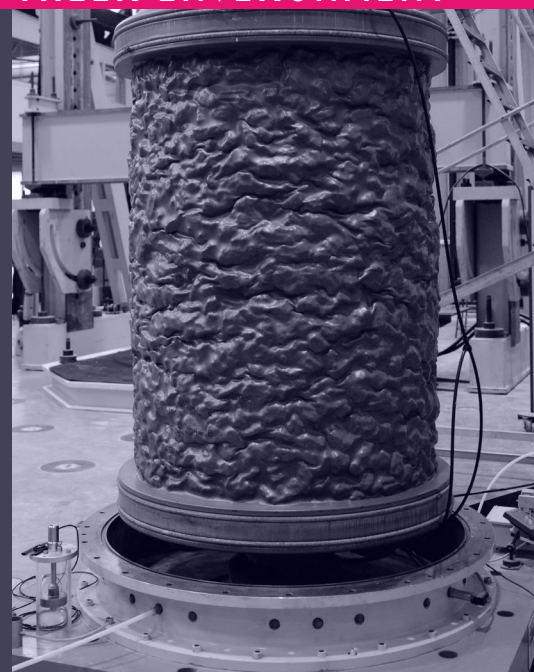


Création : direction de la communication. École Centrale de Nantes. Juillet 2014. Imprimé sur papier recyclé. Crédits photos : École Centrale de Nantes - Ville de Nantes. Tous droits réservés.

## MASTER OF SCIENCES IN CIVIL ENGINEERING

### Civil Engineering

## MATERIALS AND STRUCTURES IN THEIR ENVIRONMENT




ACCÉLÉRATEUR DE VOTRE ÉNERGIE



The Master programme is fully recognized and accredited by the French Ministry of Higher Education. The network established by the researchers engaged in the programme guarantees international exposure to the students. The programme of study lasts two years and gives a total of 120 credits.



[www.ec-nantes.fr/masters](http://www.ec-nantes.fr/masters)

 [MastersProgrammeInEcoleCentraleNantes](https://www.facebook.com/MastersProgrammeInEcoleCentraleNantes)



## CENTRALE NANTES

Close to the Atlantic Ocean, in a highly advanced scientific and industrial environment (Airbus, shipyards, etc.), Centrale Nantes, created in 1919, offers graduate engineering programs, Masters and PhDs, to French and international students.

With over 1900 graduate and post graduate students, 200 teaching and research staff, 38 partner countries, Centrale Nantes is one of the top Engineering Schools providing human resource to the industry worldwide.

Widespread recognition of the institute by firms and R&D organizations has enabled graduates to assume positions of responsibility in every sector.

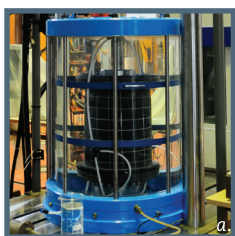
### MASTERS

Centrale Nantes offers the possibility to French and international students to achieve Master's Degree specialised in various fields of engineering such as Robotics, Computational Mechanics, Hydrodynamics and Ocean Engineering, Control Engineering, Applied Informatics, Civil engineering, Energetics and Propulsion, Design and Systems and Products, Metallic Assemblies and Complex Assemblies, Urban Environment.

Being hotbeds of innovation and open-mindedness, the research laboratories of Centrale Nantes provide strong links with France's industrial companies and enjoy a reputation of excellence in Europe and all around the world.

Depending on the specialisation, graduates may join the industry or may pursue PhD programmes in various laboratories of Centrale Nantes, or join other universities all over the world.

## CIVIL ENGINEERING AND ENVIRONMENT

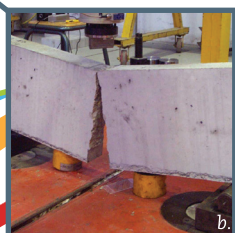


The Master of Civil Engineering and Environment is dedicated to develop scientific and technological knowledge. It is characterized by a high degree of scientific specialisation. The principal vocation of our Master is designed to prepare students for research in the public and industrial sector.

The program focus on the following areas: advanced experimental methods and numerical modeling, geotechnical engineering, earthquake engineering, concrete durability, structural reliability.

The training is mainly provided by researchers from the research Institute in Civil and Mechanical Engineering (GeM, [www.ec-nantes.fr/gem](http://www.ec-nantes.fr/gem)), the French institute of sciences and technology for transport, development and networks (IFSTTAR, [www.ifsttar.fr](http://www.ifsttar.fr)) and the Scientific and Technical Center for Building ([www.cstb.fr](http://www.cstb.fr)).

The supporting research institutes are well equipped in experimental test facilities for static and dynamic characterisation of materials and structures, as well as powerful computational clusters.



a. triaxial cell  
b. large concrete beam failure test

## PROGRAMME

### The First Year

SEMESTER 1 (270h)	30 credits★	SEMESTER 2 (290h)	30 credits★
<b>Common courses (15 ECTS credits)</b>			
French Language I + II (110h)	6	French language III (50h)	3
Programming languages (20h)	3	Business Environment (25h)	2
Algorithms (15h)	3	Probability and statistics (30h)	4
Numerical methods (50h)	4	Numerical analysis (25h)	3
Continuum mechanics (35h)	6	Mechanical design technology (20h)	3
Vibrations (15h)	3		
Fluid mechanics I (25h)	5		
<b>Specialty courses (15 ECTS credits)</b>			
		Engineering materials (40h)	5
		Structural mechanics (30h)	3
		Constitutive laws (30h)	3
		Geotechnical engineering (20h)	2
		Concrete and structures (20h)	2

### The second Year

SEMESTER 1 (160h)	30 credits★
<b>Common courses (8 ECTS credits)</b>	
Nondestructive experimental methods for materials and structures (20h)	4
Numerical analysis (20h)	4
<b>Specialty courses (22 ECTS credits)</b>	
Constitutive laws (20h)	4
Physical modeling (20h)	4
Durability of cement materials (20h)	4
Earthquake engineering (20h)	3
Design and behavior of modern concrete (20h)	4
Statistics of materials and structural reliability (20h)	3

SEMESTER 2 - MASTER THESIS	30 credits★
----------------------------	-------------

★ Credits : ECTS European Credits Transfer System

