REINVENT ENGINEERING

CENTRALE NANTES

Master of Science (MSc)
Mechanical Engineering

COMPUTATIONAL MECHANICS

OBJECTIVES

This MSc programme develops skills in advanced techniques in scientific computing at the interface between scientific disciplines for the modelling of mechanical engineering problems.

The courses cover the modelling and numerical simulation of complex mechanical systems (both fluid and solid) involving a possible coupling of different physics at different scales. The training is based on 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.
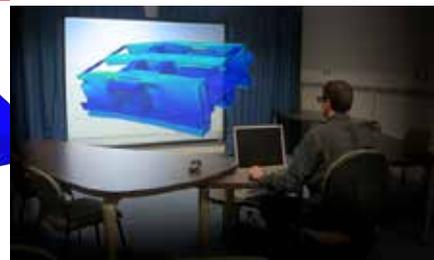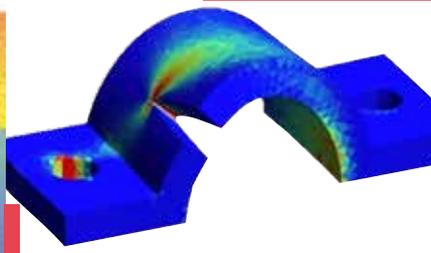
SKILLS

Specialism-specific

> Model solids and fluid flow problems

> Use advanced numerical and scientific technics to discretize and solve mechanical problems

> Master the mathematical analysis of models and approximation methods

General

> Identify models, perform simulation and analyse results

> Communicate comprehensive results in a meaningful way

> Undertake bibliographic surveys from international research and professional literature

> Manage or be part of a project

JOB PROSPECTS & FURTHER PHD STUDIES

SECTOR: Aeronautics, Automotive, Transportation, Wind and Marine Energy, Software, Consulting.

FIELDS: Mechanical Engineering, Design, Research and Innovation.

JOB POSITIONS: Computational Engineer, Mechanical Engineer, Research and Innovation Engineer (post PhD).

SCHOOL OF ENGINEERING | FRENCH **GRANDE ÉCOLE** | FOUNDED IN 1919
This MSc programme is accredited by the French Ministry of Higher Education and Research.

www.ec-nantes.fr
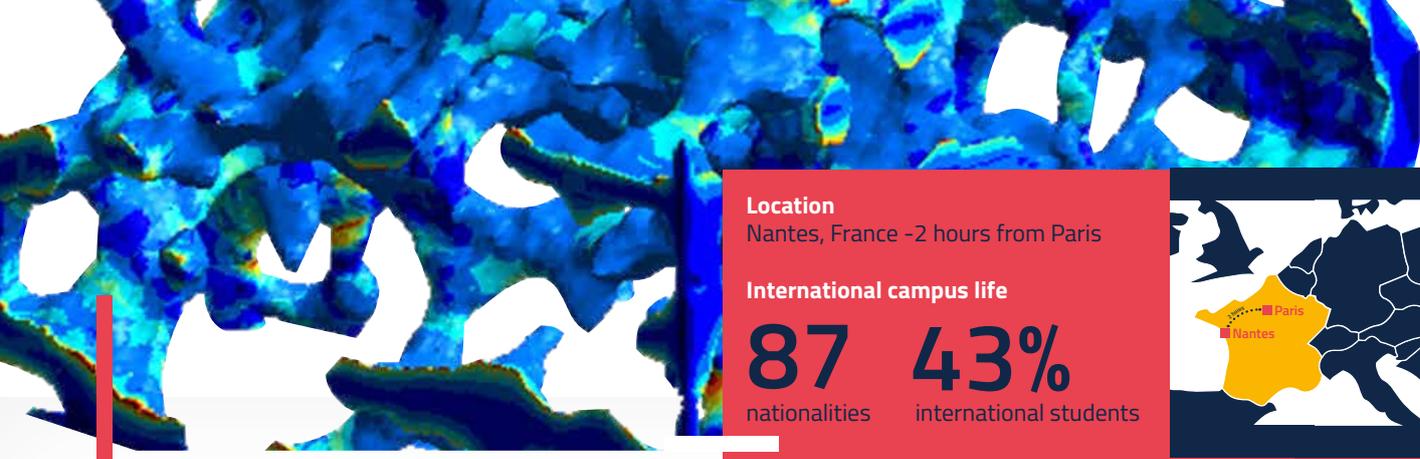
Location
Nantes, France -2 hours from Paris

International campus life

87
nationalities

43%
international students

CONTENT AND COURSES
(A Master Degree requires the validation of 120 ECTS credits)

M1 - AUTUMN SEMESTER	ECTS
Continuum Mechanics	5
Fluid Mechanics	5
Algorithmics for Engineering Modelling	4
Numerical Methods	5
Vibrations and Differential Equations	5
Business Environment	4
Modern Languages	2
Conferences	0
M1 - SPRING SEMESTER	**ECTS**
Probability and Statistics	5
Numerical Analysis	5
Structural Mechanics	5
Fluid Mechanics 2	5
Programming and Algorithmics	5
Conferences and Initiation to Research	3
Modern Languages	2
M2 - AUTUMN SEMESTER	**ECTS**
Computational Configurational Mechanics	3
Computational methods for incompressible flows	3
Domain decomposition and iterative solvers	4
Extended Finite Element Method and level set techniques	4
Model Reduction	3
Numerical methods for simulation of coupled problems	4
Numerical methods for uncertainty quantification	3
Physical Modeling of Fluids	4
Modern Languages	2
M2 - SPRING SEMESTER	**ECTS**
Master Thesis or Industrial Internship (paid)*	30

*In France, for internships exceeding 2 months a minimum legal level of remuneration (approximately €600 per month) is fixed by the government. In some professional branches, this amount may be higher.

NB Course content may be subject to minor changes

EXAMPLES OF FINAL YEAR INTERNSHIP/MASTER'S THESIS

> Superelement reduction for sequential analysis of offshore wind turbines INNOSEA, Nantes
> Multiphysics optimisation of fibre reinforced composite material, FAURECIA, St Malo
> CFD simulation of gas-droplets flow in a spray scrubber, IMT Atlantique Bretagne Pays de la Loire
> High-performance computing of fluids with discontinuous Galerkin method, Observatoire de la Cote d'Azur
> Validation of a lubrication code for rotating machines: Case of tilting pads journal bearing with scratched pads, EDF LAB Paris Saclay

FACULTY, INDUSTRIAL PARTNERS AND RESEARCH LABS

This MSc relies on the Centrale Nantes' faculty, staff and research facilities of the GeM Institute, the Jean Leray laboratory, the LHEEA Laboratory and the LS2N Institute. Centrale Nantes has several industrial partnerships with Airbus, Renault, Faurecia, Solvay, IFREMER, CETIM.

OTHER PROGRAMME INFORMATION

> Length of Studies: 2 years
> Language of instruction: English
> 3 semesters of courses and 1 semester of Master's thesis

Tuition & Fees - Scholarships - Application process - Deadlines

MORE INFORMATION AND FULL PROGRAMME:
www.ec-nantes.fr/masters

CONTACT: master.admission@ec-nantes.fr

École Centrale de Nantes. Direction de la communication. September 2023